

**RECOGNITION AND CARE SEEKING BEHAVIOR FOR NEWBORN AND  
MATERNAL COMPLICATIONS AND FACILITY READINESS TO PROVIDE  
QUALITY ANTENATAL, INTRAPARTUM AND POSTPARTUM CARE IN  
RURAL NEPAL**

by

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# **Abstract**

## **Background**

Globally between 1990 and 2015, maternal and newborn mortality have decreased 44% and 46% respectively. Achievement of the Sustainable Development Goal targets, however, will require accelerated progress to ending preventable maternal and newborn deaths. This requires a renewed focus on maternal and newborn care at the facility level and by trained health workers. In settings such as rural Nepal where the majority of the births still occur at home, there are still knowledge gaps on reasons for low usage of maternal and newborn care at health facilities despite safe motherhood programs and community based newborn care services.

## **Objective**

This dissertation aims to describe the facility readiness in providing quality maternal and newborn care services, to assess how women and caretakers identify maternal/newborn complications, and to characterize the decision making process and patterns of care seeking. We also explored if place of birth was associated with the type of postnatal care sought for severely ill newborns.

## **Methods**

Primary data on facility readiness and health worker knowledge to provide maternal and newborn care was collected through a health facility audit and health worker interviews at 23 birthing centers and one district hospital in Sarlahi district. A qualitative study included 32 illness event narratives (6 maternal/newborn deaths each and 10 maternal/newborn illnesses each) collected through small group interviews and in-depth interviews on illness recognition,

decision-making process and the care-seeking steps along with timeline of events from illness recognition to illness resolution or death. Bivariate and multivariate multinomial logistic regression was used to analyze the association between place of birth and type of postnatal care sought among a subset of severely ill newborns from a population based sample of newborns.

## **Results**

Readiness of facilities to provide basic emergency obstetric and newborn care services was poor among the primary health care center level birthing centers. Infection prevention was lacking in quarter of health facilities and shortage of essential medicines was a major barrier to facility readiness. Only half of the health workers had received the government-mandated additional training in skilled birth attendance and the private sector staff scored significantly lower on knowledge of essential maternal health issues. Delay in perceiving the severity of illness, and initial care-seeking from informal health providers (traditional healers for mostly maternal cases; village doctors for both) delayed prompt care-seeking at health facility. Some barriers to seeking care at a health facility included transport problems, lack of money, illness onset at night, low perceived severity and distance to facility. Informal care and no care was sought for 44% and 20% of severely ill newborns. Caregivers of severely ill newborns born in a health facility were twice as likely to seek formal care as opposed to no care compared to non-facility born newborns [adjusted relative risk ratio (RRR): 2.00; 95% CI: 1.30-3.06].

## **Conclusion**

These findings have important implications for safe motherhood programs, newborn care programs and quality of care improvements in health facilities. We suggest addressing the gaps in facility readiness through routine monitoring and supervision, improving supply chains, creating an enabling environment for health workers, and extending refresher trainings to all

health workers. Our findings show the need to utilize informal care providers as links to the formal providers by training them in danger sign identification and referrals to health facility. We also suggest improving counseling on recognition of danger signs and prompt care seeking through community level interventions so as to reach a wider audience. The supply and demand for delivery at health facilities needs to increase and postnatal home-visits of home births by female community health volunteers could increase care seeking from formal providers.

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## List of Acronyms

AMTSL	active management of third stage of labor
ANC	antenatal care
ANM	auxiliary nurse midwife
BC	birthing center
BEmONC	basic emergency obstetric and newborn care services
BPP	birth preparedness program
CB-IMNCI	Community Based Integrated Management of Neonatal and Childhood Illnesses
CB-NCP	Community Based Newborn Care Program
CEmONC	comprehensive emergency obstetric and newborn care services
CI	confidence intervals
ENP	early neonatal period
FCHV	female community health volunteers
GoN	Government of Nepal
HP	health post
IBAF	infant birth assessment form
IDI	In-Depth Interview
JHSPH	Johns Hopkins Bloomberg School of Public Health
MBAF	maternal birth assessment form
MC	maternal complication
MCHIP	Maternal and Child Health Integrated Program
MD	maternal death
MDG	Millennium Development Goals
MMR	maternal mortality ratio
MoHP	Ministry of Health and Population
NC	newborn complication
ND	newborn death



NGO	non-government organization
NHFS	Nepal Health Facility Survey
NMR	neonatal mortality rate
NMSP	National Safe Motherhood Program
NFF	newborn follow-up form
NNIPS	Nepal Nutrition Intervention Project – Sarlahi
NOMS	Nepal Oil Massage Study
OB/GYN	Obstetrics/Gynecology
PHCC	primary health care center
PMTCT	prevention of mother to child transmission
PPH	Postpartum Hemorrhage
pSBI	possible severe bacterial infection
PWG	Pregnant Women’s Group
QoC	quality of care
REDCap	Research Electronic Data Capture
RRR	relative risk ratio
SBA	skilled birth attendant
SDG	Sustainable Development Goals
SDIP	Safe Delivery Incentive Program
TBA	traditional birth attendant
U5MR	under-5 mortality rates
USAID	United States Agency for International Development
VDC	village development committee
WD	ward distributor
WHO	World Health Organization

## Chapter 1 : Introduction

The end of the Millennium Development Goals (MDG) era in 2015 showed impressive progress in reducing under-5 mortality rates (U5MR) and maternal mortality ratio (MMR) by 53% and 44% from 1990 to 2015 respectively [1, 2]. However, both goals fell short of meeting their respective targets of reducing U5MR by two-thirds and MMR by 75% by 2015 [3]. The rate of decline varies greatly by geographic regions, with the Sub-Saharan Africa and South Asian region having the highest maternal and under-5 deaths [1, 4]. Among, the under-5 deaths, the decline in neonatal deaths has been slower with neonatal deaths now comprising a little less than half (45%) of under-five mortality deaths, up from 40% in 1990 [5]. Similarly, maternal mortality still remains high with about 830 women dying every day from pregnancy or childbirth-related complications around the world, with the majority in low-resource settings [6].

Under the new Sustainable Development Goal (SDG), the targets are to reduce MMR to less than 70 deaths per 100,000 livebirths and reduce neonatal mortality rate (NMR) to 12 deaths per 1,000 live births by 2030 [7]. Newborn health plays an increasingly important role in the SDG period; the day of birth and the first 28 days of life are the most vulnerable time for a child's survival and health. About 75% of all newborn deaths result from three preventable and treatable conditions – complications due to prematurity, intrapartum-related deaths (including birth asphyxia) and neonatal infections [5]. Maternal health is closely linked to newborn survival and an estimated 46% of all maternal deaths and 40% of all stillbirths and neonatal deaths take place during the time of labor and day of birth (first 48 hours) [8]. Majority of maternal deaths take place due to complications during and following pregnancy and childbirth. Severe bleeding (mostly bleeding after childbirth), high blood pressure during pregnancy (pre-eclampsia and

eclampsia), infection and complications from delivery (obstructed labor and other direct causes) is estimated to account for 27%, 14%, 11% and 9% of maternal deaths respectively [4]. Cost-effective, proven interventions exist to prevent and treat each main cause.

Skilled and timely care before, during and after childbirth can save the lives of women and newborn babies from preventable and treatable causes. Many women give birth at home and may not see a skilled health worker before or after delivery. In 2016, 78% of all births occurred with a skilled birth attendant (SBA) present, compared with 61% in 2000, showing progress but huge variation by geographical region and within country differences exist [9]. Only 53% and 51% of deliveries were conducted by SBA in South Asia and Sub-Saharan Africa respectively [9]. The equity gap in terms of accessing and service utilization has widened in many countries especially between the urban and rural gap. Analysis from 56 of 75 countdown countries with available survey data shows a median gap of 35·4% (IQR 22·2–43) between urban and rural women for skilled birth attendance [10].

Although facility births are increasing in all regions and income groups, quality of care at birth remains a major challenge. Skilled health workers often lack access to critical supplies and medicines or proper training and clinical guidelines to implement the proven and established interventions. For instance, despite established interventions to prevent and treat postpartum hemorrhage in facility births through active management of third stage of labor (i.e., uterotonic immediately following delivery of the fetus, controlled cord traction and fundal massage immediately after delivery of the placenta, followed by palpation of the uterus every 15 minutes for 2 hours to assess the continued need for massage), hemorrhage remains the leading cause of maternal deaths [11]. Similarly, effective low-cost interventions like the provision of magnesium sulphate that halves the risk of death from pre-eclampsia have been used widely in health

facilities worldwide but the mortality due to eclampsia was not reduced, highlighting the fact that more attention is needed in the quality of care element of intervention implementation [10].

Intrapartum stillbirths and neonatal deaths are sensitive markers of delay, since these babies die quickly [12]. Besides, the quality of care received in health facilities, it is important to understand the delays in receipt of care for newborns and pregnant women. Thaddeus and Maine (1994) outlined three factors that contribute to maternal morbidity and mortality: 1) the delay in deciding to seek care if a complication occurs, 2) the delay in reaching care, and 3) the delay in receiving care from a medical facility [13]. These delays are influenced by social and cultural factors, accessibility of services, and quality of obstetric care. The Three Delays framework has been widely used to structure safe motherhood programs in designing context specific community and health system strengthening strategies [14]. Proven low-cost interventions are available but coverage and utilization by the pregnant women and newborns in areas with highest mortality rates are low. Addressing of barriers to care seeking for newborn and maternal illness, improvement of quality of care at all levels (including health facilities), and clear definition of clinical roles and responsibilities in newborn and maternal care are essential for further advances in neonatal and maternal mortality reduction [15–17].

## **1.1. Purpose of this study**

In settings such as rural Nepal, 56% of women still give birth at home and 62% reported going for at least 4 antenatal care visits [18]. There are still knowledge gaps on the reasons for low usage of maternal and newborn health facilities even after the implementation of health programs and policies that aim to improve demand and supply of free and accessible health services provided by the National Safe Motherhood Programme (NSMP) and Community-based newborn care services.

Understanding the care seeking practices and what drives decisions (both facilitators and barriers) at family and at community levels for maternal and newborn complications is crucial to identify gaps in service delivery and outreach. Availability of maternal and newborn care services at health facilities has been demonstrated as an important determinant of care seeking [19]. However, there are few data on the specific types of services that communities in rural Nepal seek for maternal and newborn care (especially at the time of illness) or the reasons for seeking these services; available studies are largely limited to the period prior to implementation of the NSMP and newborn specific programs [20–25].

Thus, the overall goal of this study is to assess how women and caretakers identify maternal/newborn complications, the factors behind decision-making to seek care, combined with a concurrent assessment of the readiness of facilities to provide quality maternal and newborn care at primary level in rural Nepal.

## 1.2. Specific Aims

**Primary Aim 1:** To assess the facility readiness and health worker knowledge of maternal and newborn care that are a vital component of health facilities' capacity to provide quality maternal and newborn care. This was a descriptive study to understand the health facility readiness in primary health care birthing centers and district hospital in the provision of quality antenatal, intrapartum and immediate postnatal care.

**Primary Aim 2:** To characterize the process and factors behind recognition of perceived maternal and newborn complications and decision-making for seeking treatment/care among Nepalese women, household, and community members in rural Sarlahi District, Nepal. We used a qualitative research approach to understand the process of care-seeking among families and communities upon the onset and recognition of a newborn or maternal illness in a rural setting of Nepal. The health care system in Nepal is diverse, and use of “other” types of care besides skilled care from a trained medical provider or in a health facility is prevalent. We, therefore, wanted to explore these care seeking patterns and reasons for seeking the type of care sought.

**Primary Aim 3:** To understand if being born in a health facility was associated with parents/families of severely ill newborns choosing to seek postnatal care from qualified formal providers in a rural community in Nepal. We will also assessed the type of postnatal care sought from informal providers and its association with place of birth.

### **1.3. Organization of Dissertation**

The dissertation is presented in seven chapters. Chapter 1 introduces the background and specific aims of the research. Chapter 2 provides a review of the current literature on maternal and newborn health situation along with the programs and policies in Nepal. Chapter 3 provides details on the study area and an overview of the methods for each specific aims. Chapters 4, 5, and 6 describe three substantive research papers, each aligned with one of the above three aims. Chapter 4 focuses on the facility and health worker readiness to provide quality antenatal, intrapartum and postpartum care. Chapter 5 explores the qualitative findings on illness recognition, decision making and care seeking pattern for maternal and newborn illness. Chapter 6 details the association between types of postnatal care sought by place of birth for severely ill newborns. The final chapter provides a synthesis of the overall conclusions, implications, and suggestions for future research. The Appendices includes the tools and guides used for data collection, institutional approval letters, and supplementary tables and figures.

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## **Chapter 2 : Literature Review on Background on the Maternal and Newborn Situation and Program/Policies in Nepal**

### **2.1 Maternal Mortality and Morbidity in Nepal**

Worldwide, at least 300,000 women still die annually due to pregnancy-related complications with 95% of these deaths taking place in the low and middle-income countries [1]. Sub-Saharan Africa and South Asia were the two regions that accounted for about 84% of all maternal deaths [1]. Nepal has made significant improvements in maternal health services resulting in a decrease in MMR. According to the World Health Organization (WHO) estimates, the MMR in Nepal declined from 901 in 1990 to 258 maternal deaths per 100,000 live births in 2015 [2]. The Nepal Maternal Morbidity and Mortality Survey 2008/09 reported that 41% of maternal deaths occurred at health facilities, 40% at home, and 14% on the way to health institutions and 62% of the deaths occurred outside the intrapartum period [3]. Although the proportion of maternal deaths due to hemorrhage has reduced it is still the leading cause of maternal deaths in Nepal [3]. Among the maternal morbidities in an emergency obstetric facility, prolonged labor was the most commonly reported, followed by abortion related complications and hemorrhage of which two-thirds was postpartum hemorrhage (PPH) [3].

Utilization of health facilities and seeking care from skilled providers for maternal health has also increased over the years. According to the 2016 Nepal Demographic and Healthy Survey, 85% of women reported receiving at least one ANC visit from a skilled provider and 57% reported delivering at a health facility compared to 58% and 35% respectively in 2011 [4]. However, rural areas in Nepal have a much lower utilization of maternal health care services and the inequity in service outreach and utilization is still huge between the rural and urban

population. For instance, health facility delivery (rural 44% vs urban 69%); four or more ANC visits (rural 62% vs urban 76%); postnatal care for mothers in the first two days after birth (rural 48% vs urban 64%) [4].

## **2.2 Neonatal Mortality and Morbidity in Nepal**

Unlike the progress made in reducing maternal mortality, neonatal mortality has remained a public health challenge in Nepal. According to the 2016 NDHS, the NMR has decreased from 33 in 2006 to 21 deaths per 1000 live births in 2016 after remaining stagnant at 33 deaths in 2011 [4]. However, the decline has not been substantial as neonatal deaths still accounts for 61% of the under-five mortality. Disparity in the newborn health situation between the urban and rural populations are also evident. The 2011 Nepal Demography and Health Survey shows that the NMR in the rural area is much higher at 36 deaths per 1000 live births, compared to 25 deaths per 1000 live births in urban area [5]. Although the annual health report by the Ministry of Health and Population (MoHP) of Nepal, the proportion of deliveries that followed with the recommended three postnatal visits was 20% in 2014/2015 and 18% in 2015/2016 [6]. This indicates the need to promote access to and use of postnatal care services in the country. The proportion of deliveries that received first postnatal care within 24 hours of delivery is higher at 52% in 2015/2016 [6].

A 2014 study to ascertain cause of neonatal deaths in Nepal using verbal autopsy showed that the major causes of death were infections (48 %), birth asphyxia/birth injury (16 %), and pre-maturity related (13 %) [7]. Other Nepalese community- and hospital-based data also suggest infections, birth asphyxia, preterm birth and hypothermia as the most important causes [8–10].

## 2.3 Care-Seeking Behavior Theoretical Framework

There are many real and perceived barriers to accessing care, particularly for women in rural areas of low-income countries. The delays in accessing care for women with obstetric emergencies and neonatal complications that result in adverse outcomes on maternal and newborn survival can be characterized by the ‘three delays’ model developed by Thaddeus and Maine [11]. Delays in receiving appropriate care can be important for many conditions, but delays of even a few hours in addressing an obstetrical emergency around the time of birth or the onset of sepsis in a neonate can be significant. The model comprises of the following three delays: delay in recognition of problem and decision to seek care (delay 1), delay in reaching the health facility (delay 2), and delay in receiving quality care at the health facility (delay 3). The conceptual framework behind care-seeking for maternal and newborn illness (adapted from USAID TRAction Project) is displayed in Figure 2.1.

Although the “three delays model” was developed in the context of understanding care seeking behavior and obstacles to maternal survival, the same model can be applied to address access to care and care-seeking practices for newborns with danger signs [12–14]. Delay 1 and delay 3 were found to be the major contributors to newborn death in study done in Uganda that used social autopsy on all reported home and facility newborn deaths [14]. However, studies done in rural Gambia [15] and India [13] showed that the delay in decision making and delay in reaching the health facility (transport/cost delays) were the major contributing delays to newborn death. In Tanzania the delay in receiving quality care (delay 3) was the major contributing factor to newborn mortality, although this study was restricted to newborn deaths in health facilities [12].

The delay in recognition of the problem and decision to seek care deals with the first step of delay where women may be unaware of the need to access maternal health or newborn care services or their benefits thus delaying the illness recognition. Furthermore, they may also lack the power to make decisions on their own health care and care is further delayed [16, 17]. Such a delay, even if short, can be fatal especially for neonatal complications which generally presents less obviously and progresses more quickly [14]. The delay to reach a health facility results from the actual accessibility to the required health facility. It deals with the time it takes to reach a health facility once the decision to seek care has been made. The distribution and location of health facility, physical distance, transportation access (roads, public or private transportation), and cost to cover transportation are factors that result in this delay [11]. Delay in receiving quality care at facility is the delay in receiving adequate and appropriate care at the health facility level once the patient reaches a health facility. Poorly staffed facilities, poorly equipped facilities and inadequate management of patients are the factors identified that result in inadequate quality of care [11]. A quality gap exists among births that take place in facilities in low resource settings, where few women and newborns receive the full range of necessary services, with failures to monitor pregnancy and labor, identify complications, and provide life-saving interventions[18]. The poor quality of care received at health facilities for intrapartum services is known to be associated with subsequent low use of services [19].

## **2.4 Nepal National Maternal and Newborn Program and Policies**

### **2.4.1. National Safe Motherhood Program**

The Nepal Safe Motherhood Program (NSMP) started in 1997, with the goal to reduce maternal and neonatal mortality and morbidities. The NSMP addresses the factors that are caused by

pregnancy, childbirth and postnatal period complications and works to prevent these complications. The NSMP strategies are based on the “three delays model” identified by Thaddeus and Maine.

To reduce the risks associated with pregnancy and childbirth and address factors associated with mortality and morbidity three major strategies have been adopted in Nepal [20]:

- Promoting birth preparedness and complication readiness through awareness raising and improving the availability of funds, transport and blood supplies.
- Encouraging institutional delivery through provision of free institutional delivery services and financing scheme to cover transportation cost.
- Expansion of 24-hour 7 days a week emergency obstetric care services (basic and comprehensive) at selected public health facilities in every district through the establishment of birthing centers with trained nurses and midwives

The NSMP covers all 75 districts of Nepal and has invested in health system strengthening of maternal and newborn care services through government funds as well as support from donor funding. The Safe Motherhood and Neonatal Health Long Term Plan (2006-2017) included a strategy for strengthening and expanding the number of births conducted by skilled birth attendants (SBA), having basic and comprehensive obstetric care services at all levels, and establishing a functional referral system [20]. At the health facility level, the MoHP has recognized the importance of skilled birth attendance at every birth and embodies the Government’s commitment to training and deploying doctors, nurses and auxiliary nurse midwives (ANMs) with the required skills across the country at the primary health care facilities [21]. One of the actions taken is the decentralization of 24-hour emergency obstetric care

services through establishment and expansion of separate birthing centers (BCs), which are the lowest health units where facility-based births are available. The BCs attached to the grass-root level Health Posts (HPs), the lowest health units in the community, provide basic obstetric care to women with no complications or low risk pregnancies and also referral and arranging transport if needed. The BCs available at the second higher unit at the primary health care centers (PHCCs) provide the Basic Emergency Obstetric and Newborn Care (BEmONC) to prevent and treat hemorrhage, puerperal sepsis, eclampsia, and infection, and to manage prolonged labor. Comprehensive Emergency Obstetric and Newborn Care (CEmONC) is available at regional, zonal and most district hospitals to manage BEmONC as well as caesarean services and blood transfusion [6, 22, 23].

In principle, a BC must have an SBA-trained Auxiliary Nurse Midwife, but many BC are being run by ANMs who do not have the additional SBA training [24]. The SBA package is a two-month long, focused training on emergency obstetric and neonatal care including antibiotics, anticonvulsants, and uterotonics, clean cord care and neonatal resuscitation [25]. ANMs are accredited as SBAs after such additional specific training that enables them to provide childbirth services. At the household and community level, Female Community Health Volunteers (FCHVs) are deployed to provide counseling to mothers and distribute condoms, birth control pills, folic acid, Vitamin A, and oral rehydration packets [20]. They are also trained to give first aid treatment to complicated obstetric cases before referring to appropriate service center and are provided with an Emergency Obstetric Kit box (EOC Kit) with lifesaving obstetric medicines [20].

The national safe motherhood program has initiated both demand and supply side strengthening to improve maternal and newborn health service utilization through the following programs:

#### *2.4.1.1 Aama Suraksha Karyakram*

In order to increase demand for maternal and newborn care service, the government of Nepal launched the Aama Suraksha Karyakram (Safer Mother Programme) nationwide in 2005. This program consists of four related components: 1) the Safe Delivery Incentive Program (SDIP), a cash incentive scheme, which was initiated in July 2005, 2) free institutional delivery care, which was launched in mid-January 2009, 3) incentive to health worker for home delivery and 4) incentive to women for completing 4 ANC visits [6, 26].

The SDIP provides a cash payment to women immediately following institutional delivery; the amount is region-specific at NRs. 1,500 (~USD 15), Nrs. 1000 (~USD 10), and Nrs. 500 (~USD 5) in the mountain, hill, and terai (plains) regions, respectively [26]. This financial incentive is intended to defray transportation cost to the health facility, a known contributor to delaying the decision to seek care and/or reaching care. Furthermore, in order to increase care-seeking for ANC from trained health workers, the pregnant woman is also entitled to NRs: 400 if she completes all four ANC visits as per the ANC protocol (at months 4, 6, 8 and 9 of pregnancy) [20]. In addition to the clients, SBAs are also provided with a financial incentive: NRs. 300 and 200 per delivery at health facilities and home-assisted births, respectively.

While the financial incentive component of the Aama Suraksha Karyakram program has been associated with increased facility births, several challenges to implementation remain. These include delays in receiving the cash payments due to district budget deficits and improper cash flow, poor and unaware mothers not receiving cash payments, and an overall lack of awareness of cash payment incentive [26, 27]. Discrepancies in the awareness of the different demand side financing schemes exist. For instance, a rapid assessment of the demand side financing scheme for maternal health services in Nepal found that women were more aware of the financial scheme



under the SDIP program than the 4 ANC visit program, thus resulting in differences in uptake of the two services [26].

#### *2.4.1.2 Birth Preparedness Program (BPP)*

In an effort to prevent unnecessary delays related to delivery care, the MoHP has implemented the birth preparedness package (BPP), which outlines steps mothers should take to prepare for their delivery. BPP is a major part of the NSMP, initially piloted in 2002 and gradually expanded nationwide by 2009. The intervention promotes active preparation and decision-making for births, including pregnancy and postpartum periods, by pregnant women and their families. The guidelines recommend that families save money for obstetric emergencies, arrange transportation beforehand based on local conditions, identify persons who can and are eligible to donate blood if required, identify and contact health facilities and health workers who can provide services, and have a clean delivery kit handy [6]. At the community level, FCHVs are mobilized for demand creation to increase the care seeking of maternal and newborn health services through promotion of key behaviors during pregnancy, delivery and post-partum periods, including those for neonates through the BPP [20].

## **2.4.2 National Neonatal Program**

Focused newborn health programs did not exist in Nepal until the mid-2000s. Maternal and child health interventions were implemented through various programs such as the National Safe Motherhood Program (NSMP), Community-Based Integrated Management of Childhood Illness (CB-IMCI) (piloted in 1997 and with the nationwide roll-out completed in 2009), bi-annual supplementation of Vitamin A, and the National Program on Immunization. These in combination reduced maternal and under-five deaths in the country but neonatal deaths remained a major problem. In 2004, the Family Health Division of the MoHP developed the National Neonatal Health Strategy resulting in newborn health receiving appropriate attention [28].

### *2.4.2.1 Community Based Newborn Care Program (CBNCP)*

In 2007, the Ministry of Health initiated a new intervention called Community-Based Integrated Newborn Care Program (CB-NCP) based on recommendation of the rapid assessment of the newborn health and programs in Nepal and piloted in first 10 districts [29, 30]. Among others, the specific objectives of CB-NCP were to 1) Prevent and manage newborn infection, 2) Prevent and manage hypothermia and LBW babies, 3) Manage post-delivery asphyxia, and 4) Develop an effective system of referral of sick newborns [31]. The CB-NCP is based on the lessons learned from various community based interventions and provides a comprehensive newborn and maternal care package that will be delivered by trained FCHVs and other frontline health workers in rural areas [30, 31]. The FCHVs are the pillars for the implementation of CB-NCP and are required to identify and counsel pregnant women, encourage institutional delivery, accompany the mother to the health facility for delivery and provide home based postnatal

newborn care on day 1, 3 and 7 with provision of initial dose of oral antibiotic treatment, timely referral of sick newborn to health facilities, and management of birth asphyxia [30].

Preliminary findings from pilot areas were encouraging. In Bardiya pilot district, skilled attendance at last delivery increased from 30% at baseline (2008) to 75% in 2011, although a number of health system changes have occurred over the same time [29]. Nearly all mothers received counselling from a FCHV during pregnancy (97%) and reported receiving a postnatal check for their baby within 2 days of delivery (96%) [29]. However, evaluation at scale indicated substantive challenges with realizing the programme's goals. In the 39 CBNCP districts, there were a total of 736,163 expected pregnancies in 2012/2013, of which only 14 % were captured by FCHVs indicating the need for strengthening the CBNCP program [32].

#### *2.4.2.2 Community Based Integrated Management of Neonatal and Childhood Illnesses*

The CB-IMCI was focused on preventative and promotive measures, and treatment for common childhood illnesses, especially neonatal sepsis, measles, malaria, pneumonia, diarrhea, and malnutrition (11). FCHVs and health workers in rural health care facilities were the service providers in both of the CB-NCP and CB-IMCI programs. The CB-NCP had scaled up rapidly to 41 districts by 2013 without proper monitoring and evaluation of the pilot program. Some of the underperforming aspects of the CB-NCP included the birth asphyxia and low birthweight management components and FCHVs' role as health care provider. The 2012 assessment of the CB-NCP in the pilot districts found that FCHVs were the first care of contact for only 11% of sick newborns and only 3% of diarrhea cases and even smaller number of acute respiratory infection cases were seen by FCHVs [33]. FCHVs were found to have very low sensitivity in classification of low birth weight babies and only 33% were found to be able to use a thermometer correctly [33]. Instead, care was being sought from trained health workers at the

health facility. Thus, it was suggested to have the FCHVs play the promoter/health educator/dispenser role in the community rather than diagnostic and decisive role. The resulting conclusion is that some of the most central strategies of the CB-NCP needed to be reconsidered and revised as appropriate.

In 2014, the MoHP decided to integrate the CB-NCP into the existing CB-IMCI program into the Community-Based Integrated Management of Neonatal and Childhood Illness (CB-IMNCI) as both programs had duplicated interventions like management of neonatal sepsis, promoting essential newborn care practices, infection prevention and management of low birth weight babies [6]. The plan is to roll out CB-IMNCI program gradually and nation-wide by 2017/2018 [6]. In the CB-IMNCI program, FCHVs are expected to carry out health promotional activities for maternal, newborn and child health and dispensing of essential commodities like distribution of iron, zinc, ORS, chlorhexidine and immediate referral in case of any danger signs appear among sick newborn and child. And health workers at the facilities and outreach clinics will counsel and provided the health service like management of non-breathing cases, skin to skin contact and management of neonatal sepsis and common childhood illness. Also program has provisioned the post-natal visits by trained health workers through primary health care outreach clinic [6].

#### **2.4.3 Barriers to seeking skilled maternal and newborn care in Nepal**

Barriers to utilization of maternal and newborn health care services during pregnancy and postpartum period in Nepal are varied. Geographical difficulties; diverse culture and religion; lack of transportation; lack of time due to heavy workloads and a shortfall of skilled health professionals are some of the reasons that affect the utilization of maternal health services [17, 34, 35]. Women's low social status and the social hierarchy and power imbalance in decision

making in households for health care needs are also known barriers in seeking skilled care when needed [16, 36, 37]. Previous studies on ANC usage reported access to service and financial costs of seeking care to be the main barriers but these were prior to implementation of the Aama Suraksha Karyakram [38]. Family members (often times the mother-in-law) provided assistance during deliveries for home births [37, 39]. Among marginalized populations in Nepal, husbands were more often the decision-maker in households where an SBA was utilized, while mothers-in-law led decision making when an SBA did not assist [37].

Lack of knowledge about illness and lack of awareness about obstetric/gynecological danger signs resulted in delayed recognition of complications which played a significant role in fatal outcomes of the mother or newborn [39]. A wait-and-see approach is often followed when both mother and newborn danger signs initially arise, delaying seeking appropriate care [39]. Several studies have reported that a decision to seek care was often made only after complications progressed in severity, such as prolonged labor, excessive post-partum bleeding, retained placenta, loss of consciousness, or other [36, 37]. A study done in Makwanpur district (hill district) found that the decision to seek care outside the house was delayed and only made after a process of elimination of causes, home remedies and wait and see approach [39].

Traditional healers were often found to be the first point of care sought for maternal and newborn illnesses because of the common notion that the illness was caused by evil spirits, resulting in delayed or no care sought from skilled providers [37, 39]. This may be due to cultural beliefs that women and newborns are believed to be susceptible to certain kinds of spirits [40, 41].

Unqualified care givers such as traditional healers, pharmacists, and local ‘village’ doctors were often preferred over the formal skilled care providers because of trustworthiness, ease in access, less costs and past good experience [38, 39, 41–43]. Traditional beliefs regarding the postnatal

period that the mother and baby are ‘polluted’ and untouchable or the tradition of postpartum seclusion period of mother and baby for the first 6-10 days (varies by different ethnic groups) were also found to be barriers to seeking care for mother and newborn in rural Nepal [38, 41, 43, 44].

A recent qualitative study on barriers to utilization of BC in rural Rukum district located in the hills found that difficult geography, poor birth preparedness, harmful cultural practices (seeking traditional care and spiritual beliefs) and low level of trust in the skills of health workers in handling complications were some of the contextual barriers to using BC services [43].

Similarly, at the health systems level, irregular and poor quality services, inadequate human resource and poor governance remain a challenge in service delivery [24, 37, 43]. Past poor experience of delivering at a health facility and the insufficient government incentives were also reported as barriers to utilization of health facilities for delivery care [43, 45].

According to the 2011 Nepal Demography and Health Survey, the majority (62%) of women who did not deliver at a health facility thought that it was not necessary, underplaying the importance of skilled assistance during delivery [5]. Furthermore, birth preparedness was low, with 35% reporting no birth preparation measures taken; 36% had saved money for delivery care and any related emergency; only 3.5% had arranged transportation for emergency care; 5% bought a clean delivery kit, and less than 2% contacted a health worker [5].

Several studies in Nepal have assessed the barriers to care seeking practice for maternal and newborn care but these findings are all from a period prior to the implementation of activities and policies under the NSMP and very few assessed care seeking for maternal and newborn complications. Thus, further studies on the barriers to care seeking after the improvement in both

facility- and community-level maternal and newborn health care services will help inform ways to further reduce barriers.

#### **2.4.4 Enabling factors for care seeking in Nepal**

Women who experienced complications in a previous pregnancy were more likely to visit a health facility for delivery regardless of complications in current pregnancy [39]. Proximity to SBA was also a determining factor in decision to seek care by either visiting the health facility or calling the ANM to the home [37, 39]. Another enabling factor was the type of counseling provided on recognition of danger signs and encouraging facility births during the ANC visits [36, 37]. Women and caregivers who recognized the signs and symptoms to be severe and serious were more likely to seek care outside of the home [36].

Mothers-in-law who had health-related training (e.g. as FCHV) or were more knowledgeable on the importance of ANC were more supportive of their daughter-in-law's decision to seek ANC services [16]. Similarly, studies have found that support from husband played an important role in enabling facility delivery through instrumental support in accessing care by arranging for transportation and money [45, 46]. A study in Makwanpur district tested a community-based participatory intervention with women's group facilitated by a local woman whereby through regular meeting and action-based learning, they identified local perinatal problems and formulated strategies to address them. Such an approach was associated with significant increase in care seeking for maternal and newborn morbidity and reduction in neonatal mortality [47]. A secondary analysis of the 2011 DHS, indicated that women who reported having some form of birth preparedness (e.g., saving money, arranging for transport, finding a blood donor) was found to have three times higher odds of facility-based deliveries compared to those with no birth preparations [48].

#### **2.4.5 Programmatic approaches to address the three delays**

The NSMP and CB-IMNCI both address delays in problem recognition and decision making for care seeking by raising awareness on newborn and maternal danger signs (during ANC counseling, through media and mother's group), training FCHVs to conduct postnatal home visits to provide counseling and assess for newborn danger signs, and birth preparedness program [6]. Moreover, the financial reimbursement provided for transportation expense for seeking ANC and delivery care at government health facilities reduces or relieves the financial barriers related to transportation delay in reaching health facility (delay 2). The Nepal Demography and Health Survey (2011) considered seven indicators of birth preparedness: whether or not the respondent 1) saved money, 2) contacted a health worker 3) arranged transportation, 4) identified a blood donor, 5) purchased a delivery kit, 6) brought food, or 7) provided clothes. While more than one-third (36%) of respondents indicated they saved money for delivery care and any related emergency, only 3.5% of pregnant women could arrange transportation for the emergency care, 5% bought a clean delivery kit, and less than 2% contacted a health worker [5]. More than half (55%) of women reported having arranged for food and clothes, while 35% reported no birth preparation measures taken during their last pregnancy.

Under the CB-IMNCI, the treatment of suspected newborn infection cases with oral antibiotics by FCHVs within the immediate community and provision of full course of antibiotics at the first level primary health center has helped shorten the distance to care (delay 2). An analysis conducted by Save the Children of community-based interventions to address three delays to care for newborns with danger signs shows that some gaps in addressing delay 1 (under the CB-NCP) were lack of financial incentive for seeking newborn care and lack of focus on increasing



the decision making power of mother [49]. Similarly, the lack of reimbursement to cover or minimize transportation cost to reach health facility (delay 2). About 29% of newborns were reported to have exhibited at least one newborn danger sign in Nepal, with the most common sign being fever (~16%), local umbilical cord/skin infection (~11%) and difficulty breathing (~8%) [49]. Care seeking for newborns with signs of illness was high in CB-NCP program districts based on household survey conducted among women who delivered in past 12 months (baseline n=134 and end line n=177) [30]. The percent of newborns taken to a health facility (public or private) within 24 hours of recognition of danger signs nearly doubled from 36.6% at baseline to 67.8% at end line [30].

Health system challenges in providing quality maternal and newborn care services remain. Rural BC function is poor due to acute shortages of SBAs as well as the necessary medicines and program commodities [43]. Rural BCs are bypassed by women due to perceived poor quality of care and inadequate referral links [50, 51]. But overcrowding of the zonal and regional hospitals (26–28), poor infection prevention and shortage of medicines and supplies and skilled staff to provide essential delivery care in BCs are the greatest challenges for the provision of quality maternal and newborn health services in Nepal [24, 52].

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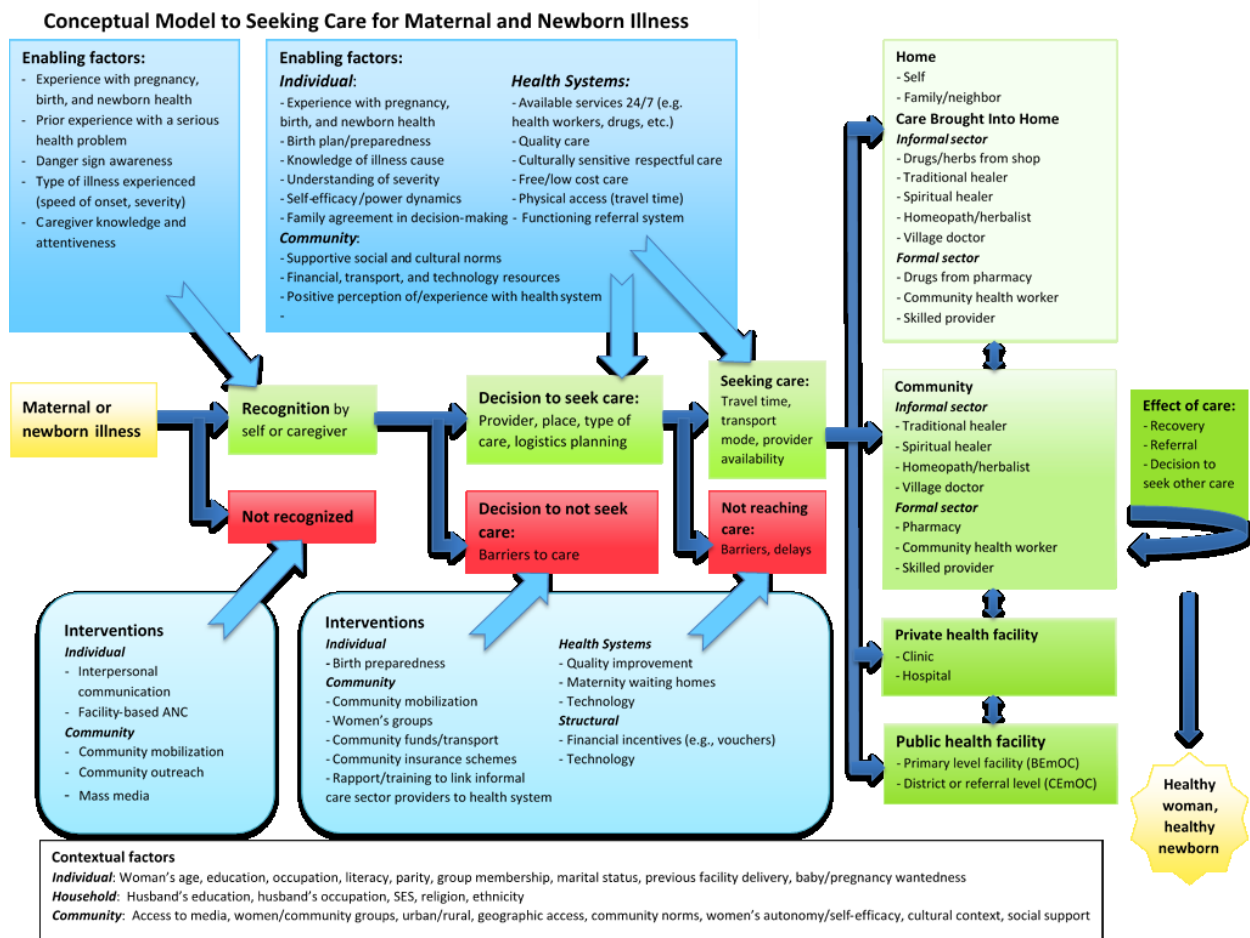
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**Figure 2.1.** Conceptual model to seeking care for maternal and newborn illnesses. Adapted from the USAID Translating Research into Action (TRAction) Project

## **Chapter 3 : Study Design and Methods**

### **3.1 Study District**

Nepal is divided roughly into three ecologic regions, running east to west: the Himalayan mountain ranges in the north, a hilly region in the center, and the terai (the southern plains) region, in the south. The terai region geographically and ethnically resembles other areas of South Asia, like northern India, Bangladesh, and Pakistan. The study site, run by the Nepal Nutrition Intervention Project – Sarlahi (NNIPS) affiliated with the Department of International Health at the Johns Hopkins Bloomberg School of Public Health (JHSPH), is located in Sarlahi district, a rural terai district of Nepal (Figure 3.1).

Bordering India, Sarlahi has a population of about 750,000 and is divided into a total of 96 Village Development Committees (VDCs) and 6 municipalities [1]. The population in Sarlahi are mostly subsistence farmers, and are mainly comprised of two major ethnic groups: madeshi (associated with the southern plains / northern Indian area) who mainly speak Maithali and pahadi (associated with the hill area) who mainly speak Nepali [2].

Sarlahi district has rolled out both the NSMP and the CB-NCP intervention; during this study period, the CB-IMNCI had yet to be rolled out. The public health facilities are available in HPs located in each VDC, along with secondary level facilities (5 PHCCs) and the district hospital that provides tertiary level care. In addition, several private hospitals or clinics are available in the larger VDCs or near the highways. In 2016, there were 21 BCs in operation in the 5 PHCCs and 16 HPs; along with the district hospital and 2 private facilities (1 NGO clinic and 1 community hospital) where free 24/7 delivery and immediate newborn care services were provided (Figure 3.2).

Since 1989, NNIPS has been conducting large community based trials on maternal, child and newborn health in this district. The first trial completed in this study district was on vitamin A supplementation in preschool children, conducted in 1989-1992 [3]. Subsequently, research topics have spanned the areas of maternal, neonatal, infant, and child mortality, and have evaluated the efficacy and effectiveness of diverse interventions including antenatal vitamin A [4], iron and zinc supplementation [5], newborn chlorhexidine cleansing [6] and chlorhexidine umbilical cord application on umbilical cords for newborns [7]. Two other large randomized trials have also been completed looking at the impact of maternal influenza vaccination on the incidence of influenza-like illness among the mothers and newborns, and the impact of installing reduced-emission cook stoves on the incidence of acute respiratory infections among children and on birth outcomes [8]. Analysis of data from 2002-2006 from the NNPS chlorhexidine trials found that the overall NMR was 32.1/1000 live births, which was approximately similar to the national NMR of 33 deaths/1000 livebirths in 2006 NDHS [9]. About 42% of the women enrolled in a parent trial (see below) within which this current work was conducted delivered at a health facility for their most recent pregnancy (data not published), which is similar to that of the 2016 NDHS findings of 44% in rural Nepal.

### **3.2 Parent Trial**

This study was nested within a community-based cluster-randomized control trial of the impact of substituting sunflower seed oil in place of the traditionally-used mustard seed oil for full-body massage of babies on neonatal mortality and morbidity. This Nepal Oil Massage Study (NOMS) started in late 2010 with expected enrollment of 29,000 live born babies from 34 VDCs (one-third of the study district) by the early 2017 (registered at ClinicalTrials.gov # NCT01177111). In this study population, like in other communities across the Asian subcontinent, traditional oil



massage of the newborn is nearly universally practiced; in Sarlahi >99% of infants receive repeated topical applications of mustard oil, with perceived benefits of strength, warmth, and health [10]. Evidence suggests, however, that relative to other types of natural vegetable oils, mustard oil significantly increases both the rate of trans epidermal water loss and recovery of skin integrity after injury; sunflower seed oil has potential benefit in enhancing skin barrier functions [11]. The investigators of the parent trial hypothesize that substituting mustard oil with sunflower seed oil for topical applications during full body massage of newborns in the community will reduce neonatal morbidity and mortality by improving overall skin barrier function and reducing exposure to invasive pathogens.

The parent trial activities generated an electronic database of all eligible reproductive aged women who are married and between ages 15 and 40. Those providing consent for pregnancy surveillance were actively followed every 5 weeks to inquire about menstruation and offer pregnancy tests. This active surveillance aimed to identify pregnancies as early as possible for enrollment into the oil massage study; participating pregnant women were then followed through the end of the first month post-partum. At initial enrollment, information on last menstrual period, reproductive and pregnancy history (including birth history), health and care seeking for the current pregnancy, and information on current health status, and literacy/occupation was collected. Basic socioeconomic status information such as family's caste, religion, household construction, household assets, and individuals working outside the home was also recorded.

Enrolled pregnant women were then followed up monthly by a trained field data collector to check on the pregnancy progress/status, and collect information on morbidity and care seeking for the current pregnancy in the past 30 days. The last pregnancy follow-up visit (approximately 29-31 weeks gestation) also called the late pregnancy visit scheduled entailed collecting

information on the previous 30 days of the woman's pregnancy and current anthropometric measurements of the pregnant woman. In addition, the field team member also provided important late pregnancy messages and interventions such as deworming tablets if needed, a clean birthing kit, and chlorhexidine (for umbilical cord cleansing) to the caregiver of the baby. During this visit, the mother and family members were also given a 100ml bottle of sunflower seed oil or mustard seed oil (depending on the random allocation of the their sector), and promotional messages regarding the use of the provided oil, reiteration of the study aim, practical guidelines for infant massage, and the potential benefits of infant massage throughout the first month of life non-specific to type of oil used. Family members were instructed to notify the local ward distributor (WD) at the earliest possible time after labor is initiated; this individual is a locally-resident female project staff member, who informs their supervising field data collector about all events occurring in their communities (births, deaths, migrations, etc.).

Upon receiving notification of a recent delivery, a project data collector (a member of the "Birth Team") responded as quickly as possible, in order to conduct an initial assessment as close to the time of delivery as possible. Babies born alive were eligible for enrollment in the parent trial. At the initial birth assessment, both the mother and baby were assessed. A maternal birth assessment form (MBAF) was filled by the Birth Team member, who collected information on pregnancy outcome, maternal morbidity before childbirth, location of birth and information on institutional delivery scheme, and labor and delivery practices. In addition, the woman's blood pressure, body temperature and pulse were also measured and recorded.

An infant birth assessment form (IBAF) was also completed for each baby at the first visit by the Birth Team member. For each live birth baby, details of the labor and delivery care practices, infant condition at birth, and anthropometry measurements were recorded. A newborn follow-up

form (NFF) was also conducted on the day 1 visit (at the same time as above described birth assessment activities) and then again at six subsequent visits (days 3, 7, 10, 14, 21, and 28 after delivery). At each of these newborn follow up visits, the Birth Team member collects data on newborn health status since the last visit where the mother is asked about certain signs (for example, “Has the baby had difficulty sucking?”) and essential newborn care practices (for example, cord care, skin-to-skin contact, thermal care practices, etc.). Mothers were asked about care-seeking for the newborn, and follow up questions on type of provider. At these visits, the Birth Team member also directly examined the baby for the following signs: i) respiratory rate per minute; ii) severe chest in-drawing; iii) axillary temperature of the body; iv) movement upon stimulation; v) cord status (separation, pus, redness, swelling); vi) observes and records if the baby’s body, soles, palms or eyes are yellow in color. Signs of skin infection and inflammation were also recorded and detailed information on oil massage practices were also asked.

On the day 7 visit, an additional set of questions specific to the mother’s health status and care-seeking patterns were asked. Finally, on each of the first 7 days of life, the locally resident WD was responsible for visiting the newly delivered woman to continue to promote the use of the project-provided oils for newborn massage, and to collect basic information on usage/compliance and frequency of massage. In the event of a death (either mother or newborn baby) occurring at any time within the 28-day follow up period, the community-level workers immediately notified the field supervisory level staff, who schedule a subsequent visit to conduct a neonatal or maternal verbal autopsy.

Structured questionnaires were used to collect the data and all the tools were translated into Nepali. The interviews were conducted either in Nepali or Maithali depending on the study population’s preference. Each field team member was provided with extensive training and

several refresher trainings over the study period on their respective forms that they were responsible for.

### **3.3 Study Methods**

This study was conducted using three distinct methodologies for each of the study aims: a facility based audit and health worker interview of all the BCs and district hospital in the study district (Aim 1); qualitative research using in-depth interviews and small group interviews (Aim 2); and a quantitative survey (Aim 3).

#### **3.3.1. Specific Aim 1**

##### *3.3.1.1. Methods*

This was a cross-sectional study in design and was implemented independent of the parent trial. Data were collected from all 23 birthing centers (BCs) (21 public facilities and 2 private facilities) as well as the maternity ward of the district hospital in the study district. This component of the study included a health facility assessment using an audit tool and individual health worker interviews using a health worker knowledge assessment tool. The tools used were adapted from the 2013 Nepal Birthing Center Assessment Study [12] and changes were made based on local interest and importance after consultations with key maternal and newborn care stakeholders at the District Public Health Office in Sarlahi. The tools were originally developed by the USAID-funded Maternal and Child Health Integrated Program (MCHIP) Quality of care surveys, which have been implemented in numerous locations globally [13–15]. Unlike larger more extensive quality of care studies [12, 15, 16], we did not conduct direct observation of the ANC and labor/delivery services being provided, and exit interviews with clients were not done.

The audit tool was used to assess the facility readiness to provide maternal and newborn care which entailed assessment of the infrastructure, medicines and supplies/equipment, and human resources in each facility through semi-structured interviews with the health worker in-charge and direct observation of the facilities. The health provider interviews were conducted with all staff (doctors, nurses and auxiliary nurse midwives) engaged in providing ANC, labor/delivery care and immediate newborn care services in the BCs and district hospital. A total of 63 health workers were interviewed and interviews were conducted in a private room at the health facility at a time that was convenient for the health worker. The tools were piloted first in April, 2016 and data were collected between May –August, 2016. Being a native Nepali speaker, I was the sole data collector and conducted all the interviews in Nepali using a Nepali translation of the tools as a guide. All data were collected electronically using the Research Electronic Data Capture (REDCap) application on a password-encrypted mobile android device.

#### *3.3.1.2. Data Analyses*

Data were analyzed to make comparisons by type of health facility: 1 District hospital, 5 PHCCs, 16 HPs, and 2 private facilities. Descriptive analysis was conducted to assess facility readiness to perform basic ANC services, based on availability and functionality of essential supplies, equipment and medicines. Furthermore, mean percentage scores were calculated based on the unweighted mean of the percentage of facilities within each health facility type that had functioning supplies and medicines required to carry out six of the seven BEmONC components [17]. Due to the small sample size of only 24 facilities, tests of statistical significance were not conducted.

Health worker knowledge responses were grouped into seven domains: five maternal health (e.g., Knowledge on Active Management of Third Stage of Labor (ATMSL)) and two newborn

health related. Mean of the percent correct answers within each domain were calculated and compared between the four facility types as well as between SBA and non-SBA trained health workers. SBA trained was defined as those who received the additional two-month SBA training provided by the Ministry of Health [18]. The elements of the mean percent scores were compared statistically using chi-square or Fisher's exact test. STATA version 13.0 [19] was used for all analyses.

### **3.3.2. Specific Aim 2**

#### *3.3.2.1. Methods*

Data from the parent trial were used to identify and select thirty-two event narratives (6 maternal/newborn deaths each and 10 maternal/newborn illnesses each). We purposively sampled across specific illness and complication definitions, using data collected prospectively from the cohort of women and newborns followed from pregnancy through the first 28 days postpartum in the parent trial. Similarly, the newborn and maternal death cases were also purposively selected using the data from the verbal autopsies collected in the parent trial. The newborn illness and maternal complication definitions and inclusion/exclusion criteria are described in Chapter 6. For each event narrative, a small group interviews were conducted with a group of 3-5 witnesses that consisted of the main caregiver and 2-4 other family or members from the community who witnessed the illness event and process that followed. In the case of the ten maternal complication event narratives, a separate in-depth interview was conducted with the focal woman who underwent the complication in addition to the small group interview. A separate interview guide was used for each of the four groups of event narratives. The interview guides included questions on the perceived onset and sequence of signs and symptoms, decision-

making process for the identified signs and symptoms and the sequence of care-seeking that followed. In addition, information on the perceived quality of care and reasons for seeking the care sought were also collected.

A team of six female interviewers with prior qualitative data collection training and experience were trained for a month to familiarize with the interview guides and practice conducting qualitative interviews. The interviews, completed between February and October, 2016, were conducted in pairs by a trained interviewer and note-taker predominantly in Maithili (the local language). A separate note-taker was needed for these interviews as detailed notes on the timeline of events from recognition to illness resolution or death was required for each event narrative.

#### *3.3.2.2. Data Analyses*

The interviews were audio recorded, transcribed verbatim into Nepali using the notes and audio recordings by the interviewers after completion of each interview. The transcripts were then translated into English using hired translators for analysis. Excerpts of the transcribed notes were cross-checked for accuracy with the audio recording by one of the senior field coordinators who is a native Maithali speaker. Entire translations were cross-checked for accuracy and corrected by the doctoral candidate (TPL, fluent in English and native Nepali speaker). Atlas Ti software was used for coding and analysis. Each transcript was read through several times; passages were highlighted and coded for content analysis using a standard codebook developed *a priori*. Matrices for each case were developed along the three research domains (illness recognition, decision-making and care-seeking) and common themes were identified corresponding to each domain. A detailed illustration on the care-seeking pattern was also developed for each illness

narrative. The findings were compared between and within each of the four type of event narratives.



### 3.3.3. Specific Aim 3

#### 3.3.3.1. *Methods*

Data from the parent trial were used for this study. All pregnant married women between age 15 and 40 who were enrolled in the parent trial, gave birth to one or more live births, and whose live birth was assessed at least once were included in the study. The starting study sample consisted of all pregnant women and newborns regardless of signs of complications or illness. A detailed account of the data collection process in the parent trial has been detailed above. For this specific aim, we used the prospectively collected data on the newborn follow up visits as well as data from the census, socioeconomic form, pregnancy enrollment, MBAF and IBAF visits.

#### 3.3.3.2. *Measures*

**Outcome variable:** The primary outcome variable was care-seeking for the newborn, defined as care sought from any health care provider in the seven days following each newborn visits. Care sought was classified into three categories: 1) formal care; 2) informal care; and 3) no care. Further details on the classification of the care providers as formal and informal can be found in the methods section of Chapter 6. No care seeking was the reference category.

**Primary exposure variable:** Place of delivery/birth defined as health facility (health post, clinic or hospital) or non-health facility (home, outdoors or on the way to health facility) was the primary exposure variable collected from the MBAF visit.

#### 3.3.3.4. *Defining severely ill newborns*

The analysis of care-seeking was restricted to a subset of the study population defined to be severely ill. Severely ill newborns were defined based on the presence of two or more of the

following danger signs during the early neonatal period (ENP:0-7 days): caregiver's report of baby having (1) difficulty feeding or sucking; (2) difficulty breathing; (3) convulsion or stiffness of the back; and the trained field staff's observation during newborn assessment of baby having (4) severe chest indrawing; (5) rapid breathing (respiratory rate  $>70$  breaths/min); (6) baby not moving upon stimulation; (7) umbilical cord infection (pus discharge from the cord stump or redness of the cord stump or around the base of the cord); (8) fever (axillary temperature to be  $\geq 38^{\circ}\text{C}$  or  $100.4^{\circ}\text{F}$ ); and (9) hypothermia (axillary temperature to be  $<35^{\circ}\text{C}$  or  $95^{\circ}\text{F}$ ). This definition is more stringent than the broader definition developed through the WHO Young Infants Clinical Signs Study (YICSS) [20, 21], which has been used to classify sick newborns in both research and programmatic domains [22, 23]; our strict criteria were designed to increase specificity of the definition, as the current consensus definition is highly sensitive but non-specific. The data from the first three follow up visits (i.e. NFF visits on days 1, 3, and 7) were used to identify severely ill newborns.

A sub-set of healthy newborns were defined as those having NONE of the following signs across the first three assessments (i.e. the early neonatal period)ENP: (1) difficulty feeding or sucking; (2) difficulty breathing; (3) convulsion or stiffness of the back; and the trained field staff's observation during newborn assessment of baby having (4) severe chest indrawing; (5) rapid breathing (respiratory rate  $\geq 60$  breaths/min); (6) baby not moving upon stimulation or mother's report of baby being lethargic; (7) umbilical cord infection (pus discharge from the cord stump or redness of the cord stump or around the base of the cord); (8) fever (axillary temperature to be  $\geq 37.5^{\circ}\text{C}$ ) or mother's report of baby being hot to touch; and (9) hypothermia (axillary temperature to be  $\leq 35.5^{\circ}\text{C}$ ) or mother's report of baby being cold to touch.

### *3.3.3.3. Data Analyses*

Data analyses were performed in Stata 13 [19]. The data from these various forms were first merged using the unique identifiers and descriptive analysis of the data were conducted. We conducted separate analysis on two sub-sets of population: 1) who met the above definitions of severely ill newborns and 2) those who met the definition of healthy newborns. To explore the data, we tabulated frequency distributions for each of the nine signs by place of birth in the overall analytical cohort and used chi-squared tests to assess for differences. We then explored the distribution of independent variables such as socio-demographic variables, pregnancy characteristics and past pregnancy history variables by place of delivery (health facility vs non-health facility) for each sub-set of the population. We retained independent variables found to be significantly associated with the outcome and primary exposure variables ( $p$ -value  $< 0.10$ ) in the final adjusted model as potential confounders. We also checked the data for completeness and accuracy and screened for missing values. Complete case analysis was used and missing data on any of the variables ( $< 0.5\%$ ) were dropped from the analysis.

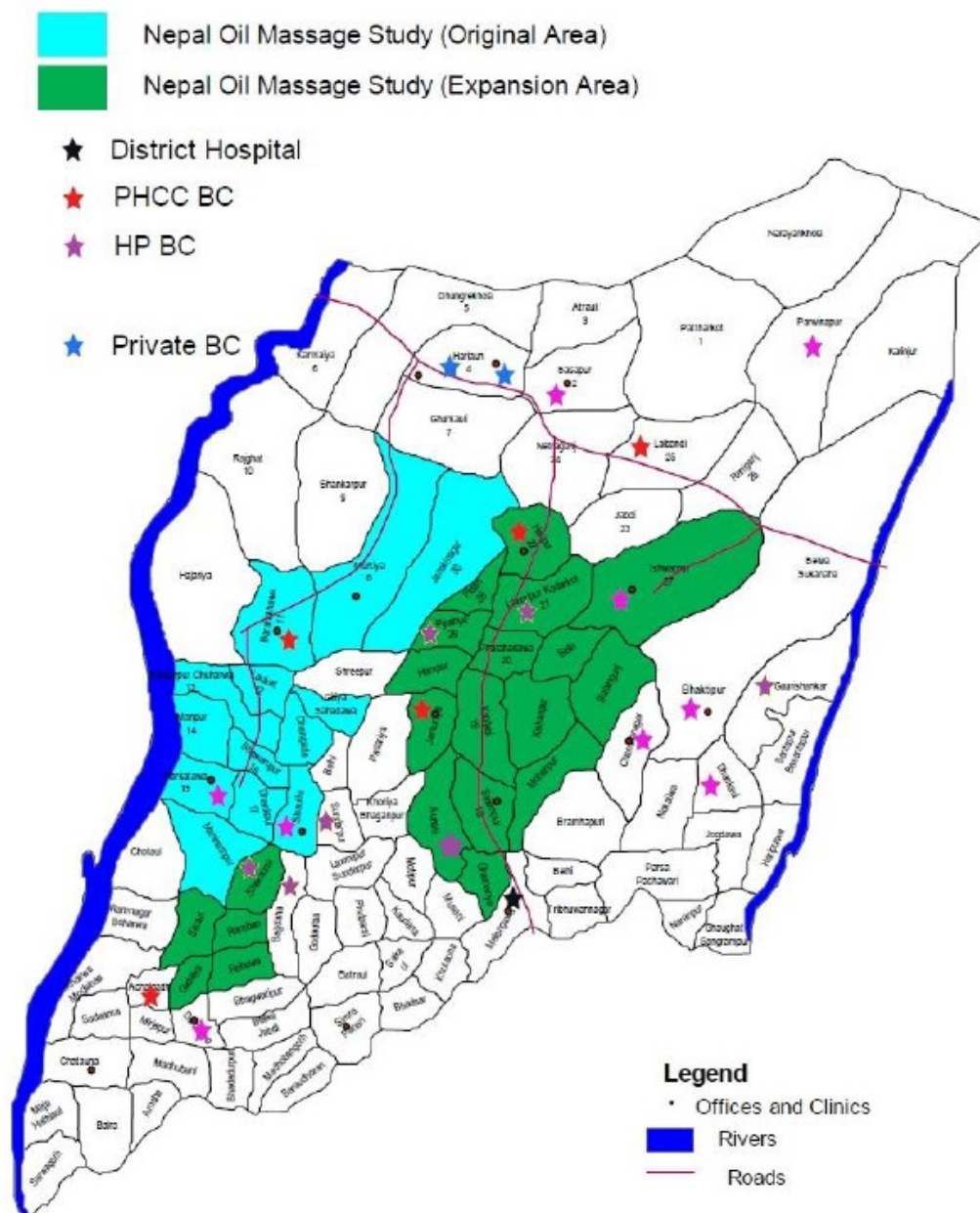
Multinomial logistic regression was used to assess the association between place of delivery (health facility vs non-health facility) and type of care (formal care or informal care compared to no care). Multinomial logistic regression expresses the log probabilities of each response category relative to the “base” category, as a different function of the exploratory variable. Thus in this case, no care sought was the base category which was compared to those receiving formal or informal care as a different function of facility vs non-facility deliveries. Multinomial logistic regression was used to obtain relative risk ratios (RRR) and 95% confidence intervals (CI) to estimate the relationships of place of birth with type of care-seeking. Using the sub-set of

severely ill newborns, simple and multivariate models were run adjusting for maternal age, maternal literacy, husband's literacy, ethnicity, caste, wealth quintile, sex of baby, preterm status, gravidity, number of ANC visits, intrapartum complication, death of any livebirth children and any referral made to seek care. Similar analysis was conducted for the sub-set of healthy newborns.



**Figure 3.1.** Map of Nepal.

# Nepal Nutrition Intervention Project - Sarlahi



**Figure 3.2.** Map of the Sarlahi district showing the NNIPS VDCs of the parent trial and the locations off the birthing centers at various level of health facility (HP, PHCC, District Hospital and Private)

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## **Chapter 4 : Assessment of facility and health worker readiness to provide quality antenatal, intrapartum and postpartum care in rural Nepal**

### **4.1 Abstract**

**Background:** Increased coverage of antenatal care and facility births might not improve maternal and newborn health outcomes if quality of care is sub-optimal. Gaps remain in facility readiness and health worker knowledge to provide quality care.

**Methods:** Using an audit tool and interviews, respectively, facility readiness and health providers' knowledge of maternal and immediate newborn care were assessed at all 23 birthing centers (BCs) and the District hospital in a rural southern Nepal district. Facility readiness to perform specific functions were assessed through descriptive analysis and comparisons by facility type (health post (HP), primary health care center (PHCC), private and District hospital). Knowledge was compared by facility type and additional skilled birth attendant (SBA) training.

**Findings:** Infection prevention items were lacking in more than one quarter of facilities, and widespread shortages of iron/folic acid tablets, injectable ampicillin/gentamicin, and magnesium sulfate was a major barrier to facility readiness. While parenteral oxytocin was commonly provided, only the District hospital was prepared to perform all seven basic emergency obstetric and newborn care signal functions. The required number of medical doctors, nurses and midwives was present in only 1 of 5 PHCCs. Private sector SBAs had significantly lower knowledge of active management of third stage of labor and correct diagnosis of severe pre-eclampsia. About half of the health workers had received the additional two-month SBA training

and comparison with the non-trained group showed no significant difference in knowledge indicators.

**Conclusions:** Facility readiness to provide quality maternal and newborn care is low in this rural area of Nepal. Addressing the gaps by facility type through regular monitoring, improving staffing and supply chains, supervision and refresher trainings is important to improve quality.

## 4.2 Background

Globally, despite declining maternal mortality ratio (MMR) and neonatal mortality rates (NMR) and increasing rates of facility deliveries, 289,000 maternal deaths [1], 2.8 million neonatal deaths [2] and 2.7 million stillbirths occur annually [3]. While the recent focus on Millennium Development Goals (MDG) targets for maternal and neonatal mortality reductions aided the scale-up of effective interventions, only 9 of 75 high burden “countdown” countries achieved their targets [4]. Even more ambitious are the Sustainable Development Goals (SDG) of reducing MMR and NMR to 70/100,000 livebirths and 12/1000 livebirths, respectively, by 2030 [5].

Increasing universal coverage of delivery in health facilities is necessary but insufficient in meeting these targets; if quality of care (QoC) provided is poor, improved maternal and neonatal health outcomes are not likely [6–8]. Recent high-profile series in *The Lancet* [9, 10], Midwifery [11, 12], and Maternal Health [13, 14] highlight substantive variability in mortality risk within facilities in low middle income countries [6, 15], and emphasize the critical need to measure QoC indicators and improve quality of services around the time of birth.

Although greatly reduced from 901 in 1990, the MMR in Nepal remains above 258 maternal deaths per 100,000 live births [1] and NMR has decreased from 33 in 2006 to 21 deaths per 1000 live births in 2016 after remaining stagnant at 33 deaths in 2011 [16]. Additionally, GoN has expanded 24/7 delivery sites like birthing centers (BCs), and basic and comprehensive emergency obstetric and newborn care services (BEmONC, CEmONC) at existing primary and secondary level health facilities and hospitals [17].

The rapid expansion of NSMP nationwide likely contributed to an increase in institutional deliveries to 57% in 2015 (i.e. from 9% in 1996), but this increased demand for services in rural

BCs might be outpacing the distribution of SBAs or the available supply of necessary medicine and commodities [18].

In this context, our goal is to assess the facility readiness and health worker knowledge of maternal and newborn care that are a vital component of health facilities' capacity to provide quality maternal and newborn care.

## **4.3 Methods**

Data were collected from facilities and providers in Sarlahi district (population ~ 750,000) located in the central southern plains of Nepal, bordering India. The annual birth cohort is approximately 18,000 [17]. QoC has various definitions; here we use the Donabedian framework to assess the structure component of QoC [19]. The structure component of quality includes the availability of skilled health workers and a well-functioning health facility. Quality improvement is dependent on improved structure as this increases the likelihood of good process indicators, thereby furthering the likelihood of improved outcomes [20]. For this study, we used a birthing center audit tool to assess facility readiness to provide care with respect to infrastructure, medicines and supplies/equipment, and a health worker knowledge assessment tool adapted from instruments previously utilized in the national Nepal Birthing Center Assessment of 2013 [21]. These were initially developed through USAID-funded Maternal and Child Health Integrated Program (MCHIP) QoC surveys, which have been implemented in numerous locations globally [22]. Adaptations reflected local interest and importance, which emerged through consultations with key maternal and newborn care stakeholders in the District Public Health Office in Sarlahi.

### **4.3.1 Data Collection**

After pilot testing the tools in April 2016, data were collected from all public and private health facilities that were classified as BCs between May 4 and August 29, 2016. Semi-structured interviews were conducted in Nepali by the lead author (TL), and data were recorded using the Research Electronic Data Capture (REDCap) application on a password-encrypted mobile android device. When possible, the birthing center audit and health worker interviews were completed on the same day; in about half of the facilities, eligible health workers were not met

on the first visit (personal or professional leave) but were conducted subsequently upon their return. The doctoral candidate (TPL) a native Nepali speaker, conducted all the interviews and facility assessment in Nepali using a Nepali translation of the Health worker interview tool as a guide. Through direct observation of the facility and interviews with staff / in-charges, the facility audit focused on the infrastructure, utilities, furniture, medical equipment, and drugs allocated for ANC, labor and delivery, and newborn care services, as well as information on the human resources. Staff (doctors, nurses and auxiliary nurse midwives) engaged in provision of ANC, labor/delivery care, and/or immediate newborn care were eligible for the health worker interview, which focused on work experience, training, and knowledge of maternal and newborn health. Knowledge on maternal health included questions on actions to be taken for management and prevention of various maternal complications and ability to make correct diagnoses based on a case scenario illustrating severe pre-eclampsia. Newborn health knowledge asked about immediate newborn care practices and signs of severe infections.

#### **4.3.2 Analyses**

We conducted descriptive analyses of the infrastructure and utilities (physical space, electricity, water supply, toilet, cleanliness), human resource availability, privacy, and capacity to 1) perform the seven signal functions under BEmONC [23] and 2) provide basic ANC services, based on the availability and functional status of essential supplies, equipment, and medicines. The indicators were summarized overall and by facility type: District hospital, primary health care center (PHCC), health post (HP) and private facility. We compared facility readiness by the availability and functional status of all the essential supplies and medicines (Box 4.1) to perform specific functions and calculated mean percentage scores which were the unweighted mean of the percentage of facilities within each health facility type that had functioning supplies and

medicines required to carry out six of the 7 BEmONC components as done in other previous large-scale facility assessments [24, 25]. Tests of statistical significance were not conducted given the small number of facilities (N=24). Elements of health worker knowledge were grouped into domains and summarized by mean percent scores (i.e., mean of the percent correct answers within a domain) using Chi-squared or Fisher's exact tests; these results were compared across facilities and by whether or not the respondent had received the Ministry of Health and Population (MoHP)-sponsored two-month skilled birth attendant (SBA) training. The correct responses included in the calculation for the mean percentage scores for topics on maternal and newborn health knowledge are shown in Appendix 4.2, Tables 4.2.3 and 4.2.4 respectively. STATA version 13.0 (StataCorp, College Station, TX, USA) was used for all analyses.

#### **4.3.3 Ethical Approval**

The Johns Hopkins Bloomberg School of Public Health Institutional Review Board (Baltimore, USA) and the Nepal Health Research Council, Ministry of Health and Population (Kathmandu, Nepal) approved this study. Written informed consent was obtained from health workers prior to the interview.

## 4.4 Results

### 4.4.1 Health Facility Readiness

We included all 22 public facilities with a designated birthing center, reflecting the three tiers of district-level service (1 District hospital, 5 PHCCs, and 16 HPs (Ministry of Health ) and 2 private facilities (1 NGO-run clinic, and 1 community-hospital).

*Accessibility:* As presented in Table 4.1.1 of appendix 4.1, all facilities were either directly linked (21 of 24) or within 5 minutes' walk (3 of 24) to a road accessible to 4-wheeled vehicles. Six facilities (District hospital, both private clinics, 3 HPs) had a functional ambulance with fuel, while 1 PHCC and 3 HPs had a non-functioning ambulance.

*Availability, infrastructure, cleanliness:* All facilities reported providing 24/7 delivery services (except one HP-level birthing center where no auxiliary nurse midwives (ANMs) were posted), but a separate room for night shift staff was available in only 18 facilities (Appendix 4.1 Table 4.1.1). Given the frequency of blackouts, backup electrical capacity is required to prevent gaps in quality services; four HPs had no such backup (Appendix 4.1 Table 4.1.1). Except for one PHCC that was renting space and had only one room dedicated for delivery, ANC, and postnatal services, all other facilities had a single room with visual and auditory privacy for delivery care (Table 4.1.1). Ten facilities had a separate dedicated space for postnatal services; the norm was to share space with the admissions room, where women are admitted right before delivery. Only four HP and 1 PHCC had separate rooms for examination/consultation/admission (at least two), delivery room, postnatal room, utility room and staff room (Appendix 4.1 Figure 4.1.1).

Laboratory areas to conduct various blood and urine/stool tests (e.g., pregnancy, HIV, syphilis, blood grouping, hemoglobin, proteinuria, etc.) are required at PHCC level or higher as per



MoHP regulations. These were available for all five PHCCs and the District hospital, in addition to three HPs and both private facilities (Appendix 4.1 Figure 4.1.1).

Most delivery and ANC rooms appeared “clean” upon visual assessment; in 3 HPs, these spaces were characterized as “not clean” based on dirty examination bed, dusty furniture and dirty floor and walls (Appendix 4.1 Table 4.1.3). Only five facilities had a toilet attached to the delivery room; all remaining had a toilet elsewhere at the facility, but in six instances the toilet was either unclean and/or water was not available (Appendix 4.1 Table 4.1.2).

*Antenatal care services and supplies (Table 4.1):* All facilities (except for 1 HP without any ANMs staffed) provided routine and referral ANC services. Proteinuria or hemoglobin testing was not consistently provided, even when laboratory services were available; when not available, most facilities reported referring clients to the nearest private or public laboratory. Tetanus toxoid vaccination was widely available. Iron/folic acid tablets were out of stock in 14 health facilities (including the District hospital), mainly due to a nationwide supply shortage, and delayed distribution by MoHP. Similarly, strips for testing proteinuria (i.e., pre-eclampsia screening) were unavailable in 2 of 5 PHCCs.

*Delivery care services, supplies and infrastructure (Figure 4.1):* Overall, about 67% of the health facilities had all items needed for infection control with both the private facilities having all the items while the District hospital did not have the disinfecting solution (at the time of the study) and so scored zero on infection control. In contrast, the District hospital had all the other elements to support quality whereas both the private health facilities lacked the essential guidelines on managing normal labor and birth and emergency obstetric care resulting in a score

of zero. Only 9 facilities stocked injectable anticonvulsants and antibiotics for eclampsia and sepsis, respectively, with health posts being particularly understocked (4 of 16).

*BEmONC Signal Functions:* Four facilities (3 HPs and District Hospital) reported having ever performed the six BEmONC signal functions queried (removal of retained products was not explored), and none reported conducting all six functions within the prior 3 months (Appendix 4.1 Table 4.1.4). Mean scores for availability of medications/supplies required for BEmONC signal functions, overall and by facility type are shown in Figure 4.2. While the District hospital had capacity to perform all seven signal functions and nearly all facilities were equipped to provide oxytocics, less than two-thirds had injectable ampicillin or gentamycin, and no PHCC level facility had manual or electrical vacuum extractors for assisted vaginal delivery; 10 BCs lacked injectable magnesium sulfate (Appendix 4.1 Table 4.1.6).

*Newborn Care:* The MoHP-indicated list of supplies for quality newborn care was either fully or largely met at the District hospital and the private facilities. However, only 9 facilities maintained a functioning heat source for preterm infants, and only half had oxygen available at the time of assessment. Functioning oral thermometers, suction devices (foot, electric, or delee), resuscitation table, and bag/mask were missing from a small number of HPs and PHCCs (Appendix 4.1 Table 4.1.7).

*Human resource:* While the District hospital met MoHP staffing criteria (OB/GYN, ANM/Senior ANM), only 1 of the PHCCs had the requisite staff nurse posted at the time of the audit (Appendix 4.1 Table 4.1.8). Where understaffed, in-charges reported extensive time periods

since vacant posts were previously filled (median 48 week, range 8 to 520 weeks) and one HP level facility had no AMs in prior year (data not shown).

#### **4.4.2 Health Worker Assessment and Knowledge**

*Health worker background characteristics, education and training/supervision:* We interviewed 63 health workers across the 16 HPs (n=33), 5 PHCCs (n=13), 1 District hospital (n=11) and 2 private clinics (n=6), and the majority (n=54, 85.7%) were ANMs or Senior ANMs, a level which requires grade 10 level education and 18 months training (24 months for Senior certification) (Table 4.2). At the District hospital maternity ward, one doctor (MBBS, OB/GYN diploma) worked in conjunction with 7 staff nurses (requires grade 10 education and 3 years nursing training), and 4 ANMs. While the MoHP aims to provide an additional two months of SBA training to staff in all BCs [17], only half of providers responsible for delivery care in Sarlahi BCs had received this training (Table 4.2). Overall, training (including refresher courses) for ANC, delivery, and newborn care in the past 3 years was 83%, 74.6% and 65.1% respectively (Appendix 4.2 Table 4.2.2A). However, when analyzing by facility type, the vast majority of District hospital and private clinic staff reported not receiving the refresher trainings. The majority of the health workers (81%) reported the need for more supplies/drugs (all health facilities) followed by 57% reporting better facility infrastructure (mostly PHCC and HP level staff) in order to improve the quality of care (Appendix 4.2 Figure 4.2.3). In addition, a quarter of the health workers reported never having received supervision or technical support (Appendix 4.2 Figure 4.2.1), and about 75% of them were new staff who started working from 2015 onwards (data not shown).

*Maternal and newborn health knowledge:* Public sector providers routinely (90%) demonstrated complete knowledge of active management of third stage of labor (AMTSL), while private clinic staff were less likely to correctly identify these steps especially uterine massage (Figure 4.3A). In contrast, knowledge of components of prevention of mother to child transmission (PMTCT) of HIV was poor (mean score 7%), with improved understanding among district hospital staff. Knowledge of appropriate management of heavy postpartum bleeding due to uterine atony was low (~40%), with a slightly higher mean score among District hospital staff (Figure 4.3A) and those with SBA training (Figure 4.3B). Case scenarios illustrating severe pre-eclampsia were correctly diagnosed by most health workers, but private sector workers' knowledge was significantly lower (16.7%) (Figure 4.3A). The majority (52 of 63 or 83%) reported providing magnesium sulfate as one of the most appropriate actions in managing women with severe pre-eclampsia at term but less than half did not mention anti-hypertensives and delivery within 24 hours (Appendix 4.2 Table 4.2.3A). Knowledge of immediate newborn care was quite low overall (55.3%) (Details in Appendix 4.2 Table 4.2.4A). A significantly higher proportion (90.6%) of SBA trained staff mentioned skin to skin contact compared to non-SBA trained staff (67.7%) (Appendix 4.2 Table 4.2.4B). Health workers' knowledge scores for recognizing signs and symptoms of newborn sepsis was slightly better at 57% overall and higher among the District hospital and PHCC health workers (Figure 4.3A) with very little difference between the SBA and non-SBA trained staff.

## 4.5 Discussion

We identified some critical gaps in facility readiness and health worker preparedness to provide quality ANC, labor/delivery and immediate newborn care. As a result, the majority of the BCs did not meet the requirements set by NSMP guidelines. A consistent barrier to readiness to provide quality services was the lack of medicines and supplies needed for vital ANC and delivery care services. The majority of the health workers at all facility levels agreed that more drugs and supplies are needed for improved QoC. The nationwide supply shortage of iron/folic acid tablets for more than a year affected the stock out seen in majority of the facilities, which is in contrast to the finding from the 2015 Nepal Health Facility Survey (NHFS) that showed 90% facilities having iron/folic acid tablets [27]. Lack of anticonvulsants to manage severe pre-eclampsia/eclampsia, which is the second major cause of maternal deaths [28], and lack of a vacuum extractor to conduct assisted deliveries in all of the PHCCs adversely affects the ability of skilled staff to provide quality care. As demonstrated in the NHFS, centers designated as BEmONC-capable do not necessarily have this capacity due to gaps in drugs and equipment; lack of magnesium sulfate, injectable antibiotics, and MVA/D&C kits were particularly glaring[27]. On the other hand, distribution of oxytocics appeared universal, which is reassuring, given that hemorrhage is the most common cause of maternal mortality [28]. Such successes must be extended to a broader set of supplies, and ensured across all health facilities in order to reduce delays in provision of lifesaving interventions.

BCs established without sufficient physical infrastructure (i.e., rooms and laboratories as per NSMP guidelines) result in sharing beds/space across labor and postnatal services, and forces referral to external labs for even basic testing services. Thus, in many facilities, lab tests which are an integral part of ANC, were not done either because they did not have the facilities or did

not have the testing supplies. Pregnant women are more likely to not have any laboratory tests done due to distance to nearest referral lab or financial constraint (correspondence with health workers). This can possibly lead to delayed diagnosis or non-diagnosis of a potential pregnancy complication, resulting in inability to take preventive measures or receive timely treatment.

Long-standing staffing gaps or sub-optimal distribution of human resource assets in many PHCC and HP level facilities is a result of insufficient SBA training programs, ineffective deployment, and poor worker retention, and reflects typical health system bottlenecks in quality care in many developing countries like Nepal [29]. Skilled health worker shortages remain a major barrier to facility readiness to provide BEmONC services in many countries in the region [20, 30].

Regular supervision and technical support, which is important to create an enabling work environment, needs to be emphasized in BCs with newer recruits who are most likely to be missed [31]. The national birthing center assessment also showed about 30% of overall health workers reporting never been supervised, with Terai region being slightly higher (36.5%) [21].

The need to strengthen the procurement and distribution chain for basic drugs and equipment and the need to improve skills of providers to ensure at least minimum coverage of EOC is in place cannot be overemphasized.

A safe, clean, hygienic environment with continuous supplies of clean water and electricity, good sanitation and safe waste disposal are the basis of appropriate care of patients, for carrying out all procedures and interventions and for controlling infection [32]. Lack of privacy in some ANC rooms, non-functioning toilets as evident in a quarter of the facilities, and about a third of the health facilities including the District hospital lacking the items for infection control are all indicators of poor QoC.

Our evaluation showed that the private BCs had high standards of care in terms of cleanliness, infrastructure, infection control, medicines/supplies and human resource, but do not necessarily have high performance in some of the maternal and newborn knowledge indicators. This may in part be due to the exclusion of the private sector in the refresher trainings and SBA trainings. In Sarlahi district, pregnant women who deliver in either one of the private clinics are eligible to receive the transportation cost reimbursement from MoHP but the exclusion of the private sector staff in trainings is a service gap that could be strengthened through public-private partnership efforts [33, 34].

Health worker knowledge on the topic of PMTCT was low, maybe due to the lack of emphasis in training programs as HIV risk is low in the general population of Nepal and training on PMTCT is centered on staff of HIV Counseling and Testing sites that operate separately from the BCs [35]. Knowledge of AMTSL which is an essential step to prevent PPH in normal vaginal delivery [36] was high among the public sector staff but significantly lower among the private sector staff. Future refresher trainings should have more focus on the topics of PMTCT, hemorrhage management from atonic contractions and severe pre-eclampsia management which was low overall. Knowledge of immediate newborn care was slightly better but more emphasis should be given in this area as well in future training.

The MoHP and key stakeholders should establish standard regulations and routinely monitor readiness by type of health facility, identify gaps and areas for improvement, and intervene accordingly at the district level. Currently, MoHP monitors Safe Motherhood Program service coverage indicator collecting monthly facility level data on indicators such as % of women who received a 180 day supply of iron folic acid during pregnancy, % institutional deliveries, ANC coverage (4 visits, at least one), % normal deliveries, % assisted (vacuum or forceps) deliveries,

% deliveries by caesarean section etc. and annual data on number of health facilities: BEmONC, CEmONC, BC facilities and lab facilities [37]. The 2015 NFHS is the first national comprehensive survey monitoring facility readiness to provide quality services to clients [27]. New BCs at the primary health post level should be established only if the facility has the requisite rooms, utilities, and personnel (i.e. at least 2 ANMs) necessary for service provision. In a few cases (1 PHCC, 2 HP and District hospital), a new health facility building has been built but has not been transferred to the health facility even after its completion due to political reasons.

#### **4.5.1 Strengths and Limitations**

Strengths of our study include utilizing existing tools allowing comparison at the national level on key indicators, universal sampling of all BCs in the district, and interviews with all the health workers working in the BCs during the study period, thus providing a complete picture of health worker knowledge in this district, which is typical of much of rural Nepal. Limitations, however, include the lack of observation-based measures of obstetric care, as conducted in other QoC studies, and which is considered the gold standard for clinical quality assessment given that knowledge (assessed through test and case scenarios) and performance are not that closely correlated [21, 24, 25, 32, 38]. Health workers who provide appropriate care may still have difficulty answering questions correctly, and those who answer questions correctly may not provide appropriate care. Similarly we did not capture the humanization aspect of QoC, which would be important to understand as disrespect and abuse are distressingly common and might dissuade women from seeking care (8,37). The performance of BEmONC signal functions was self-reported and may be subject to recall or other response bias.



## 4.6. Conclusion

In Nepal, financial incentives for women, performance-based financing for providers and facilities, and removal of user fees have increased facility births and ANC visits. Such rapid increase in utilization is likely to place a considerable burden on the facilities and compromise quality [41, 42]. This study shows that the gaps in quality of essential maternal and newborn care remains a major challenge at all levels and differs by type of facility in rural Nepal. To reduce the burden of maternal and newborn death and to achieve the SDGs, we need to overcome both the “coverage gap” and the “quality gap” [13, 43]. Routine and robust monitoring of health facilities to ensure readiness is an important first step towards improving quality [44]. In addition to periodic national birthing center assessments, focused maternal and newborn QoC assessments at the district level through regular monitoring, audits, supervisions and refresher trainings are also required.

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**Box 4.1:** Items included in the mean percentage score calculation for the six BEmONC signal functions

- i) Removal of retained products of conception: Manual vacuum aspiration (MVA) or dilation and curettage kit; injectable oxytocin; syringes and needles; and IV solution (ringer's lactate, dextrose 5% in normal saline (D5NS) or normal saline (NS) infusion)
- ii) Parenteral antibiotics use for infection: Injectable ampicillin or gentamycin; syringes and needles; and IV solution (ringer's lactate, D5NS or NS infusion)
- iii) Parenteral oxytocin use: Injectable oxytocin; syringes and needles; and IV solution (ringer's lactate, D5NS or NS infusion)
- iv) Parenteral Magnesium Sulphate use: Injectable magnesium sulfate; syringes and needles; and IV solution (ringer's lactate, D5NS or NS infusion)
- v) Manual removal of placenta: Injectable ampicillin; injectable oxytocin; syringes and needles; and IV solution (ringer's lactate, D5NS or NS infusion)
- vi) Newborn resuscitation: Bag and mask (infant size), and resuscitation table for

**Table 4.1.** ANC services and supplies by type of health facility

<b>ANC tests prior to and during consultations</b>	<b>PHCC (N=5)</b>	<b>HP (N=16)</b>	<b>Private (N=2)</b>	<b>District Hospital (N=1)</b>	<b>Total (N=24)</b>
<b>Routinely conducted for all ANC clients*</b>					
Weighing clients	5	15	2	1	23
Taking blood pressure	5	15	2	1	23
Urine test for protein	5	2	2	1	10
Blood test for anemia	5	2	2	1	10
Conducting group health education sessions	3	11	0	1	15
<b>Tests and services routinely offered (at least once during ANC)</b>	<b>N=5</b>	<b>N=16</b>	<b>N=2</b>	<b>N=1</b>	<b>N=23</b>
Blood test for anemia	4	2	2	1	9
Blood test for syphilis	3	2	2	1	8
Blood group	4	2	2	0	8
Test for Rh factor	3	2	2	0	7
Urine test for protein	4	2	2	1	9
Urine test for glucose	3	2	2	1	8
Counseling on danger signs for pregnancy, labor/delivery, PNC	5	15	2	1	23
Counseling to come to BC for delivery and to bring their ANC card	5	15	2	1	23
Counseling about family planning	3	14	2	1	20
Counseling about HIV/AIDS	1	11	2	0	14
Testing for HIV/AIDS	1	5	2	1	9
<b>Tetanus Toxoid Vaccinations available at the ANC</b>					
Yes, all days ANC available	0	3	1	0	4
Yes, but not all days (only designated days in a month)	5	13	1	1	20
<b>Infection control items in ANC room *</b>					
Soap and running water	4	11	2	1	18
Hand disinfectant (Alcohol hand rub)	1	7	0	0	8
Sharps container	5	15	2	1	23
<b>Essential supplies for basic ANC*</b>					
Blood pressure apparatus	5	16	2	1	24
Stethoscope	5	16	2	1	24
Fetoscope	5	16	2	1	24
Adult weighing scale	4	15	2	1	22
Iron and/or folic acid tablets	1	8	1	0	10
Mebendazole/Albendazole tablets	3	16	1	1	21
Urine test strip for protein	3	1	2	1	7

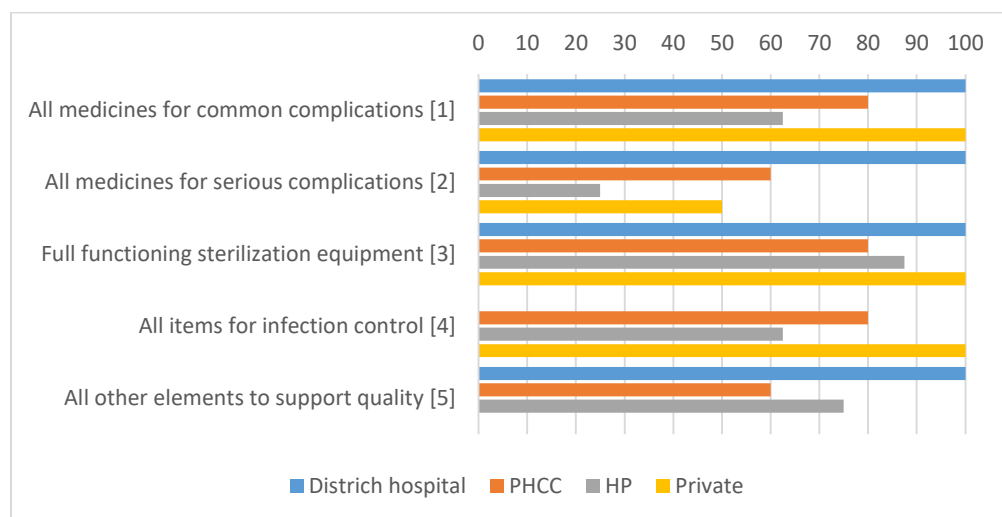
*\*Observed or reported not seen and functioning*



**Table 4.2.** Distribution of health worker characteristics, training and education by type of health facility

Characteristics	DH (%) N=11	PHCC (%) N=13	HP (%) N=33	Private (%) N=6	Total (%) N=63
<b>Health Worker Cadre</b>					
Sr. ANM/ANM	27.3	92.3	100	100	85.7
Sr. Staff Nurse/Nurse	63.6	7.7	0	0	12.7
Medical Doctor	9.1	0	0	0	1.6
<b>Age of respondent</b>					
18-25 years	9.1	23.1	39.4	16.7	28.6
26-30 years	54.5	23.1	24.2	16.7	28.6
31-35 years	9.1	15.4	18.2	0	14.3
36-40 years	18.2	15.4	12.1	50	17.5
>40 years	9.1	23.1	6.1	16.7	11.1
<i>Median (years)</i>	<i>27 years</i>	<i>34 years</i>	<i>28 years</i>	<i>37.5 years</i>	<i>29 years</i>
<b>Highest Professional/Technical/Medical Qualification*</b>					
Bachelor of Medicine and Bachelor of Surgery (MBBS) with OB/GYN diploma	9.1	0	0	0	1.6
BSc Nursing/ Bachelor in Nursing/Bachelor in Health Education	27.3	15.4	3.0	0	9.5
Proficiency Certificate Level (PCL) Nurse	36.4	23.1	18.2	0	20.6
Senior ANM training	0	15.4	0	0	3.2
ANM training	27.3	46.2	75.8	100	63.5
MCHW training	0	0	3.0	0	1.6
<b>Completion of highest level of training year</b>					
Before 2000	9.1	15.4	3.0	33.3	9.5
2000-2005	0	15.4	18.2	33.3	15.9
2006-2010	18.2	23.1	36.4	16.7	28.6
2011-2015	72.7	46.2	42.4	16.7	46.0
<i>Median year</i>	<i>Year 2013</i>	<i>Year 2010</i>	<i>Year 2010</i>	<i>Year 2002</i>	<i>Year 2010</i>
<b>SBA additional training</b>					
Yes	36.4	69.2	51.5	33.3	50.8
No	63.6	30.8	48.5	66.7	49.2

\*Fishers exact test  $p$ -value < 0.05



**Figure 4.1.** Percentage of facilities with available supplies and medicines to support quality delivery services by type of health facility (N=24)

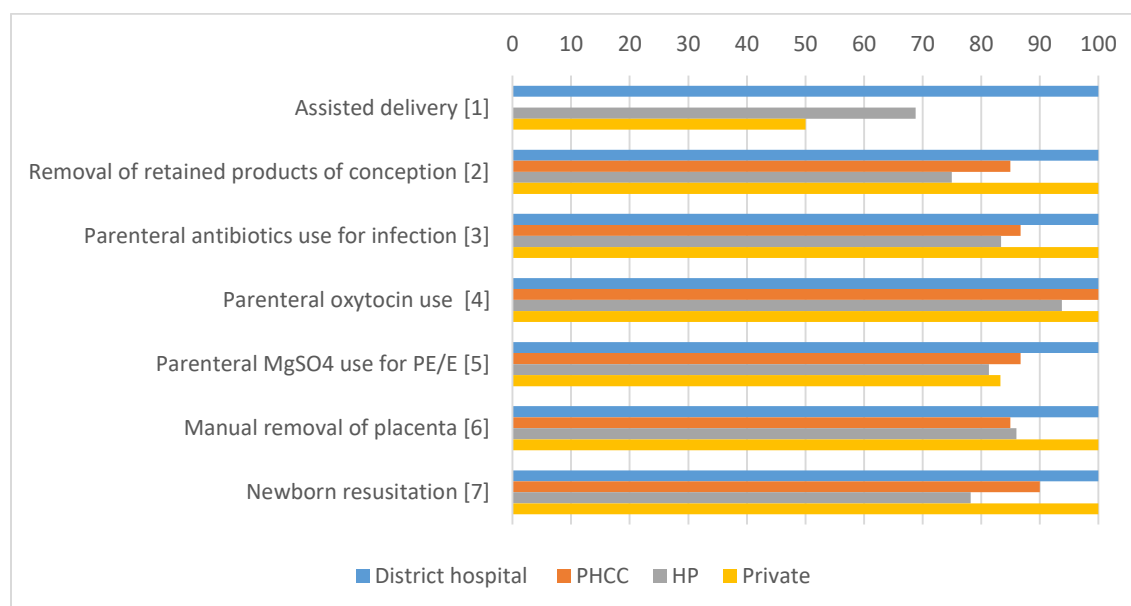
<sup>1</sup> Needle and syringe, IV solution with infusion set (IV cannula), injectable oxytocin, and perineal/vaginal/cervical repair set located in the pharmacy or delivery room

<sup>2</sup> Injectable anticonvulsants (magnesium sulfate) and antibiotic (ampicillin or gentamycin) in delivery room or pharmacy

<sup>3</sup> A working indicator to indicate when sterilization is complete for either the electric or non-electric autoclave with heat source OR a non-electric pot with cover with heat source

<sup>4</sup> Soap, water, disinfecting solution, puncture proof container, and clean & sterile gloves

<sup>5</sup> Guidelines, blank partographs, and provider on site or on call 24 hours a day



**Figure 4.2.** Availability of Medications and Supplies Needed to Perform Basic Emergency Obstetric and Newborn Care Signal Functions by type of Health Facility (N=24)

<sup>1</sup> Percent of facilities with forceps or ventouse (Vacuum extractor manual or electrical)

<sup>2</sup> Mean percentage score for functioning kit for manual vacuum aspiration or dilation and curettage kit, injectable oxytocin, syringes and needles, and IV solution (ringer's lactate, dextrose 5% in normal saline (D5NS) or normal saline (NS) infusion)

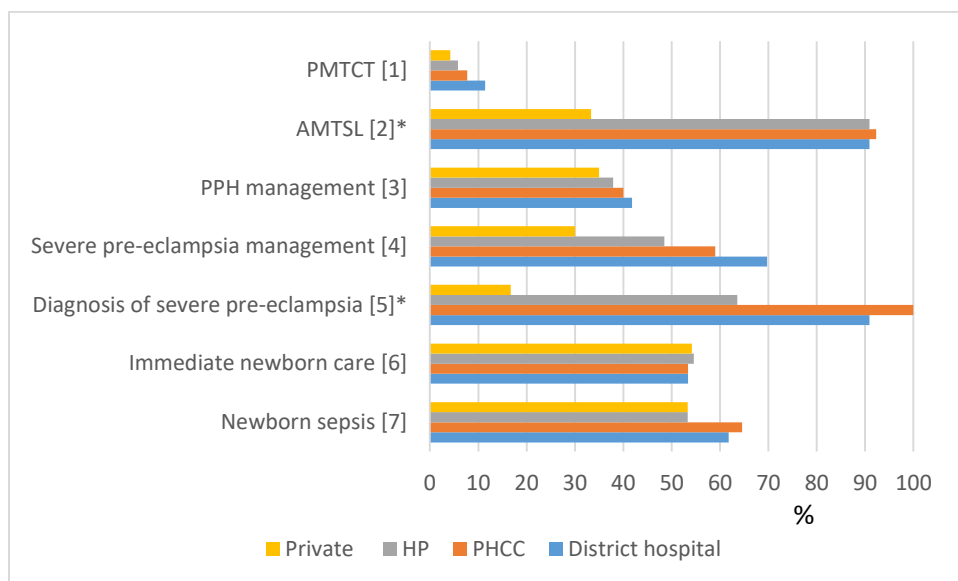
<sup>3</sup> Mean percentage score of injectable ampicillin or gentamycin, syringes and needles, and ringer's lactate, D5NS or NS infusion

<sup>4</sup> Mean percentage score of injectable oxytocin, syringes and needles, and ringer's lactate, D5NS or NS infusion

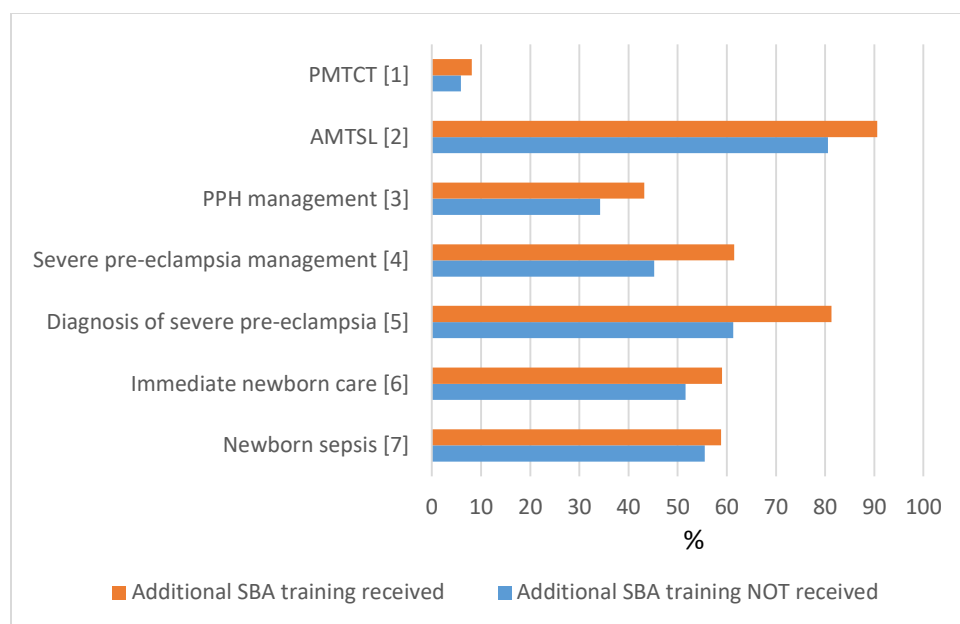
<sup>5</sup> Mean percentage score of injectable magnesium sulfate, syringes and needles, and ringer's lactate, D5NS or NS infusion

<sup>6</sup> Mean percentage score of injectable ampicillin, injectable oxytocin, syringes and needles, and ringer's lactate, D5NS or NS infusion

<sup>7</sup> Mean percentage score of bag and mask (infant size), and resuscitation table for newborn



**Figure 4.3.A.** Percent distribution of maternal and newborn health knowledge (mean scores) among health workers by type of health facility (N=63)



**Figure 4.4.B.** Percent distribution of maternal and newborn health knowledge (mean scores) by health workers who received and did not receive additional SBA training

<sup>1</sup> Mean percentage score of knowledge on actions for the prevention of mother-to-child transmission of HIV (PMTCT) during labor and delivery

<sup>2</sup> Correct knowledge on all three key steps of active management of third stage of labor (AMTSL) namely administration of uterotonic immediately/within 1 minute of delivery, controlled cord traction and uterine massage

<sup>3</sup> Mean percentage score of knowledge on actions appropriate for heavy bleeding postpartum from atonic/uncontracted uterus

<sup>4</sup> Mean percentage score of knowledge on actions most appropriate in managing woman with severe pre-eclampsia at term

<sup>5</sup> Correct diagnosis of severe pre-eclampsia on the case scenario

<sup>6</sup> Mean percentage score of knowledge on immediate newborn care after birth and within the first hour baby delivered with no complication

<sup>7</sup> Mean percentage score of knowledge on five signs and symptoms of newborn infection (sepsis) namely poor/no breastfeeding, hypo/hyperthermia, restlessness/irritability, and breathing difficulties

\* Fishers exact test p-value <0.05

## **Chapter 5 : Illness recognition, decision-making and care-seeking for maternal and newborn complications: A qualitative study in Sarlahi district, Nepal**

### **5.1 Abstract**

**Background:** Identification of maternal and newborn illness and the decision making and subsequent care seeking patterns are poorly understood in Nepal. We aimed to characterize the process and factors influencing recognition of complications, the decision-making process and care-seeking behavior among families and community who experienced a maternal complication, death, neonatal illness or death in a rural setting of Nepal.

**Methods:** Thirty-two event narratives (6 maternal/newborn deaths each and 10 maternal/newborn illnesses each) were collected using in-depth interviews and small group interviews. We purposively sampled across specific illness and complication definitions, using data collected prospectively from a cohort of women and newborns followed from pregnancy through the first 28 days postpartum. The event narratives were coded and analyzed for common themes corresponding to three main domains of illness recognition, decision-making and care-seeking; detailed event timelines were created for each.

**Results:** While signs were typically recognized early, delays in perceiving the severity of illness compromised prompt care-seeking in both maternal and newborn cases. Further, care was often sought initially from informal health providers such as traditional birth attendants, traditional healers and village doctors. Key decision-makers were usually female family members; husbands played limited roles in decisions related to care-seeking, with broader family involvement in decision making for newborns. Barriers to seeking care at any type of health facility included transport problems, lack of money, night-time illness events, low perceived severity, and

distance to facility. Facility care was often sought only after referral or following treatment failure from an informal provider and private facilities were sought for newborn care. Respondents characterized government facility-based care as low quality, and reported staff rudeness and drug type and/or supply stock shortages.

**Conclusion:** Delaying the decision to seek skilled care was common in both newborn and maternal cases. Among maternal cases, delays in receiving appropriate care when at a facility were also seen. Improved recognition of danger signs and increased demand for skilled care, motivated through community level interventions and health worker mobilization needs to be encouraged. Engaging informal providers through training in improved danger sign identification and prompt referral, especially for newborn illnesses, is recommended.

## 5.2 Background

Maternal mortality ratio in Nepal has decreased from an estimated 901 to 258 maternal deaths per 100,000 livebirths from 1990 to 2015 [1]. Similarly, the 2016 Nepal Demographic Health Survey shows a decrease in neonatal mortality rate from 33 deaths in 2011 to 21 deaths in 2016 per 1,000 livebirths, accounting for about 65% and 53% of infant and under-five mortality, respectively [2]. Large inequities in accessing and utilizing maternal and newborn services remain between rural and urban populations. Examples include the proportion delivered in a health facility (rural 44% vs. urban 69%), 4 or more antenatal care (ANC) visits (rural 62% vs. urban 75%), and postnatal care within the first two days after birth (rural 48% vs. urban 64%) [2].

There are many real and perceived barriers to accessing care, particularly for women in rural areas of low-income countries. These delays are often characterized using Thaddeus and Maine's 'three delays' model: 1) deciding to seek care; 2) reaching a facility; and 3) receiving quality care upon arrival [3]. While initially used to elucidate barriers to improved maternal health and survival, the model can be extended to address access to care and care-seeking practices for newborns with danger signs [4–6].

Nepal's government has aimed to improve maternal and newborn health outcomes through addressing supply and demand-side barriers to service uptake. The National Safe Motherhood Program (NSMP) [7, 8] aims to provide free 24/7 delivery care, financial incentives for accessing antenatal care (ANC) and delivery services in a facility, birth preparedness, and payments to health facilities to cover free care [8]. The Community-Based Integrated Management of Neonatal and Childhood Illnesses (CB-IMNCI), relies on female community health volunteers (FCHVs) and health workers at health posts to provide counselling for



maternal, newborn and child health, to dispense essential commodities, and refer upon identification of danger signs [9]. Effectiveness of these efforts depend on timely recognition of danger signs followed by immediate care seeking.

Studies in Nepal assessing barriers to skilled ANC and facility delivery were conducted prior to implementation of NSMP and CB-IMNCI. Few studies, however, focus on care seeking for maternal and newborn illness [10–15]. Reasons for sub-optimal utilization of free maternal and newborn services in facilities in rural Nepal remain unclear, despite the above-mentioned efforts to remove financial barriers and link community-volunteers to these primary health care facilities. We characterized the processes and factors behind recognition of perceived maternal or newborn complications, the decision-making process, and care-seeking behavior among families and communities who experienced a maternal complication or neonatal illness, some of which resulted in death, in a rural setting of Nepal.

### **5.3. Methods**

#### **5.3.1 Study site**

Bordering India, Sarlahi District (population ~750,000) in the southern plains of Nepal is divided into 96 Village Development Committees (VDCs) and 6 municipalities [16]. Public facilities include one district hospital (with an OB/GYN doctor position) and 21 birthing centers at the primary level; additionally there are two private facilities (one Family Planning Association of Nepal Clinic and the other a community hospital) that are supposed to provide 24/7 delivery care staffed by nurses and/or auxiliary nurse midwives (ANMs). In our study area, about 42% of pregnant women deliver at a health facility (data not published). When reporting results, the term facility is used generally and encompasses all types of facilities, unless otherwise specified.

### 5.3.2 Study design

Our study was complementary to a multi-country study funded by USAID through the Translating Research into Action Project (TRAction). To guide the research, a conceptual model was developed based on the literature review, adapting the Three Delays Model (Chapter 2 Figure 2.1). This study collected data on 32 event narratives: 6 maternal deaths, 10 maternal illness, 6 neonatal death and 10 neonatal illness cases, in line with a common multi-country protocol of having a minimum of 5 cases per case type to have enough cases to reach saturation [17]. Despite the fact that maternal deaths are a rare event in our study area, we were able to collect six maternal and newborn death cases each. For each event narrative, a small group interview was conducted with the primary caregiver for the ill focal woman or newborn and a group of 2-4 other witnesses, who were other family or community members (including care providers) present during the onset of the illness and/or the process that followed. The small group interviews included the witnesses in order to maximize information for the event narratives. For the 10 maternal illness cases, a separate in-depth interview (IDI) was first conducted with the focal woman experiencing the complication, which was then followed by the small group interviews in order to gain personal insight on the focal woman's experience without the influence of other family members, which may happen in a group setting in this study area. Thus, 10 IDIs and 32 small group interviews were conducted for the 32 illness narratives (Table 5.1).

This narrative development activity was nested within a large cluster-randomized community-based trial of the impact of topical applications of sunflower seed oil (compared to mustard oil) to newborn babies on neonatal mortality and morbidity in rural Sarlahi District, Nepal

(NCT01177111). The parent trial was implemented in a subset of the district (34 VDCs) by the Nepal Nutrition Intervention Project – Sarlahi (NNIPS), Johns Hopkins Bloomberg School of Public Health, and Nepal Netra Jyoti Sangh; activities included enrolling approximately 30,000 pregnant women and following them and their newborn babies. Post-delivery home visits by field workers on days 1, 3, 7, 10, 14, 21, and 28 allowed for collection of data on labor and delivery circumstances and maternal and neonatal health conditions through the first month of life.

In the event of deaths among pregnant or recently-delivered women or newborns, verbal autopsies were routinely conducted in the parent trial. Both the maternal and newborn verbal autopsies are conducted by trained field supervisors upon notification of a death. The field supervisors approach the family members at the earliest possible time (after an appropriate mourning period) to record information on the following: date and approximate time of death; the morbidities present or observed before/during the time of death; care-seeking patterns; and open description regarding the process of death of the baby or woman.

### **5.3.3 Sampling method**

We utilized the data collected in the larger parent trial to select illness and death events for the 32 event narratives using the criterion sampling strategy. Inclusion criteria for maternal cases included: female, married, age 15-49 years, parent trial participant, residing in study area, gave birth in the previous six months, and quantitative data from the parent trial indicated maternal complications during late pregnancy (third trimester), delivery or post-partum period. These complications (defined below) were identified prospectively from self-reported maternal morbidity from interviews with the focal woman conducted during the monthly pregnancy visits, immediate postpartum visit and after the first week postpartum visit in the parent trial. The

complications were categorized into the following four groups of the most common complications: 1) postpartum hemorrhage (PPH): the woman reported excessive bleeding at the time of birth or soon after; 2) eclampsia: the woman reported convulsions excluding epileptic fit in the absence of high fever during pregnancy or intrapartum period; 3) puerperal sepsis: the woman reported fever along with foul-smelling vaginal discharge or lower abdominal pain; and 4) prolonged labor: the woman reported labor pains lasted >24 hours. All cases are based on self-reported signs in the absence of medical diagnosis, and are thus considered suspected cases of PPH, pre/eclampsia, puerperal sepsis, or prolonged/obstructed labor. These definitions were used in previous studies of self-reported morbidities in South Asia based on WHO Integrated Management of Pregnancy and Childbirth (IMPAC) guidelines [18, 19].

Unlike the other TRAction multi-country studies, we did not exclude women who gave birth at a facility and developed the complication or died prior to discharge and did not limit the maternal complications to only perceived PPH cases. We purposively selected the majority of the maternal complication cases to be perceived PPH cases but also selected a small number of possible eclampsia, sepsis and prolonged labor cases to see if there were differences in recognition, decision making and care seeking pattern by type of complications. The small number of non-PPH complications is not representative of the cause distribution of maternal complications in the study area. Maternal verbal autopsies, routinely collected as part of the parent trial, were used to identify maternal death cases, defined as a death during pregnancy or within 42 days of cessation of pregnancy from any cause related to the pregnancy or its management; we additionally required that the death occurred within 6 months prior to the family interview.

The inclusion criteria for newborn cases included that they be born in the last 6 months, enrolled in the parent trial and met our definition of neonatal illness, based on data collected during the 7

home visits conducted in the first 28 days of life (routine parent trial data collection visits). For the purpose of this study, newborn illness was defined as one or more of the following signs: fever, convulsion, difficulty breathing, feeding problems, and skin feels cold. Newborn verbal autopsies were reviewed to identify newborn deaths resulting from an illness event with any one of the above mentioned signs.

#### **5.3.4 Data collection**

A separate instrument was developed for women and newborns cases (Appendix 2). The instruments contained open ended questions to elicit the perceived onset and sequence of signs and symptoms, emotional and cognitive reactions, behavioral responses, and the process of decision-making for identified signs and symptoms as experienced by the informants. Also included was a record of preferred types of treatment/care sought, sequences of care-seeking and the perceived quality of care and economic or logistical barriers to care-seeking. The instrument also included a structured timeline time-by-event matrix adapted from previous research studies to prior illness narrative matrices to facilitate the recording of the event [20]. The instrument also permitted the recording of textual responses by specific group members that detail the circumstances surrounding the event and any factors associated with the identification of and response to the event. Informants' demographic and social characteristics were also captured.

Instruments were translated into Nepali and reviewed for accuracy by the doctoral candidate (TPL) and field coordinators. A team of six female interviewers with prior qualitative data collection training and experience were trained for a month. The interviews were completed for all cases between February and October, 2016, and were conducted in pairs by a trained interviewer and note-taker predominantly in Maithili (the local language). Each 60 – 90 minute interview was conducted at a time and place that was convenient for the informants. During the

interview, and at its completion, interviewers reviewed the entire sequence of perceived signs and symptoms, emotional and cognitive reactions, and actions taken in response to the event. By doing so, the interviewers stimulated recall, and verified and clarified ambiguities in the event history. Ongoing supervision and assistance for quality assurance and periodic re-training were conducted by the doctoral candidate (TPL). The interviews were audio recorded, transcribed verbatim into Nepali using the notes and audio recordings by the interviewers and then translated into English for analysis.

### **5.3.5 Analysis**

The quality of the transcribed notes and entire translations were cross-checked for accuracy by a Maithili speaking employee and the doctoral candidate (TPL), respectively. Atlas Ti software was used for coding and analysis. Each transcript was read through several times; passages were highlighted and coded for content analysis using a standard codebook developed *a priori*. Any text that could not be categorized with the initial coding scheme was given a new code.

Comparisons were made within and between the four case groups. The results are presented according to the main domains and comparisons made between and within the cases. When referencing care-seeking, we use specific terms to describe types of providers; these terms are described in Table 5.2.

### **5.3.6 Ethical approval**

Written informed consent was obtained from all the respondents. The Johns Hopkins Bloomberg School of Public Health Institutional Review Board (Baltimore, USA) and the Nepal Health Research Council, Ministry of Health and Population (Kathmandu, Nepal) reviewed and approved this study prior to the start of fieldwork.

## **5.4. Results**

### **5.4.1 Background characteristics**

A total of 101 people participated in the 32 small group interviews (excluding the focal women in the IDI) of which 14 were men who were family members who witnessed the illness event. Ten focal women participated in IDIs among which 9 also participated in the small group interviews for the maternal illness event narratives. The median age of maternal cases was 20 years and ranged from 16 to 40 years. Four of six newborn deaths cases occurred within three days after birth. The majority of the deliveries were at home for newborn cases and at a health facility for the maternal cases. A description of health providers, their training and the location of care provided is included in Table 5.2. In addition, a summary of pregnancy profile, illness signs and outcome for each illness narrative case are presented (see Appendix 5).

### **5.4.2 Maternal death and complication cases**

#### *5.4.2.1 Illness recognition*

Among the six maternal death cases, headaches and excessive bleeding were reported in three cases each. Two of the maternal death cases from eclampsia also had signs of swelling of the body, headache, vomiting, convulsions and stiffness of the limbs. One pre-eclampsia case had report of headache, swollen body, vomiting, unconsciousness and high blood pressure upon measurement. Other recognized signs were rolling of the eyes, fever and signs of cold. Of the ten maternal complication cases, excessive bleeding, unconsciousness and convulsions (one during final month of pregnancy and the other postpartum) were reported. One case had both excessive bleeding and convulsions occur soon after delivery.

In the three PPH maternal death cases, the family members or health worker present at the time recognized the bleeding. In the eclampsia and pre-eclampsia cases, the headaches were initially recognized by the focal woman herself and the signs of vomiting, convulsions and loss of consciousness were recognized by the mother-in-law or mother. In most cases, the focal woman who had the problem informed the female members of the family first of their problem.

Among the various signs, excessive bleeding was very subjective and recognizing this as a severe problem by the focal woman and other witnesses was delayed due to factors such as lack of prior experience (especially in primigravida cases) or the perception that bleeding was normal (i.e., by, female members of the family or health workers). For example, the sister-in-law of a woman with PPH said **“This new mother (focal woman’s name), had the same amount of bleeding that we had when we had our babies. She had just like us. That is why I said it was all right” (MC-1)**. Prior pregnancy was also reported as an enabler for recognizing the severity of PPH sign. One focal woman stated **“You know the bleeding should stop after a while, but it didn’t. I have two other children and before this pregnancy, I did not have such an experience” (MC-4)**.

The focal woman and witnesses to the PPH described the excessive bleeding as severe if bleeding did not decrease, flow was heavy, or bleeding was accompanied by loss of consciousness. One of the traditional birth attendants (TBAs) who did not think the focal woman’s excessive bleeding was severe stated **“If the person had fainted or if the person felt nauseous after excessive bleeding then we would consider it as a problem” (MC-5)**.



In all four of the eclampsia cases, the sign of headache, vomiting and swelling of the body were not recognized as severe signs until the onset of convulsions and loss of consciousness.

Knowledge about other women's fatal outcomes after similar signs also prompted recognition of the severity of the signs. One of the focal women who had excessive bleeding and convulsions said **"In that village of ours, one of the women had the same kind of problem and she died"** (MC-9). A sudden inability to conduct household chores helped recognize the problem in other instances. For example, in the prolonged labor case, the focal woman's brother-in-law reported **"When it became difficult for her to work and when she had difficulty in walking about she started to cry and walk up and down. Then only did we know that she was having problems. She did not tell anybody"** (MC-3). All of the focal women perceived their problem to be severe and many of them said they felt like they would die.

Cause attribution for the complications varied. For the eclampsia and pre-eclampsia cases, the initial cause for the signs was believed to be possession by evil spirit or witchcraft (*'boksi laageko'*), mainly due to the sudden onset of convulsion and/or unconsciousness and the circumstances surrounding it. The prolonged labor was thought to be caused due to weakness, while sepsis was thought to be caused by the delivery of the baby. Most of the PPH cases were thought to be due to the delivery process.

#### *5.4.2.2 Decision to seek care*

Decision makers in first seeking care for maternal cases (both survivors and deaths) were usually the mother-in-law or mother, followed by the husband; less commonly a sister-in-law or neighbor initiated decision-making. As bleeding was often considered normal, the decision to go to a facility was often delayed in favor of a wait-and-see approach as seen in the three home birth

PPH cases (MC-1, 7 and 9). In one case, even when the bleeding started while at the hospital, the mother-in-law did not perceive the bleeding to be excessive and thus informed the nurse only after 7 hours without a decrease in bleeding (MC-10). As eclampsia or pre-eclampsia were attributed to ‘*boksi laageko*’, traditional healers were called first in all cases; in one case the traditional healer’s immediate advice prompted the family to seek facility care.

Factors prompting care seeking outside the home included recognizing signs as severe, proximity to facility (any type of health facility), arrangement and availability of transport (ambulance or private vehicle), availability of money, facility workers being relatives or known acquaintances, referral, and prior use of services; seeking care inside the home from informal providers was enabled by familiarity (prior use) of such services and close proximity (ease of contact). Barriers to seeking care outside of the home included difficulty accessing transport, fuel shortages, restriction on vehicular movement due to local or national strikes (‘*bandhs*’), perceived lack of medicines/supplies in health facility, and illness occurring at night. In many cases, more than one care provider was sought and the main delay in deciding to seek subsequent care was late referral by the previous care provider (five cases), or false reassurances, given by the initial provider, that everything would be fine. **“The doctor did the checkup and said that she has convulsion illness which will not go away this soon and will take time. The doctor also said that it will take her 3 days to recover. The doctor told us not to worry and said that he would save both her and her baby’s life. But when it was 5 o clock, she passed away.” – Father of focal woman (MD-3)**

#### *5.4.2.3 Actual care seeking pattern*

**Deaths:** In four of the six maternal death cases, home care from informal providers such as a traditional healer (pre-eclampsia and eclampsia cases) or village doctor was first sought (care

seeking trajectories and timings shown in Figure 5.1a and 5.1b). Subsequently, all four were first referred to a private hospital or a government health facility, and in three cases (MD-1, MD-2, MD-4) this was followed by referral to a higher level facility. One of the deceased women with PPH, was at a private hospital before problem onset, and did not seek care elsewhere (MD-5). The other PPH associated death occurred within three hours of homebirth (wherein obstructed labor and breech birth were reported); in this case, rapid progression of illness and distance to health facility were cited as reasons for not seeking care (MD-6) (Figure 5.1b). All six maternal deaths occurred within 26 hours of recognition (Figure 5.1b).

**Complications:** Among four of the seven PPH cases, sign onset and initial care occurred while at a health facility; in two such cases, the woman was discharged despite continuous bleeding, and subsequent care was then sought from a village doctor (MC-10) or another private hospital (MC-8). In one of these facility PPH cases (MC-4), despite a referral to the next level, financial constraints led the mother-in-law to instead summon to the birthing center a village doctor, who gave an injection to stop the bleeding; the woman and relatives then returned home. In three PPH cases where the woman had delivered at home, two sought care from informal providers (traditional healer and/or village doctor) and one did not seek care despite heavy bleeding for seven days. In two cases of eclampsia (MC-2 and MC-9), a traditional healer was called-in first, who then referred care outside of home to a health facility. For the case of prolonged labor (MC-3) and sepsis (MC-6), care was first sought at home from a TBA. Two sources of care were sought in majority of cases, due to direct referral from the first provider, or because of continuing signs.

The sequence, locations, and timing of care seeking for the maternal complications are illustrated in Figures 5.2a-b. Four of the PPH cases occurred after delivery at a health facility prior to being

discharged (MC-4, 5, 8 and 10) among which in three cases, they were discharged without any referral despite the woman having excessive bleeding (Figure 5.2b). In three other cases (MC-2, 3 and 9) some form of care was sought at home within an hour of sign recognition. In four cases, the signs were reported as resolved within 24 hours of recognition but in one case, it took 11 days (Figure 5.2b).

#### *5.4.2.4 Perceived quality of care*

The respondents' perception of quality of care and satisfaction varied. Positive responses were reported when the focal woman's condition improved. However, some respondents also noted satisfaction with care in health facilities when signs did not resolve; in these cases the respondent highlighted the fact that health workers provided immediate care, were polite and did all they could within their capacity before referring elsewhere. Other respondents expressed dissatisfaction with the care provided, because the focal woman either died or did not improve after treatment. One of the PPH related maternal deaths was thought to be due to the negligence by the doctors as the baby was "pulled out" (MD-1). In another instance where the woman died (MD-5), timely delivery of appropriate emergency obstetric care for excessive bleeding following a C-section was delayed due to a shortage of blood for transfusion; a family member travelled to a neighboring district to get the required quantity, but the woman's condition had worsened before his return.

**"The doctor should stay at the hospital at all times, and tell the relatives of the patient ahead of time that your patient has low blood and that the hospital is low on some other supplies, only then can we prepare for such things ... Only after she (focal woman) was in a very serious state, the doctor told us to quickly get blood. So at that time, where can we get**

**blood immediately?” – Mother in-law (MD-5) discussing the care provided at private hospital**

In a few cases, health workers in both the private and public health facilities were reported as speaking rudely and harshly when the family asked many questions. **“I did not like the behavior of the employees there because they used to speak very harshly. The sister (nurse) of the hospital also used to speak very unkindly.” – Mother-in-law (MD-2) discussing the birthing center nurse**

A shortage of drugs and supplies at both private and government facilities was a barrier to adequate care resulting in referral and further delay. It was also commonly reported that the family had to buy the medicines and supplies for care sought at government health facilities of all levels (seven cases). **“We took her to the hospital. We bought everything and did her treatment. We even had to buy gloves, syringe and everything else. What services did we get even if the government hospital was nearby?” – Mother in law (MC-4) discussing care sought at birthing center**

### **5.4.3 Newborn death and illness cases**

#### *5.4.3.1 Illness recognition*

Of the six newborn death cases, multiple signs were reported for each child. The most common of these were weakness/lethargy (four cases), difficulty breathing (three cases), “cold-like” signs (i.e., upper respiratory tract signs) (three cases) and excessive crying (three cases). Fever, not breathing after birth, inability to cry, not drinking milk, cold to touch, convulsions, stiff body and eyes rolled over, abnormal skin color, distended stomach, and deflated stomach were some of the less common signs reported. Signs were usually first recognized by either the grandmother and/or the mother. In two cases where sign-onset followed soon after birth, the attending village

doctor recognized the signs along with family members. Among three newborn death cases, the problem occurred immediately after birth; two of these were deaths of a twin in which there was no *a priori* knowledge of a multiple birth (ND-3: preterm home birth and ND-6: term facility birth) (see Appendix 5).

Among the newborn illness cases, the most common reported signs reported were difficulty breathing, fever, cough, and “cold-like” signs. Difficulty feeding, cold to touch, not breathing at birth, abnormal skin color, distended stomach, convulsions, limp body, and jaundice were less commonly reported. Signs were first recognized by the immediate family members such as the mother, grandmother and/or aunt (mother’s sister-in-law). In three separate cases, the TBA, a neighbor present during delivery and the father of the baby also recognized the signs.

In all except one (ND-6) of the newborn deaths, signs were recognized as very severe. **“I felt that it was less severe and that it would be fine at home itself. I said that the baby would be well here (home).”-Father of newborn (ND-6).** Even in a few of the newborn illnesses, the baby’s signs were perceived as severe and chances of survival considered bleak. Weakness, breathing difficulty and convulsion were mainly perceived as severe signs.

Respondents attributed the neonatal deaths to pneumonia (ND-2, ND-5), preterm birth (ND-3), excessive medication and inadequate water consumption during pregnancy (ND-1), weak baby (ND-4) and cold weather (ND-6). Among all 7 surviving illness cases where onset was within 24 hours of birth, respondents attributed the cause to pregnancy-related maternal diet (e.g., eating certain foods traditionally classified as ‘cold’ food associated with causing cold (such as sugarcane, yogurt) or lacking nutritious food), pregnancy-related behavior (e.g., taking cold bath), or the cold weather at the time of birth. For instance, the grand aunt of the child born in

mid-January [cold season] **“Many people say that the children these days already have pneumonia inside the mother’s womb” (NC-6).**

#### *5.4.3.2 Decision to seek care*

Among the newborn death cases, care-seeking decision-makers varied; the grandmother or entire family were involved in two cases each. Similarly, the newborn illness cases also saw the entire family or other female members in the household (grandmother, mother, aunt) making the decisions. In one case the father made the decision and another case it was the TBA.

In all six newborn death and nine illness cases, ultimately a decision to seek care outside of the home was made, often enabled by readiness/availability of transport and financial resources, prior experience with a provider, or proximity to care. Frequently, a village doctor’s advice was sought prior to going to a health facility, given they usually lived nearby (i.e., within same village) and prior good experience(s) led to expressed sentiment of “trustworthiness”. Prior experience was given as a reason for the decision for choosing a provider as reported by aunt of one child (NC-4) **“That doctor [village doctor] is very nice, whatever he gives the children, medicine or injection, the children become well, and he gives good medicines.”**

A prompt decision to seek care, however, was compromised by numerous barriers, including a delay in arrangement of transportation and money, family members not considering the signs to be severe, and family circumstances (not able to leave immediately due to another death in the family or needed to take care of home/livestock). Similarly, among the newborn illnesses, commonly reported barriers included difficulty finding transport due to strikes, and timing of sign recognition being late at night. In only one case was the ‘*chhatiyar*’ tradition (confinement of mother and newborn until naming and purification ceremony, typically on the 6<sup>th</sup> day [15, 20,

21] a barrier to seeking care; in this case (NC-4) the illness was recognized within the first 24 hours after birth and was considered serious. When asked why the care was sought only after 6 days the mother-in-law said **“How would I take the recently delivered mother at that time, we shouldn’t”**, followed by the sister-in-law **“We didn’t take at that time, but after the ‘chhathiyar’ we went to village doctor”** (NC-4).

#### *5.4.3.4 Actual care seeking pattern*

Newborn death care-seeking steps and timeline are illustrated in Figures 5.3a and 5.3b, respectively. In contrast to the maternal death cases, caretaker commonly turned to home remedies, including massage with oil heated with garlic, mouth to mouth resuscitation, massaging of placenta, steam treatment with ‘vicks’, and warming the baby near a fire lit from the roots of ‘lahari daal’ plant (a type of lentil plant) understood to have healing properties. Seeking advice from village doctors was common; in one case (ND-1) three different village doctors were consulted, and the baby died without any care sought from formal providers. In general, late decision making with regards to formal providers was common; in four cases, death occurred on the way to the facility (Figure 5.3b). Even with a prompt decision to seek care in the case of home-delivered preterm twins (ND-3), five hours passed while arrangements were made for money and an ambulance, resulting in death of the second twin. Four of the newborns died within 24 hours of first recognition of signs, and one died within an hour.

Some level of care was sought in all cases of neonatal illness (Figure 5.4a-b). Home remedies or bringing medicines home were predominately the first choice, followed by a subsequent step where local providers (village doctors and/or TBA) were sought, sometimes repeatedly despite no improvement (NC-2, NC-4) (Figure 5.4b). Care was eventually sought from facilities for only



half the cases, and in all these instances, these were private providers. Among the few cases where the baby was hospitalized, time of stay ranged from 3-9 days.

#### *5.4.3.5 Perceived quality of care*

Similar to the maternal cases, respondents largely indicated satisfaction with the care sought for babies' illnesses, as signs resolved or improved. One family praised the accommodating nature of a private hospital where their bill was reduced from Rs. 50,000 (~US\$ 500) to Rs. 10,000 (~US\$ 100) since they were poor. Despite fatal outcomes, numerous respondents reported satisfaction with care provided, noting that signs of improvement were initially made (ND-1 and ND-4), or health workers tried their best but ultimately had to refer elsewhere (ND-5 and ND-6). **“The doctor said he would do something so that the baby survives for two or three hours and told me to take the baby and go to Sitamadi (nearest large city in India)” – Father of baby (ND-6) about being referred from the district hospital (located near the Indian border).**

In all the newborn cases, health workers were characterized by respondents as “polite” and/or “good”. Only once, did a respondent comment on shortage of supplies: lack of oxygen was given as the reason for referral by one of the health facilities (ND-4).

## 5.5 Discussion

We characterized illness recognition, decision making and care-seeking behavior for fatal and non-fatal cases of maternal and newborn illnesses in a rural community in Nepal, following implementation of the government's recent large-scale programs, NSMP and Community Based Newborn Care Program (CB-NCP), which was implemented prior to its replacement by the CB-IMNCI. To do so, we adopted Thaddeus and Maine's three delays model to explore the delays of care seeking for maternal and newborn illnesses.

Recognition that the illness was severe was a requisite to prompt decision making related to initial care-seeking. There was some delay in the decision to seek care in a few maternal and newborn cases but for different reasons. For the maternal cases, the severity of some PPH cases was recognized late, only after worsening of signs or loss of consciousness, as senior female family members or TBAs did not consider the bleeding to be severe; this perception was often based on their own past experiences, and bleeding was considered normal, resulting in a wait-and-see approach, as observed in several other studies [14, 22, 23]. For the newborn cases, delays in the decision to seek care were due to the use of home remedies or drugs brought from a pharmacy (in these cases, it was unclear whether or not a pharmacist offered advice), timing of illness event at night, lack of perceived severity, no one to take the baby to a facility and the tradition of '*chhatiyar*'. This cultural norm of a six-day postpartum confinement for newborns and mothers ('*chhatiyar*') has been previously reported as an important barrier to seeking prompt care in Nepal and South Asia [15, 24, 25].

Spiritual causes were commonly reported for eclampsia and pre-eclampsia maternal cases, resulting in a traditional healer being called first, similar to other studies in the region [15, 22,

24]. Only when spiritual causes were ruled out or treatment failed, was the mother or newborn referred, or the family decided to seek care at a health facility, thus delaying decision to seek appropriate care (delay 1). This may be because the traditional belief that expectant mothers and newborns are susceptible to evil spirits is still deeply rooted in the culture, especially in rural areas [11, 20, 22]. In contrast, there was no care sought from traditional healers for any of the newborn cases unlike other studies in Nepal [15, 24].

There were many similarities as well as differences in care seeking practice between the maternal and newborn cases. The first care was sought at home from TBAs, traditional healers, or village doctors in all of the maternal cases when the illness onset occurred at home, consistent with other studies [15, 24, 26, 27]. In our study district, past research shows that TBA and village doctors are commonly summoned to attend homebirths, with the latter often being requested to provide injections such as oxytocin or other uterotonics [28]. Among the newborn cases, the first care sought besides home remedies was from a village doctor called to the home or at their pharmacy/clinic. Care seeking from informal providers for newborn illness is common in South Asia [24, 29–31]; as we also observed, this is often due to such providers being easily accessible, working flexible hours, and high levels of trust and familiarity [22, 32, 33].

Evidence of over-reliance on private informal providers such as village doctors (for both maternal and newborn cases), and TBA and traditional healers (maternal cases) highlights the demand and supply gap in the health care sector. Timely referral by informal providers played an important role in facilitating swift decisions to seek skilled care at a facility for maternal death. There were more instances of caretakers of sick newborns not complying with referral advice among the newborn deaths than maternal cases. The lack of care or advice for care seeking sought from FCHVs who are supposed to be the frontline health workers in the community reflects

the need to increase the demand for their services within the study community. Eventually, facility-based care was sought for cases of maternal complications; when multiple facilities were consulted, the public facility was normally the initial step, possibly due to increased awareness and availability of free services provided at birthing centers under NSMP. In contrast, for newborn illnesses, government facilities were more likely to be bypassed, in favor of private facilities, perhaps suggesting that community members perceive limited capability of public facilities to provide specialized care for newborn illnesses [32].

In summary, among the maternal deaths, ineffective decision making, resulting in initially seeking care from informal providers delayed timely skilled care (delay 1), and a subsequent delay in receiving appropriate care (delay 3) when arriving at the facility, as observed elsewhere [22, 34]. For newborn deaths, the first delay appeared most critical; the decision to seek skilled care or to act upon referral advice was frequently delayed and made only after failed home remedies or unsuccessful attempts to resolve the problem through consults with village doctors; in numerous cases these delays likely contributed directly to the death. These findings are consistent with other systematic reviews [35] and studies on care seeking for neonatal illness in Nepal and elsewhere [5, 15, 36].

### **5.5.1 Strengths and Limitations**

This study has several strengths, including nesting activities within a prospective study allowing for rapid community-based identification of cases, including both fatal and non-fatal cases for both mothers and newborns, and a mix of maternal complications beyond PPH, which is often the sole focus of other efforts. However, our work was restricted to one district in southern Nepal, and care-seeking patterns across districts or across regions of the country may differ. Further, we relied on self-reports and recall may have been biased by time since event or severity

of the cases; we tried to mitigate this by restricting recall period length to 6 months, and using small groups interviews to maximize information and triangulation while constructing the narratives. This study might have been strengthened by the inclusion of the health workers in separate interviews to triangulate some of the findings.

## **5.6 Conclusion**

Ongoing programs need to strengthen demand for skilled care and improve access and quality of newborn and maternal services. Obstacles to care seeking in our study area included not recognizing and understanding the severity of danger signs, reliance on wait- and-see approaches, and a preference to first treat the illness by informal providers in the community. When antenatal or postnatal counseling emphasizes recognition of illnesses and provision of referrals by community health workers, care seeking for both maternal and newborn illnesses can improve significantly [37]. Combining such counseling along with community visits by FCHVs is currently mandated within the NSMP and is integrated into the neonatal component within the CB-IMCI program, but more intensive efforts are needed to educate communities to recognize pregnancy, intrapartum and newborn danger signs and prepare (money, transport, identify health facility, etc.) for care-seeking from skilled providers upon recognizing the severity of danger signs.

One promising demand-side model that might be further explored is the implementation of Pregnant Women's Groups (PWG) or mothers' groups at the community level [38]. The international non-governmental organization PLAN Nepal is currently implementing these group in 15 districts, including Sarlahi. Such groups, often facilitated by FCHVs, are comprised of 8-15 pregnant women and postnatal mothers who meet monthly to share essential health information related to pregnancy, birth and newborn care [38]. Additional engagement of key

decision-makers (i.e. husbands, senior female family members) in such PWGs might prove effective in this setting. Although husbands and in-laws are encouraged to participate in the PWGs as part of PLAN Nepal's implementation, their role in maternal and newborn health care seeking may be strengthened by piloting further activities. One such example might be an initiative where selected married men are actively engaged in maternal and newborn health care, such as couples-based ANC and/or PNC visits, and then encouraged to inform their peers about their experiences, promoting wider participation [39]. Alternatively, another approach might include community sensitization at the VDC level through training and mobilization of safe motherhood promoters [40]. These female promoters could complement ongoing FCHV efforts, by disseminating maternal and newborn health information at the community level, to address gaps in existing programs.

On the supply-side, while the NSMP has resulted in greatly increased accessibility to delivery care at 24/7 birthing centers and hospitals, primary health care facilities are open only briefly (4-5 hours) during work days. This reduced accessibility, combined with lack of awareness of services played a major role in respondents seeking care from private facilities for newborn illnesses.

The private sectors' (both formal and informal providers) increasing role in providing newborn care services in rural settings needs to be studied further and interventions piloted in engaging this sector to provide quality care where service gaps exist. Engaging the private informal practitioners, training them to recognize pregnancy/delivery and neonatal danger signs, and to promptly refer to appropriate health facilities has been shown to reduce maternal and perinatal deaths [33, 41–43]. The effectiveness, feasibility and scalability of such an approach can be piloted and further research on including this private sector especially in newborn care is needed.

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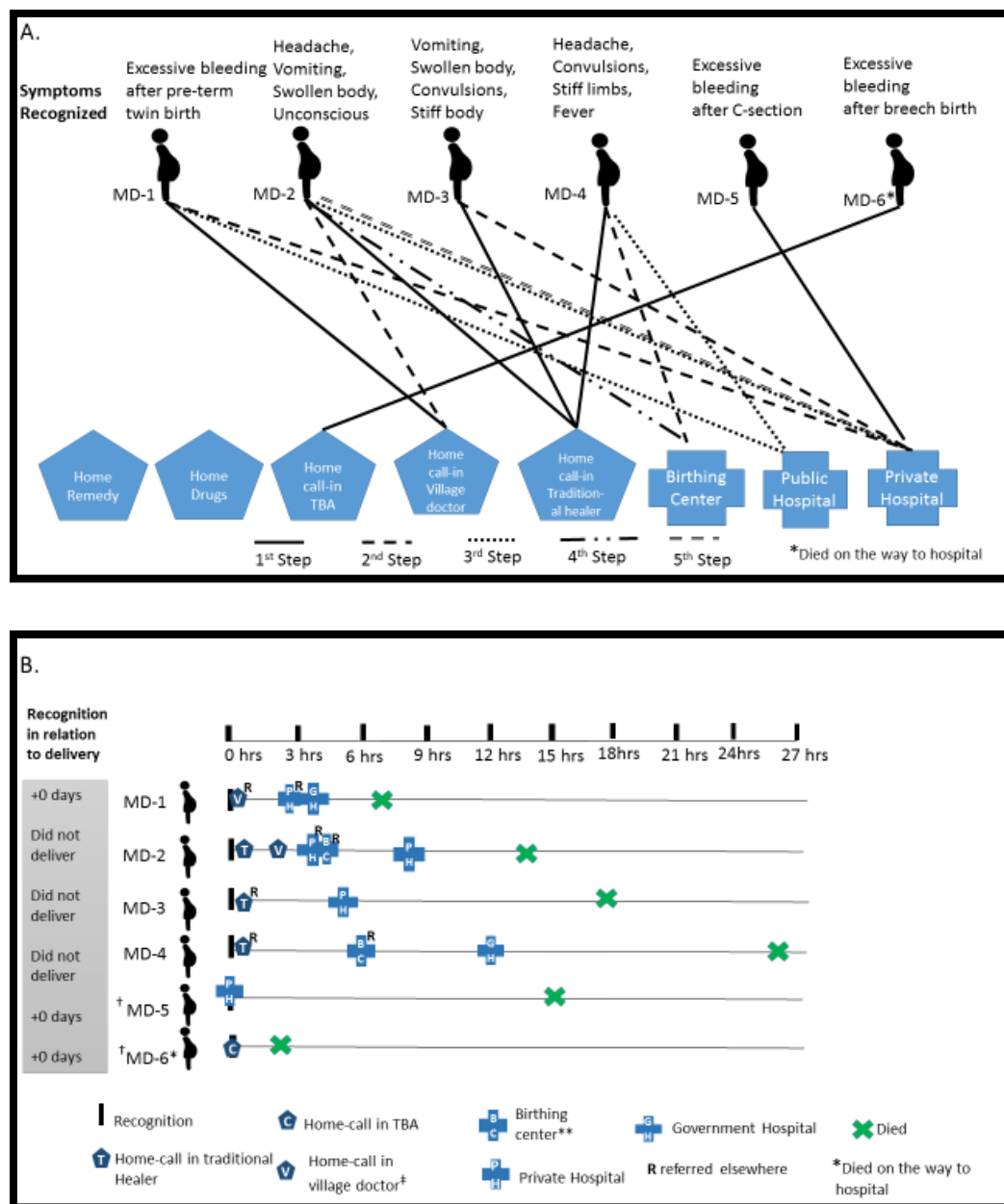
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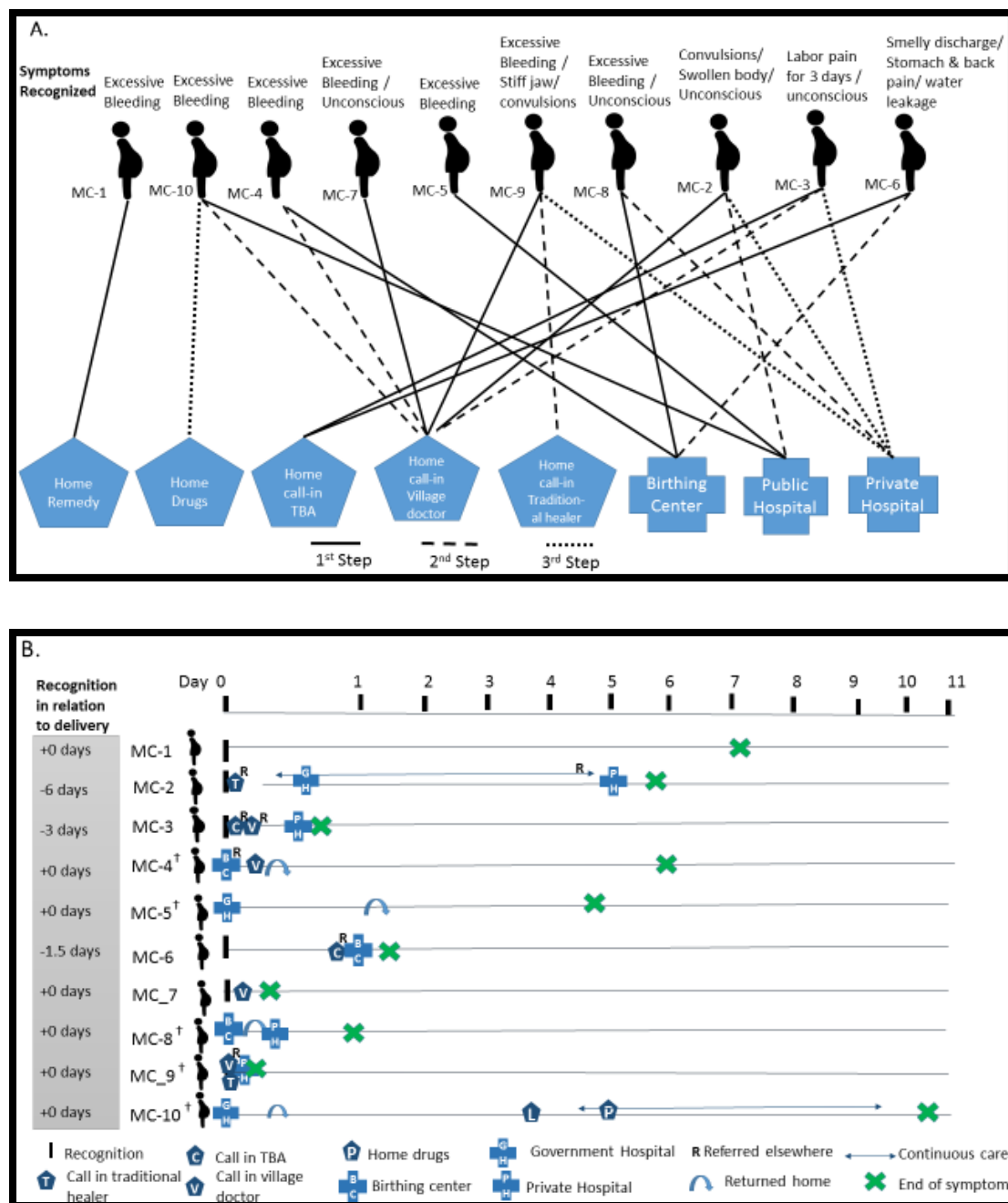


**Figure 5.1.** Maternal death cases (A) care-seeking steps and (B) care-seeking timing and locations.

†Village doctor is an informal 'doctor' who provides allopathic medicine with little or no training and conducts home visits or runs a pharmacy where care is also provided.

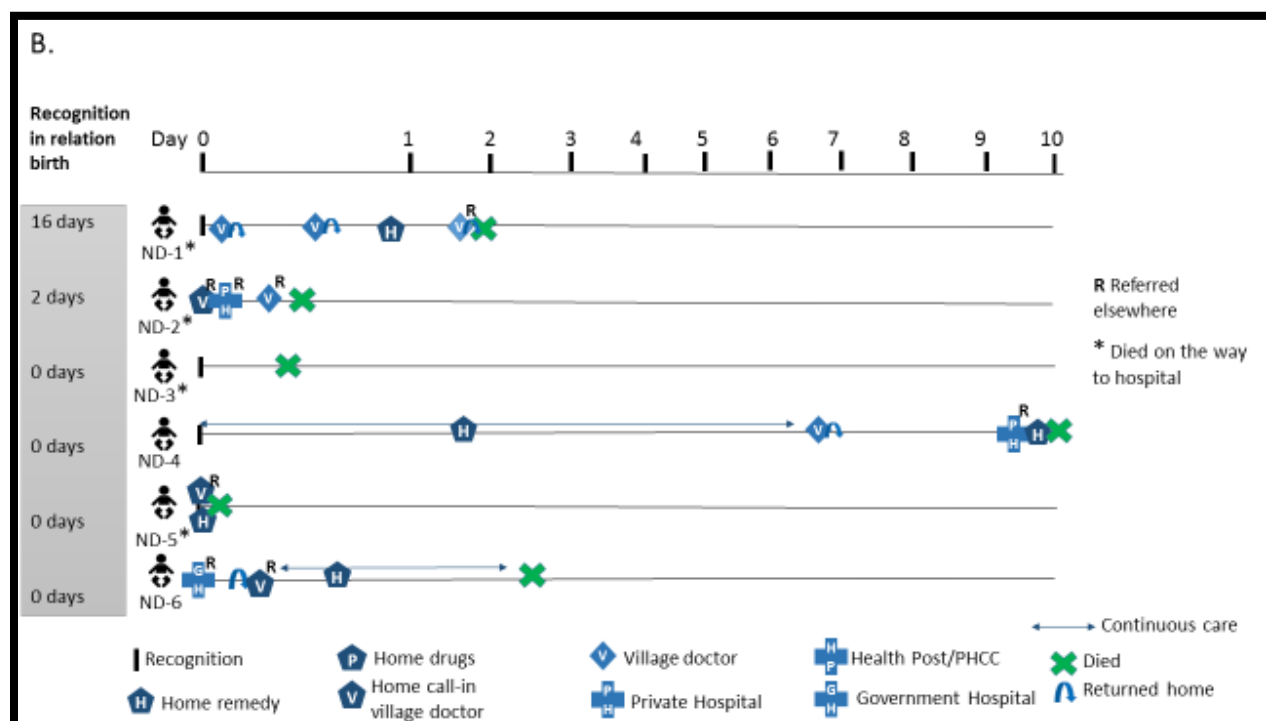
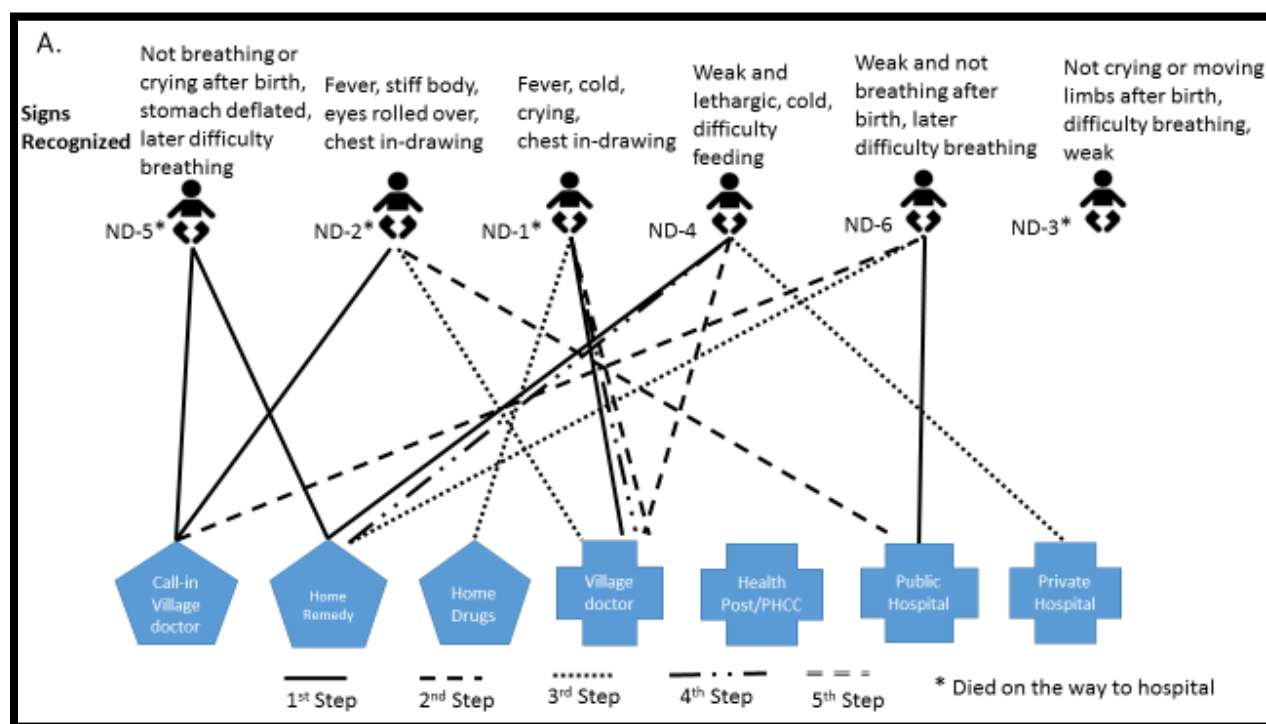
\*\*Birthing center is attached to a government primary care facility (health post or primary health care center), staffed by nurse and/or auxiliary nurse midwives that provides free ANC and 24/7 labor/delivery and immediate postpartum care

† MD-5 was at a private hospital during onset of symptoms; MD-6 a TBA was present at home to help with the home birth and a local doctor had been called to give injection to induce labor but had left before the delivery of baby and symptoms recognized

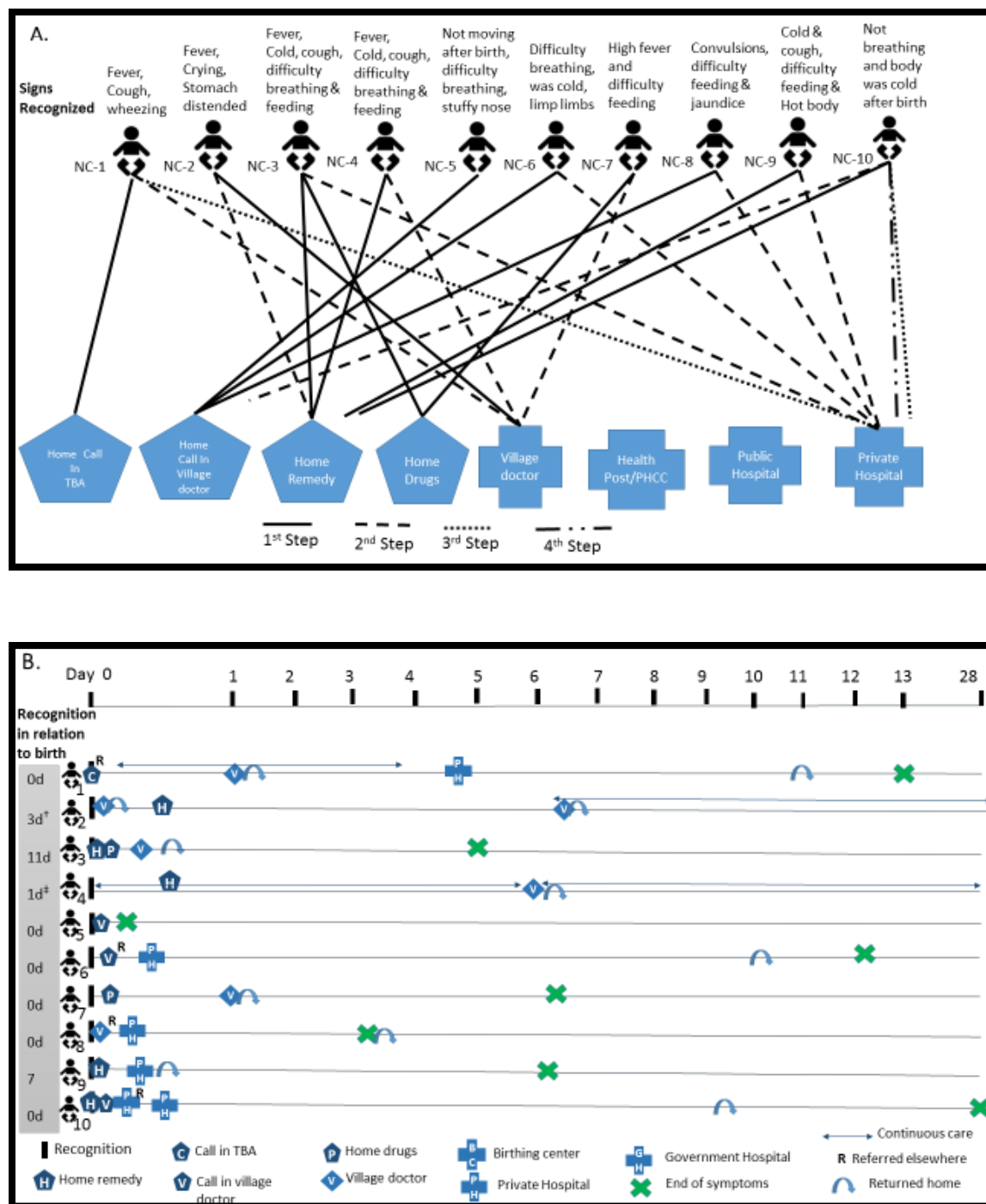


**Figure 5.2.** Maternal complication cases (A) care-seeking steps and (B) care-seeking timing and location

<sup>†</sup>MC-4, MC-5 MC-8 and MC-10 were already at a health facility during onset of symptoms; MC-9 a village doctor was present at home to check on the newborn baby before onset of symptoms



**Figure 5.3.** Newborn death cases (A) care-seeking steps and (B) care-seeking timing and location



**Figure 5.4.** Newborn complication cases (A) care-seeking steps and (B) care-seeking timing and location

<sup>†</sup>Illness not resolved yet; still on continuous care from same local doctor every week. Not resolved even after 24 weeks since the onset of signs (NC-2)

<sup>‡</sup>Illness not resolved yet; still on continuous care from same local doctor every 11th day. Some signs not resolved yet even after 15 weeks since onset of signs (NC-4)

**Table 5.1.** Summary of types of illness event narratives and number of interviews

<b>Type of Event Narratives</b>	<b>Target Group</b>	<b>Methodology</b>	<b># of Interviews</b>
Maternal Death	Main caregiver & 2-4 witness present	Illness Narrative: Small Group Interview only	6
Maternal Illness	Focal woman & 2-4 witness present	Illness Narrative: In-depth interview + Small Group Interview	20
Neonatal Death	Main caregiver & 2-4 witness present	Illness Narrative: Small Group Interview only	6
Neonatal Illness	Main caregiver & 2-4 witness present	Illness Narrative: Small Group Interview only	10
<b>TOTAL</b>			<b>42</b>

**Table 5.2.** Description of health providers, by type of provider, training and type of care provided, and location of care, Sarlahi District, Nepal

PROVIDER	TRAINING AND TYPE OF CARE PROVIDED	LOCATION
<b>TRADITIONAL/INFORMAL PROVIDER</b>		
<b>Traditional birth attendant</b>	May have some training in clean delivery and newborn health Attends home-based births	Patient's Home
<b>Traditional healer</b>	Shamans referred to as 'dhami/jhakri' Provides healing through spiritual cleansing for illnesses believed to be caused by spirit possession	Patient's Home Healer's home
<b>Village doctors</b>	Village doctors or pharmacy doctors who reside nearby May have some training (e.g. Health Assistant—3 academic years or Community Medical Auxiliary – 2 academic years), but often informal and based on experience Some have their own pharmacy shop Provides allopathic medicines, injections (including uterotonics) and IV solutions	Patient's home Doctor's home/pharmacy shop
<b>SKILLED/FORMAL PROVIDER</b>		
<b>Doctor</b>	Certified as Bachelor of Medicine and Bachelor of Surgery (MBBS) doctor <sup>1</sup>	Clinic/Hospital
<b>Nurse</b>	Certified as nurse	Clinic/Hospital/ Birthing Centers
<b>Auxiliary nurse midwife</b>	Certified as auxiliary nurse/midwife <sup>2</sup>	Clinic/Hospital/ Birthing Centers

<sup>1</sup> Six years of Bachelor's degree level training

<sup>2</sup> Eighteen months training after high school



## **Chapter 6 : Postnatal care-seeking pattern by place of delivery of newborns: a population-based study in rural Southern Nepal**

### **6.1 Abstract**

**Background:** About three-quarters of newborn deaths occur in the first week of life. Facility-based care during pregnancy, intrapartum and the first week of life is known to have the greatest effect on improved newborn health. We compared patterns of postnatal care-seeking between families of newborns born at home and those born in a health facility in a cohort of newborns in rural Nepal.

**Methods:** A population based sample of newborns was followed prospectively through 28 days. These data were used to identify two cohorts: one severely ill and the second, healthy newborns during the early neonatal period. For each severely ill and healthy newborn cohort, differences in type of care sought (formal, informal and no care) by place of birth (health facility vs home) were analyzed using bivariate and multivariate multinomial logistic regression models.

**Results:** Overall, 20% of severely ill newborns (n=1021) did not seek any care and 44% sought care only from informal care providers who mainly consisted of drug vendors or local village doctors. Caregivers of severely ill newborns born in a health facility were twice as likely to seek formal care as opposed to no care compared to non-facility born newborns [adjusted relative risk ratio (RRR): 2.00; 95% CI: 1.30-3.06] and were less likely to seek informal care over no care compared to their non-facility born newborns [adjusted RRR: 0.60; 95% CI: 0.40-0.92].

**Conclusion:** To improve appropriate and timely care-seeking practices for severely ill newborns, we recommend: 1) increase and continue to encourage health facility delivery; 2) strategic deployment of female community health volunteers to provide early postnatal home visits; 3)

continuous community awareness efforts on newborn danger signs and importance of timely and proper care-seeking; and 4) further research on the quality of newborn care services provided in both the formal and informal sector.

## 6.2 Background

Of the 5.9 million estimated under-5 deaths, 2.7 million (approximately 45%) were neonatal deaths and the fraction of neonatal deaths was even larger (57%) in South Asia [1]. The most common causes of neonatal deaths were preterm birth complications, intrapartum complications and infection [1]. A major focus of child survival programmes has shifted towards neonatal causes and reducing preventable neonatal deaths through simple, cost-effective interventions [2]. As the great majority of neonatal and maternal deaths occur during the intrapartum and early postpartum period, policies have included a strong emphasis on increasing access to skilled attendance at birth, both by raising the level of health facility deliveries and increasing access to a skilled birth attendant (SBA) for home deliveries [3–5]. .

The 2016 Nepal Demography Health Survey [6] shows an overall increase in facility births from 35% in 2011 to 57% in 2016 and at least one antenatal care (ANC) visits from 58% to 84%. Such gains in the maternal health care services may be due to the National Safe Motherhood Program (NSMP) that provides free 24/7 delivery care, financial incentives for accessing ANC and delivery services in a facility, birth preparedness counseling, and payments to health facilities to cover free care [7, 8]. However, the uptake of these services still varies greatly between the urban and rural population.

Nepal has made progress in reducing neonatal mortality from 33 deaths per 1,000 livebirths in 2011 to 21 deaths in 2016, which accounts for 53% of under-five mortality [6]. Newborn care has been integrated into the NSMP and the Community Based Integrated Management of Neonatal and Childhood Illnesses (CB-IMNCI), which includes early postnatal home visits by female community health volunteers (FCHVs) who provide counseling to mothers on essential

newborn care, danger signs and first line oral antibiotics if danger signs suggesting possible severe bacterial infection (pSBI) is identified, followed by referral to the nearest health facility. In addition, the CB-IMNCI also includes newborn care services at a primary level health facility to provide counselling and assess and treat newborns in case of illness [8].

Understanding care-seeking behavior during serious illnesses is important in designing effective public health interventions for neonatal care. Inappropriate and delayed care-seeking can contribute substantially to fatal neonatal outcomes [9–11]. A systematic review of care-seeking behaviors for neonatal and childhood illnesses in low and middle-income countries showed that in South Asia, levels of care-seeking from a health facility or medically trained provider was particularly low [12]. Several studies in Bangladesh have looked at factors associated with care-seeking for fatal neonatal outcomes where the majority received either traditional or no care [13–15]. A study from Sylhet, Bangladesh on care-seeking for preterm births showed that preventative or curative care was sought for only 30.9% of preterm newborns from qualified medically trained providers [16]. Furthermore, formative research in South Asia has reported the common practice of seeking care for ill newborns from informal care providers such as traditional healers or drug vendors/local “village” doctors [17]. A few studies limited to fatal newborn illness have shown that care-seeking was more common among babies born in a health facility [14, 15] and some do not distinguish the type of care [18]. Existing literature is lacking on differential care-seeking behaviors by place of birth for ill newborns not limited to fatal outcomes.

Despite the increase in institutional deliveries in Nepal and implementation of NSMP and CB-IMNCI services, the neonatal mortality rate is still high. Gaps in existing services need to be identified so as to deliver targeted interventions to promote timely and appropriate care,

especially for neonatal illness. We aimed to understand if being born in a health facility prompts parents/families of severely ill newborns to seek care from qualified formal providers compared to informal care providers or no care in a rural community in Nepal. For comparison, we also investigated postnatal care-seeking patterns among healthy newborns by whether they were born in a facility or not.

## **6.3 Methods**

### **6.3.1 Study Design**

We analyzed prospectively collected data from a large community-based cluster-randomized trial (registered at ClinicalTrials.gov # NCT01177111) conducted in rural Sarlahi district of Nepal.

The purpose of this trial was to estimate the impact of topical applications of sunflower seed oil (compared to mustard oil) to newborn babies on neonatal mortality and morbidity.

### **6.3.2 Study setting**

The study was implemented in 34 village development committees (VDCs) of Sarlahi district in southern plains of Nepal during September 2010- January 2017. The study district has a population of approximately 750,000 and the study area encompassed one-third of the district [19].

Formal health care was available to the community within the study area through government run facilities such as health posts (HP) (first-level health centers staffed with Health Assistants) located in each VDC; five Primary Health Care Centers (PHCCs) (secondary-level health centers staffed with a Medical doctor) and the one district hospital as well as private hospitals or clinics usually available in the larger VDCs or near the highway. Twenty-one birthing centers were in

operation in the 5 PHCCs and 16 HPs; along with the district hospital and 2 private facilities (1 NGO clinic and 1 community hospital) where free 24/7 delivery and immediate newborn care services are provided.

Informal non-medically trained care providers such as drug vendors and/or “local village doctors” known to assist in deliveries also provide newborn care in the study area [20, 21].

Traditional spiritual healers such as “dhami/jhakri” and traditional birth attendants (TBA) also provided informal care at home [21].

### **6.3.3 Study implementation**

All pregnant married women of reproductive age (15–40 years) residing in this area were eligible for this study. Pregnancy surveillance was conducted every 5 weeks where the eligible women were asked whether there was a missed menstrual period since the previous visit and, if so, they were offered a pregnancy test. If they tested positive, the study procedures were explained and oral informed consent was obtained. Data on household socioeconomic status, parental education, birth history and anthropometry were recorded at the same visit. All women received iron supplements, deworming tablets, clean birthing kits, chlorohexidine and basic counseling on nutrition and prenatal and postnatal care. Families were instructed to notify the locally resident female staff immediately after delivery, and data on maternal health and conditions during labor and delivery were collected as soon as possible. In addition, scheduled post-delivery home visits to assess the newborn’s health based on an interview with the caregiver and observations/assessments were conducted on days 1, 3, 7, 10, 14, 21, and 28. Each newborns follow up visit included a standardized physical assessment of the baby and maternal report of signs of illness experienced by the neonate since the previous visit. Mothers were asked if the newborn had difficulty breathing or feeding since the previous visit, had experienced

convulsions or stiffening of the back, or whether the newborn had been cold or hot to the touch since the previous visit. The standardized physical assessment included among other things, measuring the newborn's respiratory rate and axillary temperature, recording whether the newborn was experiencing severe chest indrawing, and examining the infant for signs of umbilical cord infection and whether the newborn had movement upon stimulation.

Care-seeking data were also collected at each home visit by maternal report of care sought for the infant since the previous visit. If care was sought, then a follow up question was asked about from whom care was sought. A variety of response options were available with up to three responses for type of provider where care was sought. A separate module was added into the parent trial on June 1, 2015 where questions were asked about postnatal visits in the first 7 days since birth, reasons for seeking care, type of care sought and decision makers.

#### **6.3.4 Outcome variable**

The primary outcome variable was care-seeking defined as any care sought from any health care provider in the seven days following each newborn home visits during days 1, 3 and 7. We focused on the care-seeking after the onset of signs of severe illness in the early neonatal period (ENP: 0-7 days) only because this is a critical period during which three-quarters of all neonatal death occur and up to two thirds of newborn deaths can be prevented if effective health measures are provided at birth and during this period [22]. Care sought was classified into three categories: 1) formal care; 2) informal care; and 3) no care. Formal care in this context was defined as care sought from one of the following: a trained medical doctor (MBBS training), staff nurse, health assistant, private practitioner, auxiliary healthy worker; or from a health post, primary health center, nursing home or hospital. Similar to other studies, informal care was defined as care sought from non-medically trained providers such as a medicine shop, *“local village doctor”*

(generally untrained local providers without a medical license), “*dhami/jhakri*” (traditional spiritual healer), or TBA in the absence of any formal care sought [12, 15, 13]. If no care was sought in the seven days following each of the home visit, then it was classified as no care sought.

### **6.3.5 Primary exposure variable**

Place of delivery/birth defined as health facility (health post, clinic or hospital) or non-health facility (home, outdoors or on the way to health facility) was the primary exposure variable. Information on the place of delivery was collected at the time of the birth assessment visit as soon after birth as possible, conducted only for live births.

### **6.3.6 Independent variables**

We focused on socioeconomic, demography, biological and current pregnancy factors associated with care-seeking. Upon enrollment, data were collected on maternal age, literacy (mother and husband), demography, religion, and socio-demographic and economic information. Women’s age, religion and caste was self-reported at enrollment. Pregnancy history such as number of previous pregnancies and the outcome of those pregnancies including stillbirths, miscarriage or death of a live born child were also collected. Preterm birth was defined as <37 completed weeks gestation, estimated from maternal report by subtracting date of birth from date of last menstrual period. Information on the current pregnancy, including number of ANC visits, singleton or multiple births, and report of any intrapartum complication were also collected during the first maternal and newborn assessment after delivery.

Women’s household socioeconomic characteristics were collected including household assets and construction of homes. To measure socioeconomic status, we used an asset-based wealth



index constructed using principal component analysis of household assets which included television, radio, bicycle, motorbike, bullock cart, electricity, livestock (cattle and goat) and land ownership measured in terms of number of kattha of flat lowlands (“*kheti*”) and non-irrigated uplands (“*bari*”) (1 kattha is approximately 338 m<sup>2</sup>); house construction materials used for walls and roof; number of rooms; and presence of a private latrine in the household. Descriptive analysis was conducted to assess which variables captured the inequality between households so as to avoid the problem of ‘clumping’ and ‘truncation’ and were then used in generating a wealth index [23].

### **6.3.7 Definition of severely ill newborn and healthy newborns**

We classified all live births in the study area during the study period who received newborn assessments by the field team during the first two weeks into one of three groups: i) severely ill, ii) healthy newborns and iii) neither healthy nor severely ill babies. Babies that did fall under the group that was neither healthy nor severely ill were excluded in the analysis. Severely ill newborns were defined using stringent criteria based on the presence of two or more of the following danger signs: caregiver’s report of the baby having (1) difficulty feeding or sucking; (2) difficulty breathing; (3) convulsions or stiffness of the back; or the trained field staff’s observation during newborn assessment of the baby having (4) severe chest indrawing; (5) rapid breathing (respiratory rate >70 breaths/min); (6) not moving upon stimulation; (7) umbilical cord infection (pus discharge from the cord stump or redness of the cord stump or around the base of the cord); (8) fever (axillary temperature to be  $\geq 38^{\circ}\text{C}$  or  $100.4^{\circ}\text{F}$ ); or (9) hypothermia (axillary temperature to be  $< 35^{\circ}\text{C}$  or  $95^{\circ}\text{F}$ ). We used more stringent criteria in defining severely ill newborns than the criteria used to identify possible severe illness in newborns in the WHO

Young Infants Clinical Signs Study (YICSS) [24, 25] and severe disease in other studies [26, 27]. We wanted our definition of severely ill newborns to be more specific in capturing the severely sick so as to understand the care-seeking pattern among those who are at greater risk of fatal outcomes. Newborns were referred for care by the field team upon report or identification of any of these signs.

We defined healthy newborns as those with the absence of any signs that defined severely ill babies but with less specific WHO YICSS criteria cutoffs for fever (axillary temperature  $\geq 37.5$  °C), hypothermia (axillary temperature  $< 35.5$  °C) and rapid breathing ( $\geq 60$  breathers/min) along with the absence of the mother's report of the baby being lethargic and hot or cold to the touch.

### **6.3.8 Analyses**

We restricted our analysis to all reported livebirths in the study area during the study period who met the definition of severely ill and healthy based on the presence or absence of signs in the ENP. We analyzed the care sought in the seven days following the newborn assessments on day 1, 3 and 7 prospectively until days 7, 10 and 14 respectively.

We first cross tabulated the frequency distributions for each of the nine signs by place of delivery in the overall analytical cohort and compared them using  $\chi^2$  tests. Then we explored the data by the two subset population of severely ill and healthy babies. The percent distribution of socio-demographic data, pregnancy characteristics and past pregnancy history were compared between those born in a facility vs a non-facility separately for each of the subset study populations (severely ill and healthy) and both groups combined. The independent variables were also cross-tabulated with the care-seeking outcome variables and those significantly associated (p-value  $< 0.10$ ) with both the exposure and outcome variables were adjusted for in the final model as potential confounders.

Exploratory analysis to compare type of care sought by place of birth (health facility vs non-health facility) was conducted using cross tabulations and  $\chi^2$  tests separately for each of the two categories of newborns. Multinomial logistic regression was used to obtain relative risk ratios (RRR) and 95% confidence intervals (CI) to estimate the relationships of place of birth with type of care-seeking. Separate simple and multivariate multinomial logistic regression were run for the two population: severely ill and healthy newborns. The multivariate models were adjusted for maternal age, maternal literacy, husband's literacy, ethnicity, caste, wealth quintile, sex of baby, preterm status, gravidity, number of ANC visits, intrapartum complication, death of any previous live born children and any referral made to seek care. In the case of primipara pregnancies, the variable "deaths of any previous live born children" was coded as no prior deaths. Less than 0.50% of the cases had missing data on the outcome, exposure and independent variables and those with any missing data were dropped from the analysis. Descriptive analysis on a subset of the study population who were asked about postnatal care practices in the first week of neonatal period was also conducted. Analysis were conducted using STATA (version 13.1) [28].

### **6.3.9 Ethical approval**

The study received ethical approval from the Johns Hopkins Bloomberg School of Public Health Institutional Review Board, Baltimore, MD, USA, and the Tribhuvan University Institute of Medicine, Kathmandu, Nepal.

## 6.4 Results

### 6.4.1 Characteristics of study sample

This analysis drew from the 30,538 enrolled pregnant women that had a pregnancy outcome between October, 2010 and January, 2017 (Figure 6.1). A total of 28,373 women had live births and about 7% had either a miscarriage (n=1,411), abortion (n=122), or stillbirth (n=632). The 26,185 babies with at least one completed follow-up visit in the first week were considered the analytic cohort for this paper.

Table 6.1, illustrates the distribution of the nine signs of severe illness in the study cohort by place of delivery, with 41.5% of the births taking place in a health facility (n=10,859). Of the nine signs, mother's report of the baby having difficulty breathing (8.9%), field worker observation of rapid breath >70 breaths/min (6.7%) and hypothermia (6.3%) were the top three prevalent newborn danger signs. There were significant differences in the distribution of six of the nine signs when compared by place of birth (chi-square p-value <0.05). A mother's report of a baby having difficulty sucking; report of convulsion or stiffness of the back; umbilical cord infection; and fever were reported to be significantly higher among the facility births (Table 6.1). In contrast, hypothermia and the baby not moving upon stimulation were found to be significantly higher among the non-facility births (Table 6.1). Approximately 4% (n=1028) and 28% (n=7,417) of newborns were classified to be severely ill and healthy newborns respectively, which were then reduced to 1,021 severely ill and 7,389 healthy newborns after removing cases with missing data for the bivariate and multivariate analyses (Figure 6.1).

Table 6.2 shows the distribution of maternal and household socio-demographic, economic, past and present pregnancy characteristics by place of birth, for the two subset populations of

severely ill and healthy newborns separately and combined. The median age of women at the time of pregnancy in severely ill newborn and healthy newborns was 22.1 years and 22.4 years respectively. Facility birth was associated with younger age (<20 years), positively associated with literacy for both the woman and her husband, and higher socio-economic status (Table 6.2). More than 95% of the study population were from the Madeshi ethnic group, which is the predominant ethnic group in the study district. Sex of the baby, preterm birth, and single/multiple births were not associated with place of birth. On the other hand, the proportion of facility births was highest among the primigravida pregnancies, those who received 4 or more ANC visits and those who reported intrapartum complications during the most recent pregnancy (Table 6.2). There was no differences in distribution of the past pregnancy resulting in stillbirth or miscarriage by place of delivery in both groups of newborns.

#### **6.4.2 Severely ill newborns**

Among the severely ill newborns, 42.7% (436/1021) were born at a health facility and more than half (53.2%) of them sought formal care (Table 6.3). The majority of the formal care providers in both the facility and non-facility births were from higher level facilities such as PHC, nursing home, hospital or an MBBS doctor (data not shown). In contrast, informal care was significantly higher among non-facility (54.7%) compared to facility births (29.4%) ( $p < 0.001$ ). A higher proportion of parents/families of severely ill newborns born outside of health facility did not seek care (non-facility born, 22.1% vs facility born, 17.4%).

The estimated RRRs for the type of care sought (formal and informal care) compared to those not-seeking care among both the severely ill newborns and healthy newborns are presented in Table 6.4. Among the severely ill newborns, parents/families of babies born in a health facility are significantly more likely to seek care from formal care providers as opposed to not seeking

any care (unadjusted RRR: 2.90; 95% CI: 2.03-4.12). The adjusted model resulted in slightly reduced RRR estimates for the severely ill newborns where the facility born newborns were twice as likely (adjusted RRR: 2.00; 95% CI: 1.30-3.06) to be taken to a formal care provider vs no care compared to non-facility births (Table 6.4). In contrast, the RRR of seeking informal care was significantly lower for facility born newborns compared to the non-facility born counterparts in both the unadjusted (unadjusted RRR: 0.68; 95% CI: 0.48-0.96) and adjusted model (adjusted RRR: 0.60; 95% CI: 0.40-0.92).

An analysis of a much smaller subset of the overall analytical cohort (n=8,366) who were asked a separate module of questions (added into the parent trial on June 1, 2015) on postnatal care visits in the first 7 days since birth and reasons for seeking care showed similar results (data not published). In this subset, irrespective of presence or absence of illness, about 85% reported not seeking any postnatal care, and approximately 8% and 7% reported seeking care from informal and formal providers respectively. When asked about reasons for postnatal care, 94% reported seeking care due to a problem and not just for checkup (data not published).

#### **6.4.3 Healthy newborns**

Among the healthy newborns, 43.6% (3224/7389) were born at a health facility. As shown in Table 6.3, the majority (about 64%) of the parents/families of healthy newborns sought no care. A significantly higher proportion of facility born newborns sought formal care (11.7%) compared to only 3.8% of non-facility born healthy newborns ( $p < 0.001$ ). Among the types of formal care sought, parents/families of healthy newborns not born in a health facility went to an Auxiliary Health Worker, while a majority of those born in health facility went to PHC, nursing home, hospital or an MBBS doctor (data not shown). Overall, regardless of place of birth, the

majority of the informal providers (>97%) were medicine shop or local doctors with very few care sought from ‘dhami jhakri’ or TBAs (data not shown).

The regression analysis showed similar findings to that of severely ill newborns. Health facility born babies were associated with significantly higher care sought from formal care provides vs no care (adjusted RRR 2.09; 95% CI: 1.67-2.61) and significantly less likely to seek informal care as opposed to no care (adjusted RRR 0.83; 95% CI: 0.74-0.94) when comparing to non-facility born babies.

#### **6.4.4 Postnatal care in the first seven days**

An analysis of a much smaller subset of the overall analytical cohort (n=8,366) who were asked about postnatal care and reasons for seeking care showed similar results (data not published). In this subset, irrespective of presence or absence of illness, about 85% reported not seeking any postnatal care, and approximately 8% and 7% reported seeking care from informal and formal provides respectively. When asked about reasons for postnatal care, 94% reported seeking care due to problem and not just for checkup (data not published).

## 6.5 Discussion

Our findings demonstrate that being born in a health facility has a positive association with receiving formal postnatal care as opposed to no care for both severely ill and healthy newborns. This highlights a major gap in newborn care-seeking among the majority that are not born in a healthy facility. Under the NSMP and CB-IMNCI program in Nepal, counseling on birth preparedness, promotion of institutional deliveries and awareness on maternal as well as newborn danger signs are integral part of the ANC package provided in facilities as well as community outreach activities [29]. In addition, prior to discharge, women who deliver at a health facility are supposed to be provided with counseling on essential newborn care, promotion of postnatal care visits and made aware of newborn danger signs and to seek care from nearest health facility upon recognition of danger sign [29]. Our findings support this as women who deliver at a health facility may be more likely to be provided with information on newborn danger signs and thus, likely to seek care at a health facility. Although we did not collect data to confirm this, there is evidence that suggests that counseling on postnatal care and newborn danger signs is still not routinely provided prior to discharge after facility birth. The 2015 Nepal Health Facility Survey conducted exit interviews with 309 women who delivered at a health facility and showed that advice on postnatal care checkups and danger signs was provided to only 63% and 38% of women respectively [30]. Despite low coverage of counseling on danger signs in facility births, mothers/caregivers of babies born in health facility may still be better informed on newborn danger signs than non-facility births. Current programs should stress the importance of not missing out on the opportunity to promote care-seeking from skilled providers by providing quality information about newborn danger signs and the need to seek proper care along with postnatal visits to a health facility.



Given the absence of any danger signs in the first week of life, the majority (64%) of the families of healthy newborns opted to not seek any care and among those who sought care, the majority (80%) sought informal care. This shows that routine postnatal care in the first week postpartum is very rare. This is supported by similar findings in a past cohort in the same study district where 55% of newborns did not seek any care during the neonatal period irrespective of illness [27].

The unadjusted proportion of severely ill babies that received formal care (36%) was similar to a study conducted in rural Matlab sub-district of Bangladesh where 37% sought care from a qualified medical doctor or paramedic for fatal newborn illness [13] and in rural Ghana where 39% sought care from a hospital or doctor [31]. Our finding of 20% of severely ill newborns not receiving any care is lower than other studies conducted in rural Bangladesh that reported 32% to 47% of families with fatally ill newborns not seeking any care [15, 13, 14]. One of the reason for a higher proportion of care sought in our study may be due to active referrals made in our study. At each home visit, our field researchers would refer any newborns with danger signs, which may have inflated the care-seeking in our study population. Another reason may also be that the Bangladesh studies were based on fatal newborn illnesses where infants may have been sicker and may have had little time to seek care due to the rapid and sudden onset of symptoms [13, 32]. In our same study area among a previously followed cohort, despite higher referral and mortality rates during the ENP, care was more often sought during the late neonatal period [27]. This was also consistent with the findings from the systematic review on neonatal care-seeking [12]. Similarly, a qualitative study where newborn illness and death cases were selected from the same population cohort analyzed in this study, showed that often the first choice of care for newborn illness was home remedy or seeking care from local village doctors and only when

these failed, did the families decide to seek care from a health facility, which was commonly a private facility [21].

The respondents in our study were referred for care if any one of the danger signs of severe newborn illness was identified. The family's perception regarding severity of specific signs of illness can affect compliance with referrals for care-seeking [26]. A qualitative study on care-seeking among newborns who died or were ill in the same study cohort, showed that caregivers perceived general weakness, difficulty breathing and convulsion to be severe signs but these were relatively rare signs [21]. Furthermore, the difference in perceived severity can delay care; a study by Mesko et al. in Makwanpur District, Nepal [33], found the major obstacle to care-seeking was reported to be 'the need to watch and wait'.

No care sought especially for referred severely ill newborns may be due to the postpartum isolation period for mother and newborn seen in Nepal [21, 31, 33–35] and also practiced in other South Asian countries [13, 17]. Other factors that may delay the decision to seek care for newborns range from distance to a facility or provider, poor quality of care at facilities, lack of financial resources to access health care or transport, no family members to take the child and the opportunity costs of missed work for childcare [9, 17, 36]. Unlike past studies in rural Nepal, our study shows that <1% sought care from traditional spiritual healers 'dhami/jhakri' or TBA (<1%) for newborns in general, which is a positive sign [33, 37]. This may be because of the increase in awareness among families or caregivers of danger signs and less belief in spiritual cause of illness.

Among both the severely ill and healthy newborns who did receive care, a significantly higher proportion of non-facility born newborns were taken to informal care providers only. Similar findings from the qualitative study showed that families sought care from these informal care

providers because they were trustworthy, easily accessible, and they had past good experience with care received [21]. A study in rural Pakistan showed that 75% of mothers reported the informal unqualified providers as the ‘best’ in neonatal health services and satisfaction with care was 56% [38]. Other studies have shown that informal providers such as drug vendors keep more convenient hours, more convenient locations, minimize waiting time and levy no consulting fees [33, 17, 39]. A comprehensive literature review on the informal health care sector in developing countries has shown that informal providers make up a significant portion of the healthcare sector in developing countries with utilization ranging from 9 to 90% [39]. Studies have demonstrated that the quality of care provided by these informal providers was generally poor with low provider knowledge, inadequate drug provision and gaps in knowledge and practice [39]. We cannot ignore the major role informal care providers, mainly drug vendors/local village doctors play in such rural settings. A systematic review of literature identified that some of the most successful interventions in child health with informal providers were those that included comprehensive interventions that changed the incentives and accountability environment in which the informal providers operated [40]. Increased government oversight, training and regulation of the care provided by informal providers especially in the rural areas is much needed in Nepal.

Our findings that in general, regardless of illness, mothers who are less likely to deliver at a facility were also less likely to seek formal care indicates the need to increase the demand for formal care and the need to address the barriers to facility care for ANC, delivery care and postnatal care, targeting this group of women. The NSMP and CB-IMNCI have incorporated innovative demand-side strategies such as mobilization of FCHVs to educate women in essential newborn care and birth preparedness, including illness recognition and timely, appropriate care-

seeking. Under the previously implemented Community Based Newborn Care Program (CB-NCP), which has now been integrated with the CB-IMCI, the FCHVs had to provide home based newborn care on day 1, 3 and 7. During those home visits, in addition to counseling on newborn care and danger signs, the FCHVs also referred newborns with any danger signs to the nearest health facility and also provided an initial dose of oral antibiotics for suspected sepsis cases. A 2011 study evaluating the CB-NCP in one of the pilot districts showed that 62% of newborns received a home visit by FCHVs in the first week of life in Nepal and that the proportion of newborns taken to a facility within 24 hours of the onset of danger signs increased from 37% at baseline to 68% in the end line survey [41]. An assessment of the CB-NCP after two years of implementation in the ten pilot districts found lower coverage where only 7% of home deliveries were visited within 2 days of birth and 33% of newborns received postnatal care services from the FCHV at some point [42]. Under the current CB-IMNCI program, the focus is on increasing postnatal visits by trained health workers through primary health care outreach clinics [29]. However this is not enough given that these outreach clinics are only conducted once a month at the VDC level. As with many public health interventions, it is the least accessible groups (geographically, socially, financially) who are the most vulnerable and for whom outreach is most likely to be compromised. An intervention study aimed at managing the newborn's illnesses at the household and community levels through follow-up home visits by FCHVs was found to be effective in reducing the risk of deaths in low birth weight infants [43]. Thus similar strategic deployment of FCHVs to homes within the first three days of birth should be promoted where babies are born at home, born too soon (preterm births) or at risk of low birth weight with at least one follow-up visit in the first week of life. Strategic outreach by FCHVs prioritizing

visits to home births may help promote appropriate care-seeking among this vulnerable population.

Similarly, there is a need to simultaneously identify and strengthen supply-side strategies for neonatal health system development. Financial constraints to care-seeking are complicated to address but as with the birth preparedness program in NSMP, there is a need to encourage families to save money, identify transport and the nearest formal care providers prior to a newborn illness event. A few intervention studies in South Asia have explored and found that recognition and home-management of neonatal illness by trained health care workers leads to an increase in care acceptance and a reduction of neonatal mortality, suggesting home-based neonatal care is an acceptable and feasible intervention to enhance neonatal access to appropriate care [44–47]. A systematic review of interventions that have an impact on maternal and newborn care-seeking showed that strategies that combined interventions such as birth preparedness and home visits by community health workers who recognized illness and provided referrals had the greatest impact on care-seeking [48]. In Nepal, this is replicated to some extent by the required home visits in the first week of life by the FCHVs under the CB-IMNCI program in Nepal and provision of first line of antibiotics in suspected infection cases with further referral of care. However, service gaps with coverage of home visitation remain. The Ministry of Health and Population in Nepal has set a target of providing CB-IMNCI services to 90% of the population by 2020 [29]. In order to achieve this, there needs to be supply-side inputs to expand services at primary health care centers and offer more flexible hours of care, ensuring timely care at facilities and providing quality newborn care.

#### **6.5.1 Strengths and limitations**

This was a large population-based study in which morbidity, referral and care-seeking data were collected prospectively throughout the neonatal period, minimizing recall bias associated with

parental interviews. Furthermore, some of the danger signs used to define severely ill newborns were based on direct observation and clinical confirmation of a danger sign by trained field teams which helped validate the presence of severely ill newborns. Another strength of our study is that we could compare caregivers who did and did not seek formal care, for both severely ill and healthy newborns, giving a clearer picture as to postnatal care-seeking practice in general, regardless of illness.

One of the main limitations in this study is the unmeasured confounding by other factors for which data were not collected in the overall analysis cohort. For example, data on distance to nearest health facility and mother's knowledge of newborn danger signs, which could be potential confounders were only collected in a smaller sub-set of the analysis cohort and so not adjusted for in this analysis. Although the analysis was conducted in a prospective cohort, we cannot prove causal association due to the unmeasured confounding. It is possible that there are other determinants and barriers that needs to be addressed. More information on parental reasons for seeking care and attitudes towards formal care would have allowed for in-depth understanding on timing of care-seeking and reasons for seeking certain types of care. Additionally, the mother's report on some newborn danger signs used to define severely ill newborns such as difficulty breathing, difficulty sucking, and convulsion or stiffness of the neck is subjective and may not have been accurate.

## **6.6 Conclusion**

Further research is needed to understand the quality of newborn care services being provided by both the formal and informal providers as well as gaps and areas for improvement in current services provided in public health facilities. Findings from such research can help inform

approaches to either integrate the informal providers into the existing health system structure or ways to improve care from formal providers.

This study found that appropriate care-seeking in the week following the identification and referral of severely ill newborns in the ENP is inadequate, especially for those born at home. The majority of births in rural Nepal are still occurring at home [6]. Combined with the high likelihood of severely ill newborns in this group not seeking appropriate or any care, this is an area of concern. Our findings confirm the need for universal access to timely and effective ANC and delivery at a healthy facility for improved neonatal health outcomes. All efforts to continue increasing awareness about newborn danger signs and early care-seeking are important for improving newborn health. Thus, there is a need to take advantage of increasing facility delivery rates but also focus on community interventions through early home visits by FCHVs of mothers and newborns if the birth occurred outside a health facility, so as to ensure that all babies benefit from these practices.

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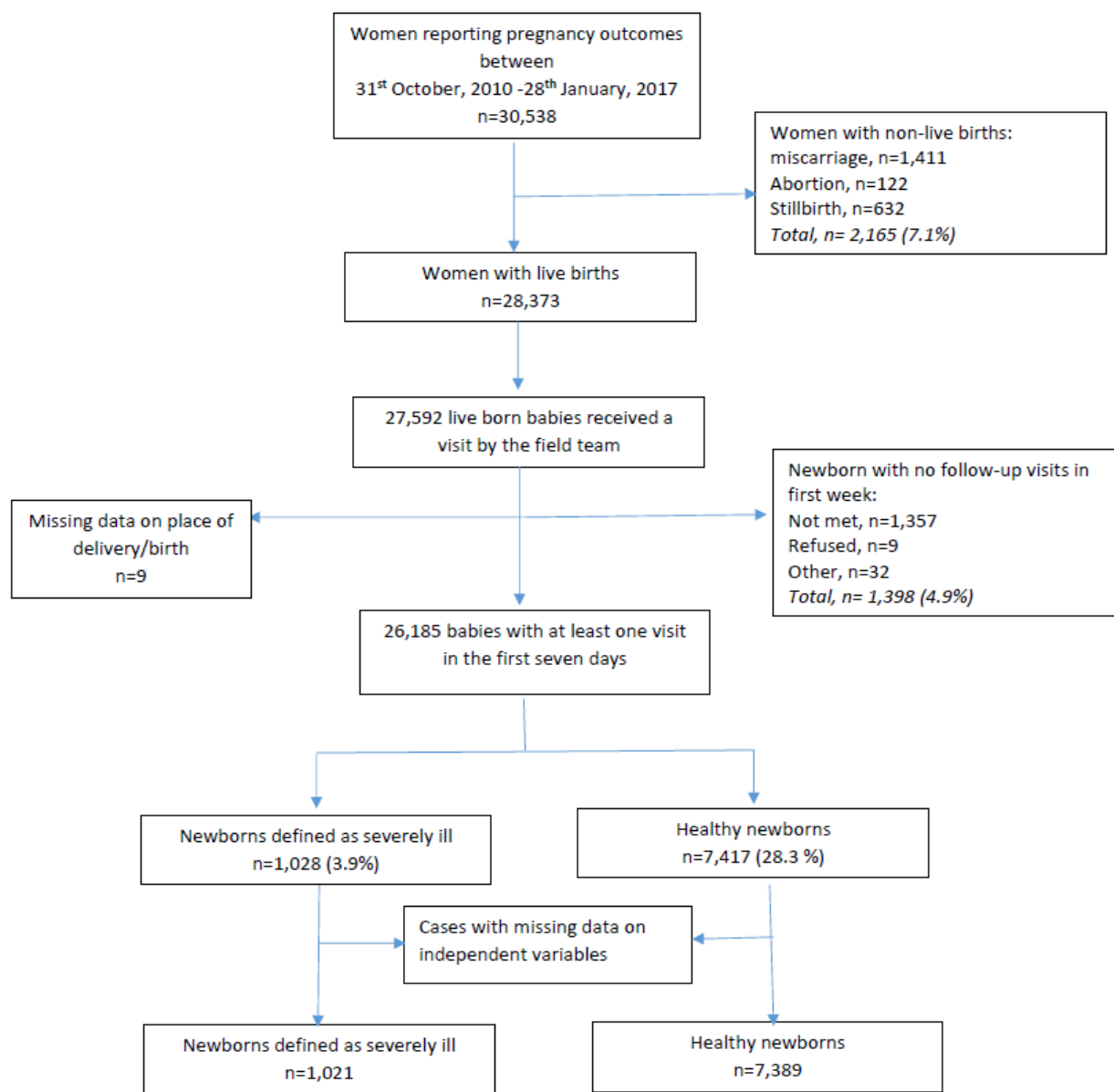
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**Figure 6.1.** Analytical cohort of newborns completing the first week home visit (n=26,185) in Sarlahi district between October, 2010 and January 2017

**Table 6.1.** Prevalence of danger signs among the newborn babies in the first seven days since birth

<b>Signs</b>	<b>Non-Facility N (%)</b>	<b>Facility N(%)</b>	<b>Total N (%)</b>	<b>p-value</b>
<b>1. Reported baby had difficulty sucking</b>	532 (3.47%)	466 (4.29%)	998 (3.81%)	0.001
<b>2. Reported baby had difficulty breathing</b>	1,359 (8.87%)	961 (8.85%)	2,320 (8.86%)	0.86
<b>3. Reported baby had convulsion or stiffness of back</b>	119 (0.78%)	117 (1.08%)	236 (0.90%)	0.01
<b>4. Observed and recorded baby not moving upon stimulation</b>	93 (0.61%)	33 (0.30%)	126 (0.48%)	<0.001
<b>5. Observed and recorded the baby to have severe chest indrawing</b>	164 (1.07%)	99 (0.91%)	263 (1.00%)	0.21
<b>6. Observed and recorded the baby's umbilical cord to have pus discharge and redness of the cord stump or around the base of the cord</b>	354 (2.31%)	366 (3.37%)	720 (2.75%)	<0.001
<b>7. Recorded the axillary temperature of baby as <math>\geq 38^{\circ}\text{C}</math> or <math>100.4^{\circ}\text{F}</math></b>	199 (1.30%)	291 (2.68%)	490 (1.87%)	<0.001
<b>8. Recorded the axillary temperature of baby as <math>&lt; 35^{\circ}\text{C}</math> or <math>95^{\circ}\text{F}</math></b>	1,286 (8.39%)	368 (3.39%)	1,654 (6.32%)	<0.001
<b>9. Observed and recorded respiratory rate <math>&gt; 70</math> breaths/min</b>	1,048 (6.84%)	706 (6.50%)	1,754 (6.70%)	0.28
<b><i>Total with at least two signs</i></b>	<b>587 (3.83%)</b>	<b>441 (4.06%)</b>	<b>1,028 (3.93%)</b>	<b>0.34</b>
<b>Total denominator</b>	15,326	10,859	26,185	

**Table 6.2.** Distribution of characteristics of severely ill and healthy babies by place of birth

Variables	Severely ill newborns			Healthy babies with no danger signs			Combined (both sick and healthy)		
	Non-facility births	Facility Births	Total	Non-facility births	Facility births	Total	Non-facility births	Facility births	Total
	N=585	N=436	N=1021	N=4165	N=3224	N=7390	N=4750	N=3660	N=8,410
	%	%	%	%	%	%	%	%	%
<i>Socio-demographic characteristics</i>									
<b>Maternal age category</b>									
< 20 years	25.5	37.4	30.6	23.8	29.7	26.3	24	30.6	26.9
20-24 years	41.7	36	39.3	42.1	42.9	42.4	42.1	42.1	42.1
25 to 29 years	21.9	16.5	19.6	22.4	19.3	21.1	22.4	18.9	20.9
30 years & above	10.9	10.1	10.6	11.7	8.2	10.1	11.6	8.4	10.2
<i>Median maternal age</i>	22.5 years	21.2 years	22.1 years	22.9 years	21.9 years	22.4 years	22.8 years	21.9 years	22.4 years
<b>Women literacy</b>									
No	79.5	60.3	71.3	77.5	57.0	68.6	77.8	57.4	68.9
Yes	20.5	39.7	28.7	22.5	43.0	31.4	22.2	42.6	31.1
<b>Husband literacy</b>									
No	52.3	38.8	46.5	48.8	31.9	41.5	49.3	32.8	42.1
Yes	47.7	61.2	53.5	51.2	68.1	58.5	50.7	67.2	57.9
<b>Ethnicity</b>									
Madeshi	97.8	92.4	95.5	98.1	93.1	95.9	98.0	93.0	95.8
Pahadi	2.2	7.6	4.5	1.9	6.9	4.1	2.0	7.0	4.2
<b>Caste</b>									
Vaiysha	68.5	76.6	72	69.7	76.9	72.8	69.5	76.8	72.7

Brahmin/Chhetri	1.5	3.0	2.2	1.9	4.0	2.8	1.9	3.9	2.7
Shudra	21.4	13.3	17.9	17.5	10.8	14.6	18.0	11.1	15.0
Muslim/Other	8.5	7.1	7.9	10.9	8.4	9.8	10.6	8.2	9.6
<b>Wealth quintiles</b>									
Lowest (poorest)	29.7	16.5	24.1	23.8	12.7	19	24.6	13.2	19.6
Second lowest	21.7	19.0	20.6	22.4	15.9	19.6	22.4	16.3	19.7
Middle quintile	16.6	19.5	17.8	20.8	19.9	20.4	20.3	19.8	20.1
Second highest	17.8	20.0	18.7	18.5	24.2	21.0	18.4	23.7	20.7
Highest (richest)	14.2	25.0	18.8	14.4	27.3	20.0	14.4	27.0	19.9
<i>Characteristics of most recent pregnancy</i>									
<b>Sex of the baby</b>									
Male	60.3	57.3	59.1	48.0	48.7	48.3	49.5	49.7	49.6
Female	39.7	42.7	40.9	52.0	51.3	51.7	50.5	50.3	50.4
<b>Preterm birth</b>									
No	87.2	86.2	86.8	88.2	87.7	88	88.1	87.6	87.9
Yes	12.8	13.8	13.2	11.8	12.3	12.0	11.9	12.4	12.1
<b>Single/multiple births</b>									
Singleton	96.2	97.0	96.6	98.8	98.4	98.6	98.5	98.2	98.4
Multiple birth	3.8	3.0	3.4	1.2	1.6	1.4	1.5	1.8	1.6
<b>Gravidity</b>									
First pregnancy	25.8	46.1	34.5	19.3	36.6	26.9	20.1	37.8	27.8
1-3 pregnancies	56.6	42.2	50.4	64.3	53.6	59.6	63.4	52.2	58.5
4 or more pregnancies	17.6	11.7	15.1	16.4	9.7	13.5	16.5	10.0	13.7
<b>Number of ANC visits</b>									
No ANC	27.9	7.3	19.1	25.7	7.5	17.7	25.9	7.7	17.8
1 to 3	57.9	45.4	52.6	55.3	42.9	49.9	55.6	43.3	50.1
4 or more	14.2	47.2	28.3	19.1	49.6	32.4	18.5	49.0	32.1

<b>Intrapartum complication reported</b>									
No	80.5	56.0	70.0	91.3	71.8	82.8	89.9	69.9	81.2
Yes	19.5	44.0	30.0	8.7	28.2	17.2	10.1	30.1	18.8
<b><i>Past Pregnancy history</i></b>									
<b>Any of previous pregnancies result in stillbirth or miscarriage</b>									
No	86.0	86.0	86.0	86.0	85.6	85.9	86.0	85.7	85.9
Yes	14.0	14.0	14.0	14.0	14.4	14.1	14.0	14.3	14.1
<b>Death of live born children</b>									
No	93.8	95.6	94.6	93.0	95.2	93.9	93.1	95.2	94.0
Yes	6.2	4.4	5.4	7.0	4.8	6.1	6.9	4.8	6.0



**Table 6.3.** Distribution of newborns seeking care from different type of provides by place of delivery among the severely ill newborns and healthy newborns

Type of care-seeking variables	Severely ill newborns**			Healthy babies with no danger signs**		
	Non-facility births	Facility Births	Total	Non-facility births	Facility births	Total
	N=585	N=436	N=1021	N=4165	N=3224	N=7389
	n(%)	n(%)	n(%)	n(%)	n(%)	n(%)
<b>No care</b>	129 (22.1%)	76 (17.4%)	205 (20.1%)	2,706 (65.0%)	2,014 (62.5%)	4,720 (63.9%)
<b>Informal care</b>	320 (54.7%)	128 (29.4%)	448 (43.9%)	1,301 (31.2%)	833 (25.8%)	2,135 (28.9%)
<b>Formal care</b>	136 (23.2%)	232 (53.2%)	368 (36.0%)	158 (3.8%)	377 (11.7%)	535 (7.2%)

*\*\*p-value <0.001 of overall difference the three groups of care-seeking by place of delivery using Chi-squared tests*

**Table 6.4.** Bivariate and multivariate multinomial logistic regression analysis<sup>†</sup> for care-seeking for by place of birth for severely ill newborns (N=1,021) and healthy newborns with no danger signs (N=7,390)

	Type of care-seeking variables	Formal care		Informal Care	
Type of Newborn Sub-group		Unadjusted Relative Risk Ratio RRR [95%]	Adjusted <sup>‡</sup> Relative Risk Ratio RRR [95% CI]	Unadjusted Relative Risk Ratio RRR [95%]	Adjusted <sup>‡</sup> Relative Risk Ratio RRR [95% CI]
Severely ill newborns	Non-facility births	Ref	Ref	Ref	Ref
	Facility births	2.90 [2.03-4.12]	2.00 [1.30-3.06]	0.68 [0.48-0.96]	0.60 [0.40-0.92]
Healthy babies with no danger signs	Non-facility births	Ref	Ref	Ref	Ref
	Facility births	3.21 [2.64-3.89]	2.09 [1.67-2.61]	0.86 [0.77-0.95]	0.83 [0.74-0.94]

<sup>†</sup>Reference category is “No care”

<sup>‡</sup> Adjusted for wealth quintile, ethnicity, caste, sex of baby, preterm status, maternal age, maternal literacy, husband's literacy, gravidity, number of ANC visits, intrapartum complication reported, death of any livebirth children and any referral made to seek care

## **Chapter 7 : Synthesis and Implications**

### **7.1. Introduction**

The majority of obstetric complications that occur during pregnancy take place during the intrapartum period, with post-partum hemorrhage being the leading cause of maternal deaths [1]. Among newborn babies, 75% of neonatal deaths happen in the first week of life with the highest risk being the first day of life [2]. The global focus of safe motherhood programs on improving utilization and access to emergency obstetric care started in 1998 and since then SBA coverage and health facility delivery rates have increased at an astonishing rate [3, 4]. On the other hand, neonatal health gradually emerged as a global public health priority only after the 2005 Lancet newborn series recognized that MDG 4 for child survival could not be achieved without increased attention to newborn health [5]. Facility-based care during labor, childbirth and during the first week of life for small and ill newborns was found to have the greatest effect on improved maternal health, newborn survival and prevention of stillbirths [6].

This dissertation explored facility readiness in providing quality maternal and newborn care services at BCs and the type of care sought for maternal and newborn illness in a rural district of Nepal. We described the infrastructure, availability of skilled human resource, medicines, supplies and equipment needed to provide routine antenatal and delivery care, BEmONC signal functions and immediate newborn care in the study district (Chapter 4). The dissertation also utilized data from a community-randomized trial in the study area to identify maternal and newborn illness as well as death cases to conduct a qualitative study to understand the illness recognition, decision-making and care seeking patterns for a variety of maternal complications and newborn illnesses (Chapter 5). We further analyzed for association of the place of delivery

with postnatal care seeking from formal providers among separate sub-cohorts of severely ill newborns and healthy newborns using the data collected from the community-randomized trial (Chapter 6). This chapter presents key results of these analyses and implications.

## **7.2. Key Results**

### **7.2.1. Specific Aim 1**

Among the 23 surveyed private and public BCs, the two private BCs had all the medicines and supplies needed to perform five of the seven BEmONC signal functions while the PHCC level BCs (n=5) that were supposed to provide BEmONC signal functions were poorly equipped to provide most of the signal functions (except for parenteral oxytocin use). The district hospital maternity ward had all the equipment and resources available to provide the BEmONC signal functions but disinfecting solution for infection prevention. At the time of the assessment, none of the PHCC level BCs had a manual or electrical vacuum extractor essential to provide assisted vaginal delivery and 10 of the BCs lacked magnesium sulfate needed to manage severe pre-eclampsia/eclampsia. Lack of staff nurse level staff was evident in the majority of the PHCCs (n=4/5) and both private facilities. While the required number (two) of ANMs were found in majority of the HP level BCs (n=12/16), there was one BC that did not have any ANMs to provide maternal and immediate postnatal care. Of the 63 health workers interviewed, only half had received the additional SBA training that is intended for all providers in birthing centers. The public sector health workers had overall higher levels of knowledge on maternal health and some components of newborn health compared to the private sector health workers. Similarly, the health workers who reported having additional SBA training had higher mean scores on maternal and newborn knowledge. In regards to training received in the past three years, a higher

proportion of health workers in the PHCC and HP level BCs reportedly received training compared those working in the district hospital and private BC.

### **7.2.2. Specific Aim 2**

Among both the maternal and newborn cases, the decision to seek prompt care was delayed (Delay 1), often due to the signs and symptoms of the illness not being perceived as severe. Home remedies and treatment at home with drugs brought from pharmacy were often used in the case of newborn illness prior to seeking care outside of home. Informal care providers were commonly sought as the first point of care for many of the maternal and newborn cases. In the maternal cases, care was initially sought at home from TBAs, traditional healers (pre-eclampsia and eclampsia cases), or local village doctors when the illness onset occurred at home. In the newborn illness cases, local village doctors were called to provide care at home or at their pharmacy/clinic. The reasons for seeking care from the informal care providers varied from convenience and ease in access (live nearby and work flexible hours); trust and familiarity (due to past good experience); and perceived cause of illness (spiritual cause resulting in traditional healer being called first). Timely care from skilled formal providers at health facilities were delayed due to seeking care from informal care providers first, transport not available or difficulty finding transport, lack of money, onset of illness at night, low perceived severity and distance to the facility. There were instances of newborn cases where no formal care was sought and only relied on care from the local village doctors. Facility care was often sought only after referral or following treatment failure from an informal provider. Families and caregivers for ill newborns sought care from private health facilities rather than public facilities. Low quality, rude staff behavior and shortages of medicines and supplies were reported by respondents when asked about the quality of care received in some of the public health facilities.

### **7.2.3. Specific Aim 3**

Of the population-based cohort of 26,185 babies, about 42% of the births took place at a health facility and about 4% (n=1,028) were found to be severely ill in the first seven days, based on our definition of severely ill newborns. Among who were born in a health facility, the majority (53.2%) reported having sought formal care at least once in the seven days following the onset of illness compared to only 23.2% among the non-facility births. No care was sought in the seven days following onset of newborn illness in 17.4% and 22.1% of facility and non-facility births, respectively. Informal care only was sought by about 55% of the non-facility born babies and this was mostly from local village doctors or drug vendors. Among the healthy newborns, the majority did not seek any postnatal care (about 64%) and families of 11.7% of facility born newborns sought formal care compared to non-facility births. The multivariate multinomial logistic regression analysis showed that families and caregivers of a newborn who was born at a health facility were twice as likely to seek formal care in the event of severe newborn illness compared to those not born at a health facility. The multivariate regression findings were similar upon analyzing the sub-cohort of healthy newborns.

### **7.2.4. Synthesis of the results from the three papers**

Facility births in the study area have increased from about 9% in 2002-2005 (past study cohort) to 42% in 2010-2016 in the most recent study cohort [7]. This may in part be due to the rapid expansion in BCs providing free delivery services and incentives to cover transport cost under the NSMP. However, annual data reported to the HMIS shows plateau in births at HP level BCs (29% in 2014/2015 to 27% in 2015/2016) despite increase in the number of HP level BCs (1,621 to 1,755 in 2015/2016) [8]. Bypassing the nearest birthing centers for delivery at higher level

facilities like hospitals is evident in some rural areas because of the lack of services such as ultrasound, lab facilities, as well as lack of medicines/drugs, skilled provider and inadequate facilities [9–11]. This has resulted in overcrowding in referral hospitals for normal delivery services contributing to poor quality of care in the district and zonal hospitals [12, 8].

As more births are now taking place in health facilities, attention has shifted towards quality of care. Improving quality of care around the time of birth will save the most lives, but this requires educated and equipped health workers, including those with midwifery skills, and availability of essential commodities [13]. In order to get a clear picture of the type of maternal and newborn care services that was available to the study population in the district, we included all the BCs in the study district as well as the district hospital in the facility assessment. In 2016, there were 21 public BCs (5 PHCC level and 16 HP level), 2 private BCs and 1 district hospital that were providing free 24/7 delivery care and immediate newborn care to the study population. The two private facilities were located near the highway and the district hospital was located in the district headquarters located to the south of the district close to the Indian border India (Figure 3.2). The HP level BCs run by ANMs provided routine normal delivery care and in the case of obstetric complications, the staff referred care to a higher level BEmONC (PHCC level) or CEmONC level facilities (district and zonal level hospital). The district hospital was the only hospital with an OB-GYN in the entire district and the OB-GYN doctor was not a permanent staff but was hired on contract basis due to shortage of human resources. The lack of full-time government employed health workers (ANMs, Staff nurse and OB-GYN) to fill in the vacant posts in BCs and hospitals is evident in many other parts of the country [8, 14].

An enabling environment for the health workers to provide quality maternal and newborn care services was lacking in most of the health facilities in our study district. Lack of essential drugs

to treat serious obstetric complications (injectable anticonvulsants and antibiotics) and stock out of essential iron/folic acid tablets due to a nationwide supply shortage limited the capacity of majority of the facilities to provide basic quality antenatal and emergency obstetric care.

Comparisons of our study findings with the 2015 NHFS and 2013 National Birthing Center Assessment also show similar findings on SBA training, health worker knowledge and lack of essential drugs and supplies especially in lower level PHCC and HP level BCs [15, 16]. Similar findings were reflected in the responses from the small group interviews with caregivers/witnesses on their perception of the quality of care provided at health facilities when formal care was sought. Some of the respondents in the small group interviews reported dissatisfaction with the care provided at health facility due to shortage of blood for transfusion resulting in death from PPH after C-section (in one private hospital in neighboring district), rude behaviors of health workers in health facilities and multiple referrals to higher level facility due to shortages of drugs and supplies.

Both the qualitative and quantitative study on care-seeking practice showed that informal care providers are still commonly sought often times as the first point of care or only care provider in instances of newborn and maternal complications. Our quantitative study supported the hypothesis that parents/families of babies who were born in a health facility are more likely to seek prompt postnatal care from a qualified formal care provider in the event of severe illness. The positive association of facility birth with postnatal care-seeking also indicates that despite the BCs not being ready to provide optimal quality care, being born in a health facility exposes the mother and caregivers to counseling on postnatal care and newborn danger sign recognition prior to being discharged and thus affects their postnatal care-seeking from formal care providers. The 2015 NFHS exit interviews with 309 women who delivered at a health facility



showed that advise on postnatal care checkups and danger signs was reported by 63% and 38% of women overall, respectively [15]. Although the majority of the women who delivered at a health facility may not have received counseling on danger signs, mothers/caregivers of babies born in health facility may still be better informed on newborn danger signs than non-facility births. Thus, although quality gap exists in delivery care services provided at BCs, efforts to increase facility births on both the supply and demand side is needed in rural Nepal.

### **7.3. Implications**

Implications of this research includes policies and programmatic interventions to strengthen the demand and supply side of existing maternal and newborn health programs.

#### **7.3.1. Programs to encourage local health system strengthening to improve BC facility readiness and service availability in providing quality care**

The Government of Nepal with support from foreign donor agencies conducted a National Assessment of Birthing Centers in 2013 followed by the first comprehensive health facility survey in 2015, which provided information on the current quality of care of maternal and newborn care services in birthing centers, district and zonal hospitals [15–17]. In addition to periodical national level facility surveys, it is important for local level monitoring of facility readiness and service availability. Although the Public Health Nurse in Sarlahi who oversees the Safe Motherhood Program in the district had been conducting regular supervision visits to the BCs, the DPHO lacked additional human resource and means (transportation) to do this at frequent intervals (personal communication with the Public Health Nurse).

Our findings showed that although there were some issues that were common across most of the health facilities, each health facility assessed had its own unique gaps indicating the need for

solutions and interventions as per the need of each health facility. Nepal could pilot test a similar approach to that tested in rural Rwanda, where a tool to rapidly assess service availability and facility readiness, combined with engagement of local leaders to utilize these data to identify priority areas for resource allocation, was effective in improving facility readiness [18]. This health system strengthening intervention was successful in improving facility readiness by ensuring funds were distributed so as to target priority areas and also allowed for equity in health service delivery. In addition, the facility survey have become a routine monitoring and evaluation tool at district level in Rwanda [18]. Similar interventions can be piloted in Nepal at the district level jointly by DPHO and other non-government stakeholders working on maternal and neonatal health in the district. Informed decision making through data-driven resource allocation for interventions in each health facility at the local level would help fill the quality gaps in care being provided. Certain indicators (composite scores on domains such as infrastructure, infection control, human resource, etc.) on BC performance disaggregated by level of facility (PHCC, HP private, etc.) may even be incorporated into the national HMIS reporting, which currently only collects service coverage indicator collecting monthly on indicators such as % of women who received a 180 day supply of iron folic acid during pregnancy, % institutional deliveries, ANC coverage (4 visits, at least one), % normal deliveries, % assisted (vacuum or forceps) deliveries, % deliveries by caesarean section etc., and annual data on number of health facilities: BEmONC, CEmONC, BC facilities and lab facilities.

### **7.3.2. In the public sector, policies to incentivize recruitment and retention of specialized skilled birth attendants (OB-GYN doctor, staff nurse and ANMs) to increase availability of obstetric are in rural areas**

Lack of human resources and poor retention of health workers (especially staff nurse and ANM) in some of the more rural and removed BCs are major barriers of provision of even normal

delivery care in many of the HP and PHCC level BCs. When the findings from this study were shared with the DPHO staff in January 17, 2016, the DPHO acknowledged that retention of health workers was a major issue and stated that the remote location and lack of vehicle access as reasons for poor retention of staff. One of the short-term solutions used by the Ministry of Health and Population is the hiring of ANMs and even OB-GYN doctors (as with the case of the district hospital in Sarlahi) on short term contracts to ensure 24 hour services at PHCC and HPs [8]. However, these short term contract health workers are only employed for six months in the year due to the administrative procedures taking six months to recruit personnel [14]. Policies to incentivize health workers in rural areas can include additional financial incentives for workers to work in more rural settings. Financial incentives alone are insufficient; non-financial incentives such as opportunity for trainings, career development (promotion), enabling working environment (adjoining staff quarters, well equipped facility with proper infrastructure, secure environment, resolving any management issues, etc.) and regular supportive supervisions and staff recognition or appreciation (from managers or community) can improve morale significantly [19]. The retention of staff especially in the rural areas through training and hiring of local staff could allow for ease in hiring and retention of staff.

In addition, our findings along with the national studies found that about half of the health workers have yet to receive additional SBA training [16]. One strategy that the DPHO staffs mentioned during the dissemination of the study findings on retention of SBA trained staff was to prioritize training first to health workers who are from Sarlahi district, as they were less likely to request being transferred to work in other districts. Long term activities could be the inclusion of SBA training package into the auxiliary nurse midwife training, which will potentially

minimize the acute shortage of SBA ensuring that all auxiliary nurse midwives graduated with the skills required in birthing centers [20].

### **7.3.3. Strategies to engage the informal providers to recognize danger signs, encourage facility births and provide referral to formal providers.**

Similar to our results, several other studies have also demonstrated that informal care is often sought as first or only source of care for both maternal and newborn conditions, and this pattern is especially strong among the less educated, belonging to low socioeconomic status and living far from nearest health facility [21–29]. The emergence of large informal markets reflects a history of failure by the public health services to meet the health-related needs especially for the poor and those living in rural areas. There is a desperate need to develop successful strategies to utilizing them as the bridge connecting the maternal and newborn complication cases to the formal providers. Informal providers are often presented in the literature as trusted members of their communities, easily accessible, available at odd hours and affordable [25, 26]. Expecting government to enforce regulations to control the behavior of such informal care providers seem unrealistic and of low priority as the demands on government health systems are high and such informal providers are widespread [30]. Training the informal providers to recognize pregnancy/delivery and neonatal danger signs and to refer such cases to formal providers/facilities have been used in other settings [31–33]. In the context of Nepal, providing free training similar to that given to community health workers and FCHVs under NSMP and CB-IMNCI in the communities and which not only limits to improving practitioners' knowledge but also includes practical training focusing on key practices, may yield the best outcomes. Informal care providers can also be tapped to promote community awareness on the importance of antenatal care, birth preparedness and promote facility delivery. Such a strategy could be piloted and tested in rural settings after further research.

#### **7.3.4. Strengthen Birth Preparedness Plan and ANC counseling to promote facility births and counseling on danger signs to prompt care-seeking from formal providers**

There is a need to further strengthen the community-based awareness on birth preparedness and complication readiness (preparation of money, health facilities for delivery, transport and blood donors) through FCHVs. As seen in our study, lack of complication readiness has resulted in delay in reaching a health facility on time, resulting in fatal outcomes. Despite ANC visits at a health facility, birth preparedness is still very low and care at a facility is still only sought when there is a complication. The demand side of increasing the utilization of the free ANC, delivery and postnatal care services needs to be further strengthened. Engaging the husbands, mother-in-law and other family members who are often times the decision makers on when and where to seek care for maternal and neonatal illnesses is also vital [21, 34–36]. Perceived severity of morbidities is an essential component in understanding why and how families make decisions regarding care seeking. Proper counseling on birth preparedness and complication readiness, recognition of danger signs and information on where and why to seek care at a health facility should be emphasized during ANC counseling and community-based awareness programs by FCHVs. Similarly, counseling on newborn danger signs and where to seek proper care should also be routinely conducted before discharge of the mother and family members after facility births. This should also be reinforced during the annual maternal and child health refresher training of BC health workers.

#### **7.3.5. A home-care based postnatal check-ups for the most vulnerable newborns in the first week of life**

Three postnatal check-ups beginning with the first within 24 hours of delivery, followed by two other visits on third day and seventh day after delivery is recommended by WHO [37]. Almost

half of the mothers and babies did not receive postnatal care checkups and only 18% reported three postnatal care visits in 2015/2016 [8]. In addition, adopting the current protocol for PNC visits to health care facilities is challenging in areas where postpartum mothers do not leave their homes until 10 days after the delivery [38–40]. Cultural and geographical factors affecting the movement of postnatal mothers could be reasons for the low coverage while the perceived low importance of care in the postpartum period could also be significant. There is a need for culturally sensitive interventions to promote access to and the use of postnatal services, especially in geographically challenging areas. The current CB-IMNCI program of increasing postnatal visits by trained health workers through primary health care outreach clinic is not enough given that these outreach clinics are only conducted once a month at the VDC levels [8]. As with many public health interventions, it is the least accessible groups (geographically, socially, financially) who are the most vulnerable and for whom outreach is most likely to be compromised. An intervention study aimed at managing newborn's illnesses at household and community level through follow-up home visits by FCHVs was found to be effective in reducing risk of deaths in low birth weight infants [41]. FCHVs are already trained to weigh the newborns, assess neonates for danger signs and treat suspected cases with referral, and provide counseling on recognition of danger signs and prompt care seeking the event of danger signs. Thus similar strategic deployment of FCHVs to conduct initial home-visits to provide postnatal checkups for babies born at home, born too soon (preterm births) or low birth weight with at least one follow-up visit in the first week of life should be promoted.

#### **7.4. Strengths and Limitations**

This study enabled a broad characterization of maternal and newborn care availability and facility readiness along with the health worker knowledge in both private and public BCs of the

study district. These findings were disseminated with the local DPHO staff, which provided information on current availability of service by type of health facility and areas that required improvement. Our study findings were also comparable with the 2015 NFHS and 2014 National BC Assessment studies given the use of the same tools in collecting the data. Since we did not observe the performance of health workers in providing ANC an obstetric care, which is considered the gold standard to assess clinical quality, the information on health worker knowledge does not translate to appropriate care being provided [13, 16, 42].

Prospective data collected on morbidity, referral and care-seeking behavior after the identification of newborn signs of illness during seven home visits in the first 28 days allowed for minimum recall bias. Our definition of severely ill newborns mostly consisted of danger signs based on direct observation and clinical measurements by trained data collectors as well as mother's report of danger signs. We restricted our analysis to those with more than one danger sign, which may have increased validity to estimate severely ill newborns. One of the limitations in our analysis was not being able to adjust for some variables known to be potential confounders for care seeking (distance to nearest health facility and mother's knowledge of newborn danger signs), as this information was only collected in a smaller sub-set of the analysis cohort.

The qualitative study, nested within the parent trial, allowed for rapid identification of cases for the illness and death events. Given that we asked the respondents to remember and re-tell the myriad details and relied on the self-report and recall of events, there may have been some recall bias. In some instances, the exact timing of events was difficult to document. We limited this bias by restricting the recall period length to 6 months, and using small group interviews to maximize information and triangulation while constructing the narratives. Another limitation is

that we did not interview health workers, who could have contributed to our understanding of the pattern of care and types of services available from informal providers.

## **7.5. Future Research Agenda**

The private sector's (both formal and informal providers) increasing role in providing maternal and newborn care services in rural settings needs further research. The markets for informal health care services in terms of the sources of health-related knowledge for the providers, the livelihood strategies of these providers and the institutional arrangements within which they build and maintain their reputation needs further investigation. Research into understanding the roles of different informal providers and influencing their behavior through health market research is vital [43]. Thus, alternative strategies can be explored to engage this sector to provide quality care through improvement in performance and serve as links to the formal providers/health facilities. Additionally, studies should assess the maternal and newborn care knowledge among the different cadre of informal and formal private practitioners, and assess their ability to identify and refer maternal and newborn illness cases.

Under the NSMP and CB-IMNCI, strategies to promote care seeking include dissemination of messages for newborn and maternal danger signs during pregnancy, delivery and postpartum period through use of flip charts, posters, murals on health facility walls and also mass media [8]. Despite the integration of these messages in the facility and community level awareness and counseling programs, our study showed that family and caregivers perceived certain danger signs to be not as severe or normal (example: excessive postpartum bleeding) or associated with non-medical causes (e.g., convulsion, severe headache, etc.) thus delaying the decision to seek formal care [21, 36]. Operational research on optimizing the content of messages to improve recognition and assessing client's knowledge on danger signs is needed.



On a health systems level, facilities reported lacking injectable antibiotics, magnesium sulfate, iron/folic acid tablets and other essential medicines due to delays in procurement and distribution of medicines from the central level. The Ministry of Health and Population has identified procurement issues with the annual bidding and tender process and has revised the rules to allow for district health offices to purchase essential drugs within a certain budget without having to call for tender [8, 44]. Research by the Ministry of Health and Population on improvements to supply chain management and the process of procurement/tendering of supplies to facilities as per their need through the local government may help identify strategies to improve coverage of essential medicines. Periodic national level health facility survey as with the Nepal Demographic Health Survey should be continued in order to assess the quality of care provided in maternal and newborn care as well as other health domains to identify progress and gaps in facility readiness in providing quality services to the clients. In addition, local district level rapid assessment of health facilities could also be piloted and studied for effectiveness and feasibility. Finally, rigorous program evaluation of the CB-IMNCI is essential to fully understand which interventions are effective at improving care seeking behaviors in an effort to improve newborn health and survival.

## 7.6. References

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## Appendix 1. Health facility assessment questionnaires

### Appendix 1.1 Health Worker Interview and Knowledge Assessment

#### Health Worker Interview and Knowledge Assessment

Week	<input type="text"/>	<input type="text"/>	<input type="text"/>	Date	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
					DD		MM		YY	
VDC	<input type="text"/>	<input type="text"/>	Ward	<input type="text"/>	Type of Health Facility	<input type="text"/>				
Health Facility code	<input type="text"/>	<input type="text"/>								

1=PHCC  
2= HP  
3=SHP  
4=Private clinic  
5 = Hospital

*EXPLAIN TO THE HEALTH WORKER THAT HIS/HER NAME WAS PROVIDED AS A KNOWLEDGEABLE MATERNAL AND/OR NEONATAL HEALTH PROVIDER. VALIDATE WITH THE HEALTH WORKER THAT HE/SHE DOES PROVIDE SOME MATERNAL AND/OR NEONATAL HEALTH SERVICES IN THIS FACILITY.*

1: *Ask health worker* Have you given your consent to participate in the study?

☐ Yes → go to 2

*READ ORAL CONSENT SCRIPT TO HEALTH WORKER.*

2: *Ask health worker* Do I have your agreement to proceed?

☐ Yes, consent is given → go to 3

☐ No, consent is not given → observation of this health worker must END; if available, approach another health worker for participation.

3. Position of health worker:  1= Doctor, 2= Staff Nurse, 3= Auxiliary Nurse Midwife

Section 1: Education, Training and Working Conditions			
<p>READ THE FOLLOWING QUESTIONS TO THE HEALTH WORKER. IF HEALTH WORKER DOESN'T KNOW THE YEAR, PROBE USING PAST EVENTS AND RECORD YOUR BEST ESTIMATE.</p>			
Question	Code		
<u>EDUCATION AND EXPERIENCE</u>			
Q101: What is your current professional/technical/medical qualification?			
Q102: What year did you graduate (or complete) with this qualification? [roman calendar]	<div style="border: 1px solid black; width: 40px; height: 20px; display: inline-block;"></div> <div style="border: 1px solid black; width: 40px; height: 20px; display: inline-block;"></div> <div style="border: 1px solid black; width: 40px; height: 20px; display: inline-block;"></div> <div style="border: 1px solid black; width: 40px; height: 20px; display: inline-block;"></div>		
Q103a: In what year did you start working in this facility? [roman calendar]	<div style="border: 1px solid black; width: 40px; height: 20px; display: inline-block;"></div> <div style="border: 1px solid black; width: 40px; height: 20px; display: inline-block;"></div> <div style="border: 1px solid black; width: 40px; height: 20px; display: inline-block;"></div> <div style="border: 1px solid black; width: 40px; height: 20px; display: inline-block;"></div>		
Q103b: In what year did you start working in your current position in this facility? [roman calendar]	<div style="border: 1px solid black; width: 40px; height: 20px; display: inline-block;"></div> <div style="border: 1px solid black; width: 40px; height: 20px; display: inline-block;"></div> <div style="border: 1px solid black; width: 40px; height: 20px; display: inline-block;"></div> <div style="border: 1px solid black; width: 40px; height: 20px; display: inline-block;"></div>		
Q104: What is your age?	<div style="border: 1px solid black; width: 40px; height: 20px; display: inline-block;"></div> <div style="border: 1px solid black; width: 40px; height: 20px; display: inline-block;"></div>		
<u>TRAINING AND SERVICES PROVIDED</u>			
Question	Yes	No	Go to
Q105: In your current position, and as a part of your work for this facility, do you personally provide any antenatal services?	1	0	No→Q108
Q106: How many years in total have you provided such services? Service may have been here or in another facility( <i>Observer: enter 00 if less than 1 year of service</i> )			
Q107a: During the past 3 years have you received any pre- or in-service training on subjects related to antenatal care?	1	0	No→Q108
Q107b: In the past 3 years, did you receive any training on the following topics ( <i>read each answer aloud</i> ):	1	0	
01) ANC screening (e.g., blood pressure, urine glucose and protein)	1	0	
02) Counseling for ANC (e.g., nutrition, FP and newborn care)	1	0	

03) PMTCT or other HIV/AIDs related	1	0	
04) Management of pre-eclampsia/eclampsia	1	0	
05) Other topic related to ANC	1	0	No→Q108
5a) List other topic:			
Q108: In your current position, and as a part of your work for this facility, do you personally provide any delivery services? By that I mean conducting the actual delivery of newborns	1	0	No→Q114
Q109: How many years in total have you provided such services? Service may have been here or in another facility (Observer: enter 00 if less than 1 year of service)			
Question	Code		
Q110: How often do you use a partograph fully to monitor and manage labor (read each answer aloud):			
Never	1		
Rarely	2		
Sometimes	3		
Most of the time	4		
Always	5		
Q111: How often do you use active management of the third stage of labor (AMTSL) during normal vaginal births (read each answer aloud):			
Never	1		
Rarely	2		
Sometimes	3		
Most of the time	4		
Always	5		
Question	Yes	No	Go to
Q112: During the past 3 years have you received any pre- or in-service training on subjects related to delivery care?	1	0	No→Q114
Q113: In the past 3 years, did you receive any training on the following topics (read each answer aloud):	1	0	
01) Routine care for labor and normal vaginal delivery	1	0	
02) Use of partograph	1	0	
03) Active management of third stage of labor (AMTSL)	1	0	



04) Sterile cord care and appropriate cord care with chlorhexidine	1	0	
05) Management of sepsis, including use of parenteral antibiotics	1	0	
06) Administer magnesium sulfate for the treatment of severe pre-eclampsia or eclampsia	1	0	
07) Management of postpartum hemorrhage	1	0	
08) Removal of placenta or products of conception? (D&C, vacuum aspiration, etc.)	1	0	
09) Manual removal of placenta	1	0	
10) Special delivery care practices for preventing mother-to-child transmission (PMTCT) of HIV/AIDS	1	0	
11) Assisted vaginal delivery (apply vacuum or forceps)	1	0	
12) Resuscitate a newborn with bag and mask (HBB)	1	0	
13) KMC for low birth weight babies	1	0	
14) Maternal death or near miss reviews/audits	1	0	
15) Quality improvement approaches such as standards based management	1	0	
Q114: Have you received additional skilled birth attendant (SBA) training?	1	0	
Q115: In your current position, and as a part of your work for this facility, do you personally provide care for newborns?	1	0	No→Q118
Q116: How many years in total have you provided such services? Service may have been here or in another facility (Observer: enter 00 if less than 1 year of service)	<div style="border: 1px solid black; width: 80px; height: 30px; margin: 0 auto;"></div>		
Q117: During the past 3 years have you received any pre- or in-service training on subjects related to newborn care?	1	0	No→Q118
<u>WORKING CONDITIONS IN FACILITY</u> <i>Now I would like to ask you some questions about supervision you have personally received. This supervision may have been from a supervisor either in this facility, or from outside the facility. ∴</i>			
Q118: Do you receive technical support or supervision in your work at this facility? If so, when was the most recent time?			

No, never supervised	0	→Q120
Yes, in the past 3 months	1	
Yes, in the past 4-6 months	2	
Yes, in the past 7-12 months	3	
Yes, more than 12 months ago	4	
Q119: The last time you were personally supervised, did your supervisor do any of the following ( <i>read each aloud</i> ):	Yes	No
01) Check your records or reports	1	0
02) Observe your work	1	0
03) Give you verbal feedback about how you were doing your job	1	0
04) Provide any written comment about how you were doing your job	1	0
05) Provide updates on administrative or technical issues related to your work	1	0
06) Discuss problems you have encountered	1	0
07) Participate in quality of care improvement activities	1	0
<p><i>FOR QUESTION Q120, DO NOT READ THE ANSWER CHOICES ALOUD. IF YOU ARE NOT SURE WHETHER AN ANSWER GIVEN BY HEALTH WORKER MATCHES THAT LISTED, PROBE FOR MORE DETAIL. IF THEY GIVE AN ANSWER THAT IS NOT LISTED, MOVE ON TO THEIR NEXT ANSWER. USE THE PROBE TO ENCOURAGE HEALTH WORKER TO GIVE 3 ANSWERS. IF THEY CANNOT GIVE AN ANSWER, OR GIVE ONLY ANSWERS THAT DO NOT APPEAR IN LIST, CIRCLE DON'T KNOW.</i></p>		
Q120: Among the various things related to your working situation that you would like to see improved, can you tell me the three that you think would most improve your ability to provide good quality of care services? (PROBE: Anything else?)	Code	
More support from supervisor	01	
More knowledge/ updates / training	02	
More supplies/drugs	03	
Better quality equipment / supplies	04	
Less workload (more staff)	05	
Better working hours / flexible times	06	
More incentives (salary, promotion, holidays)	07	
Increased security	08	
Better facility infrastructure	09	

More autonomy / independence	10
Emotional support for staff	11
More / better supervision	12
More job aids/guidelines/standards	13
Don't know / None of these	98
<b><i>END OF SECTION 1</i></b>	

## Section 2: Maternal Health Knowledge Questions

*FOR THE FOLLOWING QUESTIONS, READ THE QUESTION ALOUD TO THE HEALTH WORKER. DO NOT READ THE ANSWER CHOICES ALOUD. IF YOU ARE NOT SURE WHETHER AN ANSWER GIVEN BY HEALTH WORKER MATCHES THAT LISTED, PROBE FOR MORE DETAIL. IF THEY GIVE AN ANSWER THAT IS NOT LISTED, MOVE ON TO THEIR NEXT ANSWER. USE THE PROBE TO ENCOURAGE HEALTH WORKER TO GIVE AS MANY ANSWERS AS THEY CAN THINK OF. IF THEY CANNOT GIVE AN ANSWER, OR GIVE ONLY ANSWERS THAT DO NOT APPEAR IN LIST, CIRCLE DON'T KNOW.*

**READ ALOUD:** Please answer the following questions on maternal health to the best of your knowledge. Most of the questions I ask you will require multiple responses from you. Assume all needed supplies, medications, and equipment are available. When thinking about your answers, you should include actions or interventions that could be done at your facility and at a referral facility. I will probe sometimes to help you remember some more information. Please provide all responses that come to mind.

Question	Code
Q200: What actions during labor and delivery would you take in an HIV+ woman to prevent/ reduce mother-to-child transmission of the virus?	
	PMTCT counseling 01
(PROBE: Any other actions or interventions?)	Provide ARV prophylaxis to woman in early labor 02
	Wipe nose, mouth, eyes of newborn with gauze, suction only if necessary 03
	No routine episiotomy 04
	Minimize instrument delivery 05
	Hibitane vaginal cleansing 06
	Minimize vaginal exam 07
	Minimize artificial rupture of membranes 08
	Avoid milking cord/ immediate clamp cord 09
	Appropriate use of partograph 10
	Active mgt of 3rd stage labor 11
	Provide ARV prophylaxis to infant 12
	Don't know 98
Q201: What are the key steps for performing active management of the third stage of labor?	
	Administration of a uterotonic immediately/ within 1 minute of delivery 01

(PROBE: if health worker mentions uterotonic, ask when should uterotonic be given?)	Administration of a uterotonic with delivery of anterior shoulder	02
	Administration of a uterotonic after delivery of placenta	03
	Controlled cord traction	04
	Uterine massage	05
	Don't know	98
Q202: What actions are appropriate for a woman who presents with, or develops heavy bleeding postpartum from atonic/uncontracted uterus?		
	Massage the fundus	01
(PROBE: Any other actions or interventions?)	Empty urinary bladder	02
	Give uterotonics IM or IV	03
	Perform bimanual compression of uterus	04
	Perform abdominal compression of aorta	05
	Start IV fluids	06
	Take blood for hb, grouping and x-matching	07
	Insert condom tamponade	08
	Refer to doctor or hospital	09
	Raise foot of bed	10
	Don't know	98
Q203: When should membranes be ruptured artificially by the provider?		
	At start of second stage	01
(PROBE: Any other times?)	Immediately prior to delivery when they are bulging in vagina	02
	Routinely during active phase of labor	03
	As part of augmentation of labor	04
	Upon admission for all women	05
	To check color of fluid/liquor when fetal distress is noted	06
	Not to be ruptured	07
	Don't know	98
Q204: What actions do you believe are most appropriate in managing a woman with severe pre-eclampsia at term?		
	Provide magnesium sulphate	01
(PROBE: Any other actions?)	Provide diazepam	02
	Provide anti-hypertensives	03
	Prepare to deliver within 24 hours	04
	Don't know	98
Q205: Which antibiotic is given after delivery?		

	Ampicillin	01
(PROBE: Anything else?)	Gentamicin	02
	Metronidazole	03
	Other antibiotic (specify) _____	04
	Don't know	98

*READ ALOUD:* Now I would like to present you with a scenario you might encounter in your practice.

A woman is brought to the emergency department of the district hospital by her husband after she complained of a severe headache and blurred vision. She is 20 years old, this is her first pregnancy, and she is 37 weeks gestation. She had 2 ANC visits and no problems. She denies upper abdominal pain or decreased urine output, and fetal movement is normal. Her BP is 160/120. Her examination is normal. She has contractions 2 in 10 minutes, lasting 20 seconds by palpation. Her urine has 3+ protein.

Q206: Given the information presented above, what is your working diagnosis? *(do not read answers aloud)*

	Kidney infection	1
(CIRCLE <u>ONLY 1</u> ANSWER)	Severe pre-eclampsia	2
	Malaria	3
	Eclampsia	4
	In labor	5
	Don't know	98

*FOR QUESTION Q207, READ THE QUESTION ALOUD TO THE HEALTH WORKER AND THEN READ EACH PROCEDURE ALOUD.*

Question	Yes	N o	DK
Q207: Of the list of procedures I am going to read you, please tell me which procedures are carried out routinely for all patients during labor and delivery at your facility:			
01) Artificial rupture of membranes	1	0	8
02) Active management of third stage of labor	1	0	8
03) Episiotomy	1	0	8
04) Perineal shaving	1	0	8
05) Maternal blood pressure monitoring	1	0	8
06) Administration of prophylactic antibiotics to women in labor	1	0	8
07) Enema	1	0	8
08) Suctioning nose and mouth of newborn	1	0	8
09) Fetal heart rate monitoring	1	0	8

**END OF SECTION 2**



### Section 3: Newborn Health Knowledge Questions

FOR THE FOLLOWING QUESTIONS, READ THE QUESTION ALOUD TO THE HEALTH WORKER. *DO NOT* READ THE ANSWER CHOICES ALOUD. IF YOU ARE NOT SURE WHETHER AN ANSWER GIVEN BY HEALTH WORKER MATCHES THAT LISTED, PROBE FOR MORE DETAIL. IF THEY GIVE AN ANSWER THAT IS NOT LISTED, MOVE ON TO THEIR NEXT ANSWER. USE THE PROBE TO ENCOURAGE HEALTH WORKER TO GIVE AS MANY ANSWERS AS THEY CAN THINK OF. IF THEY CANNOT GIVE AN ANSWER, OR GIVE ONLY ANSWERS THAT DO NOT APPEAR IN LIST, CIRCLE DON'T KNOW.

**READ ALOUD:** Please answer the following questions on newborn health to the best of your knowledge. Most of the questions I will be asking you will require multiple responses from you. Assume all needed supplies, medications, and equipment are available. When thinking about your answers, you should include actions or interventions that could be done at your facility and at a referral facility. I will probe sometimes to help you remember some more information. Please provide all responses that come to mind.

Question		Code
Q301: What basic equipment and supplies must be available to ensure the baby receives appropriate <u>immediate care</u> after birth?		
	Dry warm towels or cloths	01
(PROBE: Anything else?)	Sterile blade or scissors	02
	Sterile or disposable cord ties/ clamps	03
	Cap for baby	04
	Source of warmth: heating lamp or incubator	05
	Self-inflating ventilation bag	06
	Newborn face mask size 1	07
	Newborn face mask size 0	08
	Mucus extractor/ simple suction/ bulb syringe	09
	Flat surface	10
	Clock or watch with seconds	11
	Don't know	98
Q302: Please tell me, when a baby is delivered and there is no complication, what care is important to give them immediately after birth and in the first hour?		
	Wipe face after birth of head	01
(PROBE: Anything else?)	Ensure baby was breathing/ crying	02
	Provide thermal protection (skin to skin)	03
	Suction newborn with bulb	04
	Ensure mother initiates breast feeding within 1 hour	05



	Assess/examine newborn within 1 hour	06	
	Weigh newborn	07	
	Provide eye prophylaxis /antibiotic ointment	08	
	Give prelacteal feed/ water	09	
	Cut cord with sterile blade/scissors	10	
	Apply antiseptic or other material to cord stump	11	
	Don't know	98	
Q303: Can you please tell me the signs and symptoms of severe infection (sepsis) in a newborn?			
		Poor/ no breastfeeding	01
(PROBE: Any other signs or symptoms?)	Restlessness/irritability	02	
	Breathing difficulties	03	
	Hypothermia	04	
	Hyperthermia	05	
	Breathing rating >60/minute	06	
	Convulsions	07	
	Pus/ redness around umbilicus	08	
	Abscess on any part of body	09	
	Skin pustules	10	
	Lethargy/ no movement (conscious)	11	
	Unconscious	12	
	Don't know	98	
<b>END OF SECTION 3</b>			
<b>END OF INTERVIEW</b>			

## Appendix 1.2. Birthing Center Audit Tool

### BIRTHING CENTRE AUDIT TOOL

Week

Date  DD —  MM —  YY

VDC

Ward

Type of Health Facility

1=PHCC  
2= HP  
3=Private clinic  
4 = Hospital

Health facility code

*FIND THE FACILITY DIRECTOR OR IN-CHARGE.*

*GIVE CONSENT FORM TO FACILITY DIRECTOR OR IN-CHARGE.*

*Ask facility director/in-charge* Do I have your agreement to proceed?

F1: Was permission received from director/in-charge to participate in study?

- ☐ Yes, permission was given to ask questions about the facility → go to Q.1
- ☐ No, the in-charge declined to offer information about the facility → STOP

## Section 1: Infrastructure

*READ QUESTIONS ALOUD TO FACILITY DIRECTOR/IN-CHARGE*

	Code	Go to
Q101: How long does it take to walk to the nearest motorable road (big enough for a four wheel vehicle) (in minutes)? (write '00' if linked to the birthing centre)	<div style="border: 1px solid black; width: 30px; height: 20px; display: inline-block;"></div> <div style="border: 1px solid black; width: 30px; height: 20px; display: inline-block;"></div>	
Q102: How is the transportation status to reach the District hospital from the Birthing Centre?	1	
Motorable road throughout	2	
Some section Motorable road and some section on foot/two-wheeler	<div style="border: 1px solid black; width: 30px; height: 20px; display: inline-block;"></div> <div style="border: 1px solid black; width: 30px; height: 20px; display: inline-block;"></div> <div style="border: 1px solid black; width: 30px; height: 20px; display: inline-block;"></div>	
Q103: Total time to drive to the District Hospital from the Birthing Centre (in minutes)?	<div style="border: 1px solid black; width: 30px; height: 20px; display: inline-block;"></div> <div style="border: 1px solid black; width: 30px; height: 20px; display: inline-block;"></div> <div style="border: 1px solid black; width: 30px; height: 20px; display: inline-block;"></div>	
Q104: Which year was this birthing centre established (Roman calendar)?	<div style="border: 1px solid black; width: 30px; height: 20px; display: inline-block;"></div> <div style="border: 1px solid black; width: 30px; height: 20px; display: inline-block;"></div> <div style="border: 1px solid black; width: 30px; height: 20px; display: inline-block;"></div> <div style="border: 1px solid black; width: 30px; height: 20px; display: inline-block;"></div>	
Q105: Is this birthing centre owned or rented?		
Its own	1	
Rented	2	Yes, but not separate
Other (specify) _____	3	2
Q106: Does the birthing centre have the following:	Yes	2
	Separate	No
a) Examination/consultation/admission room (at least 2)	1	0
b) Delivery room	1	0
c) Postnatal room	1	0
d) Laboratory	1	0
e) Pharmacy	1	0
f) Reception and waiting area	1	0
g) Area for family members (sleeping, eating etc.)	1	0
h) Utility room	1	0
i) Staff room (for night service)	1	0
Q107: Does this facility have a working phone to call outside that is available at all times client services are offered? (clarify that if 24 hour services are offered, this refers to 24 hour availability)		
Yes, onsite or within 5 mins walk	1	
Yes, within 5 min, not onsite	2	
Only pay phone or personal cell phone	3	
No	0	
Q108: Does this facility have a functional ambulance or other vehicle on-site for emergency transportation of clients? IF yes, ask		

if the vehicle is functioning and if there is fuel available. (Accept reported response.)	
Yes, functioning with fuel	1
Yes, not functioning or no fuel	2
No	0
Q109: What is the usual mode of transport the people in this VDC/Municipality use to bring the woman in labor at this birthing centre?	
1- Ambulance	
2- Bullock cart	
3- Rickshaw	
4- Rented motor vehicle	
5- Own motor vehicle	
6- Brought manually in the basket/stretchers	
Q110: What is done to dispose of the placenta (e.g.: placenta pit)?	
END OF SECTION 1	

## Section 2: Labor & Delivery Inventory

*ASK TO SPEAK WITH THE HEAD OF LABOR & DELIVERY UNIT (THIS MAY BE DIRECTOR/IN-CHARGE IF NO HEAD OF UNIT)*

Question	Yes	No	DK	Go to
Q201: Does this facility provide 24 hour coverage for delivery services?	1	0	98	No→Q203a
Q202: Is a person skilled in conducting deliveries present at the facility or on call 24 hours a day, including weekends, to provide delivery care?	Code			Go to
Yes, present, schedule observed	1			
Yes, present, schedule reported, not seen	2			
Yes, on-call schedule observed	3			
Yes, on-call, schedule reported, not seen	4			
No	0			

*READ ALOUD:* Now I am going to ask you about medical interventions for management of complications during labor or delivery. For each intervention, please tell me if this is ever provided at this facility, and if yes, if it has been conducted in this facility within the past 3 months.

Question	Yes	No	DK	Go to
Q203a: Does this facility ever provide parenteral oxytocic drugs for pregnancy-related hemorrhage	1	0	98	No→204a
Q203b: In the past 3 months	1	0	98	
Q204a: Does this facility ever provide parenteral anticonvulsants for pregnancy-related hypertension	1	0	98	No→205a
Q204b: In the past 3 months	1	0	98	
Q205a: Does this facility ever provide parenteral antibiotics for pregnancy-related infections	1	0	98	No→206a
Q205b: In the past 3 months	1	0	98	
Q206a: Does this facility ever perform manual removal of placenta	1	0	98	No→207a
Q206b: In the past 3 months	1	0	98	
Q207a: Does this facility ever perform newborn resuscitation	1	0	98	No→208a
Q207b: In the past 3 months	1	0	98	

Q208a: Does this facility ever perform assisted deliveries—that is, use ventouse (vacuum extractor)	1	0	No→209
Q208b: In the past 3 months	1	0	98
<p><i>READ ALOUD:</i> Now I want to ask you about how this facility handles contaminated reusable equipment after completing a delivery. If the unit processes some equipment and sends other equipment elsewhere, indicate the procedure for equipment processed in this service delivery unit. If vaginal deliveries are conducted in a different room than caesarean section deliveries, assess the processing equipment for vaginal deliveries.</p>			
Q209: After completing a delivery, what procedures do health workers follow for initial handling of contaminated equipment (such as speculums, scalpel handles, etc.) that will be reused another time?	Code	Go to	
<i>[Note: multiple response possible – up to three options]</i>			
Disinfectant, then soap & water scrub	1		
Soap & water scrub, then disinfectant soak	2		
Soap & water brush scrub only	3		
Disinfectant soak, not scrubbed	4		
Soap & water, not brush scrubbed	5		
Nothing is done	6		
Other (specify) _____	7		
Don't know	98		
<p>Q210: Besides decontaminating and cleaning, what is the final process most commonly used for disinfecting or sterilizing medical equipment (such as surgical instruments) before they are reused? If different methods are used for different types of equipment, indicate the method(s) used for metal equipment such as speculums or forceps.</p>			
Dry-heat sterilization	1		
Autoclaving	2		
Steam sterilization	3		
Boiling	4		
Chemical method	5		
Nothing is done	6		
Other (specify) _____	7		
Don't know	98		
<p><i>THERE ARE NO MORE QUESTIONS FOR THE HEAD OF LABOR &amp; DELIVERY UNIT/DIRECTOR. EXPLAIN THAT FOR THE NEXT SECTION, YOU WILL NEED TO WALK AROUND AND LOOK AT THE DELIVERY SERVICE AREA. THEY CAN NOW CHOOSE TO ACCOMPANY YOU FOR THE REST OF THE ASSESSMENT OR ATTEND TO OTHER BUSINESS. IF THEY DO NOT ACCOMPANY YOU, ASK IF A HEALTH WORKER INVOLVED IN DELIVERY CARE CAN HELP YOU WITH THE NEXT PART OF THE ASSESSMENT.</i></p>			
<p><i>ASK TO SEE THE ROOM WHERE NORMAL DELIVERIES ARE CONDUCTED.</i></p>			

Q211: Describe the setting of the delivery room	Code	Go to
Private room with visual and auditory privacy	1	
Non-private room with visual and auditory privacy	2	
Visual privacy only	3	
No privacy	4	
Q211a. How many rooms separated for delivery care?	<input type="text"/>	
Q212: Describe the conditions in the delivery room:		
Clean	1	
Dirty	2	
Don't Know	98	
Q212a: Is there a toilet for client use? near the delivery room		
Yes, attached to the delivery room	1	
Yes, but not attached to the delivery room	2	
No	0	→213
Q212b: Is the toilet functioning (clean, water availability/bucket)?		
Yes	1	
No	0	
Don't Know	98	
Q213: Is there electricity?		
Yes	1	
No	0	
Don't Know	98	
Q214: Is there backup electricity supply (inverter, solar, generator etc.) during load shedding?		
Yes	1	
No	0	
Don't Know	98	

*NOTE THE AVAILABILITY AND CONDITION OF THE FOLLOWING SUPPLIES, EQUIPMENT AND MEDICATIONS NEEDED FOR DELIVERY SERVICES. ITEMS MAY BE IN DELIVERY ROOM OR AN ADJACENT ROOM. IF YOU DO NOT SEE AN ITEM, ASK THE HEALTH WORKER HELPING YOU TO SHOW YOU THE ITEM.*

SUPPLIES AND EQUIPMENT IN DELIVERY ROOM	Observed	Reported not seen	Not available	Don't know	Go to
--	----------	-------------------------	------------------	---------------	-------

Q215: Clean and sterile gloves	1	2	3	98	
Q216: Puncture proof container	1	2	3	98	
Q217: Use of 5% Chlorine	1	2	3	98	
Q218: Stainless steel drums for gloves/instruments	1	2	3	98	
Q219: Containers to collect waste	1	2	3	98	
Q220: Soap for handwashing	1	2	3	98	
Q221: Water for handwashing	1	2	3	98	No/DK→22 2a
Question Q221a: How is water being made available for use in the delivery service area today?	Code				
Piped	1				
Bucket with tap	2				
Bucket or basin	3				
Not available today	0				
	Observed	Reported not seen	Not available	Don't know	Go to
Q222a: Syringes	1	2	3	98	
Q222b Needles	1	2	3	98	
Q223: Sterile scissors or blade	1	2	3	98	
Q224: Sterile disposable cord ties or clamps	1	2	3	98	
Q225: Chlorhexidine (CHX) available	1	2	3	98	



Q226: Towel or blanket to wrap baby	1	2	3	98			
Q227: Blank partographs or blank maternity booklets with partograph included	1	2	3	98			
	Availability (a) (Skip section b if not available or Don't know)				Functioning (b)		
	Observed	Reported not seen	Not available	Don't know	Yes	No	DK
Q228: Incubator	1	2	3	98	1	2	98
Q229: Other source of heat for premature infant (If yes, Specify) _____	1	2	3	98	1	2	98
Q230: Bag and mask (infant size) for resuscitation	1	2	3	98	1	2	98
Q231: Foot suction or electric suction or Delees for mucus extraction	1	2	3	98	1	2	98
Q232: Suction apparatus for use with catheter	1	2	3	98	1	2	98
Q.233: Cathether foies or rubber for retained placenta	1	2	3	98	1	2	98
Q234: Resuscitation table for baby	1	2	3	98	1	2	98
Q235: Ventouse (vacuum extractor - manual or electrical) for obstructed labor	1	2	3	98	1	2	98
Q236: Manual vacuum aspirator (MVA)	1	2	3	98	1	2	98
Q237: Dilatation and curettage (D&C) kit	1	2	3	98	1	2	98
Q238: GENERAL EQUIPMENT AND INSTRUMENTS	Observed	Reported,	Not Available	DK			

A. Instrument Trolley (at least 1)	1	Not	3	98
B. Stethoscope	1	seen	3	98
C. BP measuring apparatus	1	2	3	98
D. Fetoscope	1	2	3	98
E. An Oral thermometer	1	2	3	98
F. A Drum for gloves	1	2	3	98
G. A Cheattle Forceps with Jar	1	2	3	98
H. A Measuring tape	1	2	3	98
J. An Oxygen cylinder	1	2	3	98
K. A Portable light	1	2	3	98
L. Emergency light	1	2	3	98
M. Wall clock	1	2	3	98
N. IV sets (can be attached to bed)	1	2	3	98
O. Electronic suction Equipment	1	2	3	98
P. Episiotomy set	1	2	3	98
Q. Perinea /Vaginal / cervical repair set		2		
	1		3	98
Q239: FURNITURE:	1		3	98
	1	2	3	98
A. An examining Bed/Table;	1	2	3	98
B. Delivery Tables/beds		2		
C. Steps Foot	1	2	3	98
D. At least 2 mattresses with water proof covers	1		3	98
	1	2	3	98
E. At least 2 pillows with water proof covers	1	2	3	98
	1	2	3	98
F. Screen	1	2	3	98
G. Revolving stool	1	2	3	98
H. Cupboard		2		
I. Table		2		
J. At least 2 Chairs				
<i>IF MEDICATIONS ARE PACKAGED TOGETHER IN A COMBO-PAK, CIRCLE YES FOR EACH INDIVIDUAL MEDICATION IN THE PACK</i>				
Q240: MEDICATIONS in delivery room	Observed $\geq 1$ valid dose	Reported not seen	Not available	Don't know
A) Intravenous solutions: either Ringers lactate, D5NS, or NS infusion	1	2	3	98

B) Calcium Gluconate 10ml	1	2	3	98
C) Injectable oxytocin 1 IU/mL	1	2	3	98
D) 25% dextrose (2 amp)	1	2	3	98
E) Injectable magnesium sulfate 2cc/1gm	1	2	3	98
F) amoxicillin or injectable ampicillin	1	2	3	98
G) Injectable gentamicin	1	2	3	98
H) Hypertensive drug (nifedipine 5/10 mg or other)	1	2	3	98
I) IV Cannula (1 set)	1	2	3	98
<i>GUIDELINES MAY BE PRINTED OR HANDMADE.</i>				
GUIDELINES/ PROTOCOLS IN DELIVERY ROOM	Observed	Reported not seen	Not available	Don't know
Q250: Guidelines for care/managing normal labor and birth	1	2	3	98
Q251: Guidelines for emergency obstetric care	1	2	3	98
<i>ASK THE HEALTH WORKER TO SHOW YOU WHERE DELIVERY EQUIPMENT IS STERILIZED.</i>				
	Availability (a) (Skip section b if not available or Don't know)			
EQUIPMENT USED FOR STERILIZATION	Observed	Reported not seen	Not available	Don't know
				Y N DK e o s
Q253: Electric autoclave (Pressure and Wet Heat)	1	2	3	98
Q254: Non-electric autoclave (Pressure and Wet Heat)	1	2	3	98

	1	2	3	98		1	2	98
Q255:Electric boiler or steamer (no pressure)	1	2	3	98		1	2	98
Q256: Non-electric pot with cover (for steam/boil)	1	2	3	98		1	2	98
Q257: Heat source for non-electric equipment	1	2	3	98		1	2	98
Q258: TST Indicator strips or other item that indicates when sterilization is complete.	1	2	3	98		1	2	98
Q259: Does this facility practice Kangaroo Mother Care (Maya ko Angalo) for low birth weight babies?	Code							
Yes	1							
No	0							
END OF SECTION 2								

### Section 3: Antenatal Care Inventory

*ASK TO SPEAK WITH THE HEAD OF ANTENATAL CARE UNIT (THIS MAY BE DIRECTOR/IN-CHARGE IF NO HEAD OF UNIT)*

Question	Yes	No	Go to
Q300: Does this facility offer routine antenatal services?	1	0	
Q301: Does this facility offer referral antenatal services?	1	0	Q300 is no and Q301 is no→ end section
Q302: Does this facility have a system whereby measurements or procedures for ANC clients are routinely carried out before the consultation?	1	0	No→Q308

*ASK TO SEE THE PLACE WHERE ANTENATAL CLIENTS ARE SEEN BEFORE THEY HAVE THEIR MEDICAL CONSULTATION AND INDICATE WHICH OF THE FOLLOWING ACTIVITIES ARE ROUTINELY CARRIED OUT THERE. OBSERVE IF THE BELOW ACTIVITIES ARE BEING CONDUCTED ROUTINELY. IF NOT SEEN ASK:*

Is [read activity you do not see] routinely conducted for all antenatal care clients?	Observed	Reported not seen	Not available	DK	Go to
Q303: Weighing clients	1	2	3	98	
Q304: Taking blood pressure	1	2	3	98	
Q305: Urine test for protein	1	2	3	98	
Q306: Blood test for anemia	1	2	3	98	
Q307: Conducting group health education sessions	1	2	3	98	
Which of the following activities are performed as part of routine services, that is, each client has this test at least once.	Yes	No	DK	Referral only	Go to

Q308: Blood test for anemia	1	0	98	2
Q309: Blood test for syphilis	1	0	98	2
Q310: Blood group	1	0	98	2
Q311: Test for Rh factor	1	0	98	2
Q312: Urine test for protein	1	0	98	2
Q313: Urine test for glucose	1	0	98	2
Q314: Counseling on danger signs for pregnancy, labor/delivery, PNC	1	0	98	2
Q. 315: Counseling pregnancy women to come to BC for delivery and to bring their ANC card	1	0	98	2
Which of the following types of treatment and services are routinely offered to antenatal clients?				
Q316: Counseling about family planning	1	0	98	
Q317: Counseling about HIV/AIDS	1	0	98	
Q318 Testing for HIV/AIDS	1	0	98	
Q319: Is tetanus toxoid vaccination available all days antenatal care services are offered?	Code			Go to
Yes	1			
Not all days	2			
Never offered	3			
Q320: How many days each month are tetanus toxoid vaccinations offered at this	<input type="text"/>	<input type="text"/>		

facility or by this facility outside in the community? (If never offered, enter 00, don't know enter 98)		
<p><i>THERE ARE NO MORE QUESTIONS FOR THE HEAD OF ANTENATAL CARE UNIT/DIRECTOR. EXPLAIN THAT FOR THE NEXT SECTION, YOU WILL NEED TO WALK AROUND AND LOOK AT THE ANTENATAL CARE EXAMINATION AREA. THEY CAN NOW CHOOSE TO ACCOMPANY YOU FOR THE REST OF THE ASSESSMENT OR ATTEND TO OTHER BUSINESS. IF THEY DO NOT ACCOMPANY YOU, ASK IF A HEALTH WORKER INVOLVED IN ANTENATAL CARE CAN HELP YOU WITH THE NEXT PART OF THE ASSESSMENT.</i></p>		
<p><i>ASK TO SEE THE ROOM WHERE EXAMINATIONS FOR ANTENATAL CLIENTS ARE CONDUCTED.</i></p>		
Q321: Describe the setting of the ANC examination room	Code	Go to
Private room with visual and auditory privacy	1	
Non-private room with visual and auditory privacy	2	
Visual privacy only	3	
No privacy	4	
Q322: Describe the conditions in the ANC examination room		
Clean	1	
Dirty	2	
Don't Know	98	
Q323: Is there a toilet for client use near the ANC service delivery area	Code	Go to
Yes	1	
No	0	→Q324
Q323a: Is the toilet functioning (clean, water availability/bucket)?		
Yes	1	
No	0	

Don't know		98					
<p><i>NOTE THE AVAILABILITY AND CONDITION OF THE FOLLOWING SUPPLIES, EQUIPMENT AND MEDICATIONS NEEDED FOR ANC SERVICES. ITEMS MAY BE IN THE ROOM WHERE ANC EXAMINATIONS TAKE PLACE OR AN ADJACENT ROOM. IF YOU DO NOT SEE AN ITEM, ASK THE HEALTH WORKER HELPING YOU TO SHOW YOU THE ITEM.</i></p>							
SUPPLIES AND EQUIPMENT IN ANC EXAMINATION ROOM	Observed	Reported not seen	Not available	Don't know	Remarks		
	1	2	3	98			
Q324) Sharps container	1	2	3	98			
	1	2	3	98			
Q325) Alcohol hand rub	1	2	3	98			
Q326) Waste receptacle with lid and plastic liner	1	2	3	98			
Q327) Soap for handwashing	1	2	3	98			
<p><i>EQUIPMENT MAY BE IN EXAMINATION ROOM, AN ADJACENT ROOM, OR ROOM WHERE MEASURE IS TAKEN.</i></p>							
<p align="center"><i>AVAILABILITY (A)</i> (SKIP SECTION B IF NOT AVAILABLE OR DON'T KNOW)</p>							
<p><i>FUNCTIONING (B)</i></p>							
EQUIPMENT AND TESTING SUPPLIES	Observed	Reported not seen	Not available	Don't know	Y es	N o	D K
Q328) Blood pressure apparatus	1	2	3	98	1	2	98
Q329) Stethoscope	1	2	3	98	1	2	98
Q330) Fetal stethoscope (Fetoscope)	1	2	3	98	1	2	98
Q331) Adult weighing scale	1	2	3	98	1	2	98
Q332) Urine test strip for protein	1	2	3	98	1	2	98



Q333) Oral thermometer	1	2	3	98		1	2	98
	1	2	3	98		1	2	98
Q334) HIV rapid test / HIV Determine and Unigold	1	2	3	98		1	2	98
	1	2	3	98		1	2	98
Q335) Measuring tape	1	2	3	98		1	2	98
MEDICATIONS/ VACCINE	Observed	Reported not seen	Not available	Don't know	Go to			
Q336) Iron and/or folic acid	1	2	3	98				
	1	2	3	98				
Q337) Mebendazole/Albendazole tablets	1	2	3	98				
END OF SECTION 3								

## Section 4: Human Resource

*ASK TO SPEAK WITH THE DIRECTOR/IN-CHARGE AND FILL THE FOLLOWING:*

*Q401. NOTE DOWN THE INFORMATION BELOW AS PER REPORTED*

SL No	Position	A. Number of Post Designated	B. Number of Position Manned	C. If any Position not Manned/Absent, since When? (in weeks)
1	Medical Doctors			
2	Staff Nurses			
3	Health Assistants			
4	AHW / Senior AHW			
5	ANM / Senior ANM			
8	Others Specify			
<b>Total</b>				

*Q.402.* How many of the health workers are trained to conduct deliveries at the birthing center (ANM require 18 months training to be qualified)?

\_\_\_\_\_ Number

*Q403.* How many of the person(s) who is working to handle the deliveries at the birthing centre received the SBA training (additional two months training required by MoHP)?

\_\_\_\_\_ Number

End of Section 4

### Section 5: Health Facility Records/Posters

*ASK TO SPEAK WITH THE DIRECTOR/IN-CHARGE AND FILL THE FOLLOWING:*

*Q501. NOTE DOWN THE INFORMATION BELOW AS PER OBSERVATION*

SL No	Medical records/poster	Observed Yes=1 No=1
1	Anusuchi dosh (Monthly Client Information)	
2	Chlorohexidine use Cord Care Poster	
3	Jeevan Surakshya Flip Chart or Poster (Maternal and Newborn Protection)	
4	Pregnancy danger signs	
5	Newborn danger signs	
6	Family Planning Chart /Poster	
7	Magnesium Sulphate Use Guide	

Comments : \_\_\_\_\_

End of Section 5

**End of Health Facility Audit**

## **Appendix 2: Qualitative interview guides for maternal complication (in-depth interview and small group interview), maternal death, neonatal illness and neonatal death**

### **In-depth interview Illness Narrative Guide – Maternal Complication**

Week :

Interview Date:

Woman NNIPSNUM :

Interviewer ID :

Note taker ID :

Woman Ethnicity:

#### **Introduction:**

Namaste! Thank you for meeting with me today. I'm interested in hearing your story of what happened when you experienced any complication or illness during any time of your pregnancy, labor/delivery or the first seven days of postpartum period. Please take a moment to think back to that period and the events that took place during the complication. I am interested in everything you can remember especially from the time of the recognition of the complication to the events that followed.

#### **Question Guideline:**

##### **A. General information on pregnancy, labor delivery and immediate postpartum period**

1. Please describe your most recent pregnancy, labor and delivery and the first seven days of the postpartum period in terms of your experience and type of services sought in each period.

a) Probe on whether or not she received antenatal care at a health facility.

- i. If yes, ask where did she go, how often and why did she seek this service and did she seek this service in her previous pregnancies (if applicable). Also ask her opinion of the quality of care provided (satisfaction with the care provided, cleanliness, timeliness, health worker attitude etc.).
- ii. If no, then ask why she did not seek this service and what type of non-health facility service did she seek (if any) and why?

b) Probe on place of delivery.

- i. If health facility, ask where did she go, did she plan and why did she seek this service. What type of preparations were made to deliver at the health facility (saved money, transport preparation, clothes etc.) and did she seek this service in her previous pregnancies (if applicable). Ask about

her opinion the quality of care provided (satisfaction with the care provided, cleanliness, timeliness, health worker attitude etc.).

- ii. If no, then ask why she did not seek this service. If delivery was at home, who assisted with the delivery and the experience of homebirth?

c) Probe on what happened during the immediate postpartum period. Ask about the type of care she received in the first week after delivery – what type of care was sought and/or received, how often, her satisfaction with the care provided. If no care sought, ask why not.

## **B. Maternal complications**

1. Please describe some of the complications that you experienced during any time of your pregnancy, labor /delivery, and first week postpartum period of your most recent pregnancy?

If more than one described, then probe: In your opinion, which was the most severe of these complications and why?

## **C: Illness recognition of the most severe complication**

1. Please describe the types of problems related to the maternal complication that you described to be the most severe
  - a. When did this start?
  - b. What was it that made you think something was wrong?
    - i. Probe for descriptions of what was seen or felt (symptoms). Example: What were you feeling at the time?
  - c. Probe on whether you had other similar complication in the past. If so, in this pregnancy or previous pregnancy
  - d. Who among your household or community did you report to about this problem, if any?
2. How serious or severe did you think the problem was?
  - a. Probe on reasons on why you thought the problem was or was not serious.
  - b. Probe on whether you or some other member in your household or community thought it was serious

## **D. Care Seeking and Decision Making**

*Now tell the respondent that the following questions will be about the sequence of care seeking behaviors and factors related to care seeking that followed after recognizing the illness/problem.*

1. After recognizing the illness/problem, what did you and/or your family do **first** to address this problem?
  - a. If care was sought, from whom (what kind of provider) and where (place of care – facility level, home or other place) was the first level of care sought? What type of treatment/care was given?
  - b. If care was in the home, then probe on what type of treatment/care was given and by whom?
  - c. Who (family members, yourself, community members) was involved in the decision-making process for seeking this care, if anyone? Who made the final decision for seeking this care?

- d. What factors were considered in seeking this type of care? If care was provided at home, probe on why care was not sought outside of the home (barriers to seeking care at health facility)?
- e. How long did it take to seek this care after the recognition of the illness/problem? Probe on why care was not sought immediately if time to seek care was more than an hour.
- f. How did you feel about the care/treatment received? Probe on reasons for satisfaction or dissatisfaction with the treatment provider, place of treatment (if outside home), type of care received?

2. What did you and/or your family do **next** to address this problem?

- a. If care was sought, from whom (what kind of provider) and where (place of care – facility level, home or other place) was the first level of care sought? What type of treatment/care was given?
- b. If care was in the home, then probe on what type of treatment/care was given and by whom?
- c. Who (family members, yourself, community members) was involved in the decision-making process for seeking this care, if anyone? Who made the final decision for seeking this care?
- d. What factors were considered in seeking this type of care? If care was provided at home, probe on why care was not sought outside of the home (barriers to seeking care at health facility)?
- e. How long did it take to seek this care after the recognition of the illness/problem? Probe on why care was not sought immediately if time to seek care was more than an hour.
- g. How did you feel about the care/treatment received? Probe on reasons for satisfaction or dissatisfaction with the treatment provider, place of treatment (if outside home), type of care received?

*[Continue asking these questions until last treatment/care was sought]*

3. How is your health now? If recovered from illness, ask how long did it take for you to recover from the initial onset of the illness? If still not well, ask what her health problems are and what care is currently seeking or planning to seek.

### **E: Causes and lessons learned**

1. What do you think caused or resulted in this problem? Probe to elaborate on any of the reasons given. Also probe on what could have prevented this from happening and why?
2. If this were to happen again, what would you change or do differently? Probe, on whether type of care sought, decision making or timeliness of care seeking would be different and why? What advice would you give other pregnant women who had similar problem and why?
3. What do you know about the Nepal Safe Motherhood Programme? Probe on whether they know about the financial incentive program and free delivery service at birthing centers? Probe on where they received their information from.
4. Is there anything else you would like to share with me that we haven't discussed?

## **MATERNAL ILLNESS EVENT TIMELINE**

Diagram the event timeline developed by the group in the space provided below, starting at the time the focal woman first started feeling sick/unwell until she was better or the illness was resolved. On top of the line, record key symptoms and the progression of events. Below the line, include actions taken, including seeking treatment/care.

**Start of illness**

**Resolution**



## Group interview Illness Narrative Guide – Maternal Complication

Week :

Interview Date:

Woman NNIPSNUM :

Interviewer ID :

Note taker ID :

Woman Ethnicity:

Participant	Present during Interview?	Present during any time of Illness event?
Focal Woman		
Focal woman's mother		
Focal woman's mother-in-law		
Focal woman's daughter		
Focal woman's daughter-in-law		
Focal woman's sister		
Focal woman's sister-in-law		
Focal woman's other relative (define):		
Focal woman's neighbor or friend		
Focal woman's husband		
Focal woman's other (define):		
Birth attendant (define type):		
Other (define):		

### **Introduction:**

Namaste! Thank you for meeting with me today. I'm interested in hearing your story from what each of you witnessed when (fill in woman's name) experienced (fill in the most severe complication reported by the focal woman) during her latest pregnancy. Please take a few minutes to think back to the time the illness event had taken place. I am interested in everything each of you can remember from the time of the recognition of the complication to the events that



followed. It is ok if there are differences in the accounts and opinions as people often see things differently.

### **Question Guideline:**

#### **A: Illness Recognition**

3. Please describe the types of problems related to the (fill in the most severe maternal complication) that the woman experienced on (fill in the period of the event obtained from the earlier interview with the woman).
  - a. When did this start?
  - b. What was it that made you think something was wrong?
    - i. Probe for descriptions of what was seen or felt (symptoms). Example: What did the woman report at the time?
    - ii. Probe on whether any of the witnesses have different opinions on their assessment of the problem and how it differed?
  - c. How serious or severe did the witnesses think the problem was? Probe on reasons on why the witnesses thought the problem was or was not serious and if there are differences in their perception of the severity

#### **B. Care Seeking and Decision Making**

*Ask the witnesses to provide an account of the sequence of care seeking behaviors and factors related to care seeking that followed after recognizing the illness/problem.*

1. After recognizing the illness/problem, what was done **first** to address this problem?
  - h. If care was sought, from whom (what kind of provider) and where (place of care – facility level, home or other place) was the first level of care sought? What type of treatment/care was given?
  - i. If care was in the home, then probe on what type of treatment/care was given and by whom?
  - j. Who (family members, community members) was involved in the decision-making process for seeking this care, if anyone? Who made the final decision for seeking this care and why did the other approve or disapprove of this decision?
  - k. What factors were considered in seeking this type of care? If care was provided at home, probe on why care was not sought outside of the home (barriers to seeking care at health facility)?
  - l. How long did it take to seek this care after the recognition of the illness/problem? Probe on why care was not sought immediately if time to seek care was more than an hour.
  - m. How did you feel about the care/treatment provided? Probe on reasons for satisfaction or dissatisfaction with the treatment provider, place of treatment (if outside home), type of care received?
2. What was done **next** to address this problem?
  - f. If care was sought, from whom (what kind of provider) and where (place of care – facility level, home or other place) was the first level of care sought? What type of treatment/care was given?
  - g. If care was in the home, then probe on what type of treatment/care was given and by whom?

- h. Who (family members, community members) was involved in the decision-making process for seeking this care, if anyone? Who made the final decision for seeking this care and why did the other approve or disapprove of this decision?
- i. What factors were considered in seeking this type of care? If care was provided at home, probe on why care was not sought outside of the home (barriers to seeking care at health facility)?
- j. How long did it take to seek this care after the recognition of the illness/problem? Probe on why care was not sought immediately if time to seek care was more than an hour.
- n. How did you feel about the care/treatment provided? Probe on reasons for satisfaction or dissatisfaction with the treatment provider, place of treatment (if outside home), type of care received?

*[Continue asking these questions until last treatment/care was sought]*

### **C: Causes and lessons learned**

- 5. What does the group think caused or resulted in this problem? Probe to elaborate on any of the reasons given. Also probe on what they think could have prevented this from happening and why?
- 6. If this were to happen again, what would you change or do differently? Probe, on whether type of care sought, decision making or timeliness of care seeking would be different and why?
- 7. Is there anything else you would like to share with me that we haven't discussed?

### **MATERNAL ILLNESS TIMELINE**

Diagram the event timeline developed by the group in the space provided below, starting at the time the focal woman first started feeling sick/unwell until she was better or the illness was resolved. On top of the line, record key symptoms and the progression of events. Below the line, include actions taken, including seeking treatment/care.

**Start of illness**

**Resolution**



**Group Interview Illness Narrative Guide – Maternal death (anytime during pregnancy, labor or postpartum period)**

Week :

Interview Date:

Woman NNIPNUM :

Interviewer ID :

Note taker ID :

Woman Ethnicity:

Participant	Present during Interview?	Present during Illness Event?
Main caregiver during final illness (relationship to focal woman: _____)		
Focal woman's mother		
Focal woman's mother-in-law		
Focal woman's daughter		
Focal woman's daughter-in-law		
Focal woman's sister		
Focal woman's sister-in-law		
Focal woman's other relative (define):		
Focal woman's neighbor or friend		
Focal woman's husband		
Focal woman's other (define):		
Birth attendant (define type):		
Other (define):		

**Introduction:**

Namaste! Thank you for meeting with me today. Firstly, I would like to convey my condolence on the demise of (focal woman's name). I understand that this is a very difficult time for each of you. As mentioned earlier, this study aims to understand the recognition, care seeking and decision making process during the event of illness or complication that a pregnant woman experiences during any time of her pregnancy, labor/delivery and first week postpartum period. In order to understand and learn about what happened during the illness events that resulted in

maternal death, we have come to hear from your experience. We will be asking questions about what complication or illness (focal woman's name) experienced and the events that followed before she died. Some of the questions we will be asking may be uncomfortable to answer and we completely understand the sensitive nature of this topic. You can either take your time to come back to the question or not answer the question or stop/leave the interview at any time if you are not comfortable. Please take a few minutes to think back to time (focal woman's name) first showed signs of illness and the events that followed until her demise. We would like to hear from the primary caregiver first and then invite the others to contribute towards each question. It is ok if there are differences in the accounts and opinions as people often see things differently. I will start with some general questions about her pregnancy and then will ask specific questions related to the illness episode that resulted in her death.

[Ask if you can start with the interview]

### **QUESTION GUIDELINE:**

#### **A: General information**

1. Please describe the pregnancy period, labor/delivery and the postpartum period (if applicable) related to the most recent pregnancy?

a) Probe on whether or not she received antenatal care at a health facility.

i. If yes, ask where did she go, how often and why did she seek this service and did she seek this service in her previous pregnancies (if applicable). Also ask her opinion of the quality of care provided (satisfaction with the care provided, cleanliness, timeliness, health worker attitude etc.).

ii. If no, then ask why she did not seek this service and what type of non-health facility service did she seek (if any) and why?

b) Probe on place of delivery (if she did not die before delivery).

i. If health facility, ask where did she go, did she plan and why did she seek this service. What type of preparations were made to deliver at the health facility (saved money, transport preparation, clothes etc.) and did she seek this service in her previous pregnancies (if applicable). Ask about her opinion the quality of care provided (satisfaction with the care provided, cleanliness, timeliness, health worker attitude etc.).

ii. If no, then ask why she did not seek this service. If delivery was at home, who assisted with the delivery and the experience of homebirth?

c) If, she was still alive after delivery, probe on what happened during the first week after delivery. Ask about what type of care was sought and/or received, how often, her satisfaction with the care provided. If no care sought/received, then ask why not.

2. Ask the group to describe any episode of illness (besides the illness that led to woman's death) that the woman experienced at any time during pregnancy, labor/delivery and postpartum period.

Probe to elaborate on the signs and symptoms, perceived severity, timing of each illness episode and what care was sought (if any).

### **B: Recognition**

*Now tell the group that the following questions are about the illness event that led to the woman's death*

*[Take a few seconds to assess the behaviors of the group members. If they seem emotional and uncomfortable, ask them if they would like to take a break before proceeding with the interview. Mention again that they can choose not to reply to any questions if they do not feel comfortable and can also stop or leave the group interview if needed. Ask each of them whether they would like to proceed with this interview]*

4. Please describe the types of problems the woman experienced that led to her death.
  - a. When did this start and when they recognized it to be a problem?
  - b. What was it that made you think something was wrong?
    - i. Probe for descriptions of what was seen or felt (symptoms). Example: What did the woman report at the time?
    - ii. Probe on whether any of the witnesses have different opinions on their assessment of the problem and how it differed?
  - c. How serious or severe did the witnesses think the problem was? Probe on reasons on why the witnesses thought the problem was or was not serious and if there are differences in their perception of the severity

### **B. Care Seeking and Decision Making**

*Now tell the group that the following questions will be about the sequence of care seeking behaviors and factors related to care seeking that followed after recognizing the illness/problem.*

*[Take a few seconds to assess the behaviors of the group members. If they seem emotional and uncomfortable, ask them if they would like to take a break before proceeding with the interview. Mention again that they can choose not to reply to any questions if they do not feel comfortable and can also stop or leave the group interview if needed. Ask each of them whether they would like to proceed with this interview]*

1. After recognizing the illness/problem, what was done **first** to address this problem?
  - o. If care was sought, from whom (what kind of provider) and where (place of care – facility level, home or other place) was the first level of care sought? What type of treatment/care was given?
  - p. If care was in the home, then probe on what type of treatment/care was given and by whom?
  - q. Who (family members, community members) was involved in the decision-making process for seeking this care, if anyone? Who made the final decision for seeking this care and why did the other approve or disapprove of this decision? *[Probe to get information from each member of the group]*

- r. What factors were considered in seeking this type of care? If care was provided at home, probe on why care was not sought outside of the home (barriers to seeking care at health facility)?
- s. How long did it take to seek this care after the recognition of the illness/problem? Probe on why care was not sought immediately if time to seek care was more than an hour.
- t. How did you feel about the care/treatment provided? Probe on reasons for satisfaction or dissatisfaction with the treatment provider, place of treatment (if outside home), type of care received?
- u. What was the condition of the (fill in focal woman's name) then?

2. What was done **next** to address this problem?

- a. If care was sought, from whom (what kind of provider) and where (place of care – facility level, home or other place) was the first level of care sought? What type of treatment/care was given?
- b. If care was in the home, then probe on what type of treatment/care was given and by whom?
- c. Who (family members, community members) was involved in the decision-making process for seeking this care, if anyone? Who made the final decision for seeking this care and why did the other approve or disapprove of this decision? *[Probe to get information from each member of the group]*
- d. What factors were considered in seeking this type of care? If care was provided at home, probe on why care was not sought outside of the home (barriers to seeking care at health facility)?
- e. How long did it take to seek this care after the recognition of the illness/problem? Probe on why care was not sought immediately if time to seek care was more than an hour.
- f. How did you feel about the care/treatment provided? Probe on reasons for satisfaction or dissatisfaction with the treatment provider, place of treatment (if outside home), type of care received?
- g. What was the condition of the (fill in focal woman's name) then?

*[Continue asking these questions until last treatment/care was sought]*

3. At the end, where and when (since the last care was sought) did the (fill in focal woman's name) die? Ask them to elaborate on the duration it took from the onset of illness to the death.

4. Ask the group to discuss any differences in their memories of the event among themselves.

**C: Causes and lessons learned**

*Now inform the group that we have reached the last few questions of the interview which will be on their opinion of what caused the illness event and what was learnt from this unfortunate event.*

*[Take a few seconds to assess the behaviors of the group members. If they seem emotional and uncomfortable, ask them if they would like to take a break before proceeding with the interview. Ask each of them whether they would like to proceed with this interview]*

8. What does the group think caused or resulted in this problem? Probe to elaborate on any of the reasons given. Also probe on what they think could have prevented this from happening and why?
9. What would you suggest to friends/family members if you saw another woman with the same symptoms in the future?
10. Is there anything else you would like to share with me that we haven't discussed?
11. What have the group members learnt from this experience? Probe: what would the group members change or do differently and why?

### **MATERNAL DEATH EVENT TIMELINE**

Diagram the event timeline developed by the group in the space provided below, starting at the time the focal woman first started feeling sick/unwell until she died. On top of the line, record key symptoms and the progression of events. Below the line, include actions taken, including seeking treatment/care.

**Start of illness**

**Death**



## Group interview Illness Narrative Guide – Newborn Complication

Week :

Interview Date:

Woman NNIPSNUM :

Interviewer ID :

Note taker ID :

Woman Ethnicity:

Participant	Present during Interview?	Present during Illness Event?
Newborn main caregiver (focal woman) (relationship to newborn: _____		
Focal woman's mother		
Focal woman's mother-in-law		
Focal woman's daughter		
Focal woman's daughter-in-law		
Focal woman's sister		
Focal woman's sister-in-law		
Focal woman's other relative (define):		
Focal woman's neighbor or friend		
Focal woman's husband		
Focal woman's other (define):		
Birth attendant (define type): _____		
Other (define): _____		

### **Introduction:**

Namaste! Thank you for meeting with me today. I'm interested in hearing your story of what happened when (filled in the newborn baby's name) experienced any illness. Please take a few minutes to think back to the time the illness events had taken place. I am interested in everything each of you can remember from the time the baby showed signs of illness, the events that followed until the baby started to feel better. We would like to hear from the primary caregiver



first and then invite the others to contribute towards each question. It is ok if there are differences in the accounts and opinions as people often see things differently.

**Question Guideline:**

**A. General information about baby**

1. Please describe the pregnancy period, labor and delivery and the postpartum period (up to 28 days) related to the birth of this baby in terms your experience and type of care sought in each period.

a) Probe on whether or not she received antenatal care at a health facility.

i. If yes, ask where did she go, how often and why did she seek this service and did she seek this service in her previous pregnancies (if applicable). Also ask her opinion of the quality of care provided (satisfaction with the care provided, cleanliness, timeliness, health worker attitude etc.).

ii. If no, then ask why she did not seek this service and what type of non-health facility service did she seek (if any) and why?

b) Probe on place of delivery.

iii. If health facility, ask where did she go, did she plan and why did she seek this service. What type of preparations were made to deliver at the health facility (saved money, transport preparation, clothes etc.) and did she seek this service in her previous pregnancies (if applicable). Ask about her opinion the quality of care provided (satisfaction with the care provided, cleanliness, timeliness, health worker attitude etc.).

iv. If no, then ask why she did not seek this service. If delivery was at home, who assisted with the delivery and the experience of homebirth?

c) Probe on what happened during the postpartum period (first month). Ask about the type of care the baby received in the first month after delivery – what type of care was sought and/or received, how often, her satisfaction with the care provided. If no care sought, ask why not.

2. Ask the group to describe any episode of illness that the baby experience in the first 28 days since being born. Probe to elaborate on the signs and symptoms, perceived severity and timing of each illness episode.

*[Obtain consensus on the most severe illness event the baby experienced from the view point of the group members]*

**B: Illness Recognition**

*Now tell the group that the following questions are for the baby's most severe illness event that was described earlier.*

5. Please describe the most severe illness event the baby experienced.

- a. When did this start and when they recognized it to be a problem?
- b. What was it that made you think something was wrong?

- i. Probe for descriptions of what was seen (symptoms)
  - ii. Probe on whether any of the witnesses have different opinions on their assessment of the problem and how it differed?
- c. How serious or severe did the witnesses think the problem was? Probe on reasons on why the witnesses thought the problem was or was not serious and if there are differences in their perception of the severity

### **C. Care Seeking and Decision Making**

*Now tell the group that the following questions will be about the sequence of care seeking behaviors and factors related to care seeking that followed after recognizing the illness/problem.*

1. After recognizing the illness/problem, what was done **first** to address this problem?
  - a. If care was sought, from whom (what kind of provider) and where (place of care – facility level, home or other place) was the first level of care sought? What type of treatment/care was given?
  - b. If care was in the home, then probe on what type of treatment/care was given and by whom?
  - c. Who (family members, community members) was involved in the decision-making process for seeking this care? Who made the final decision for seeking this care and why did the others approve or disapprove of this decision? *[Probe to get information from each member of the group]*
  - d. What factors were considered in seeking this type of care? If care was provided at home, probe on why care was not sought outside of the home (barriers to seeking care at health facility)?
  - e. How long did it take to seek this care after the recognition of the illness/problem? Probe on why care was not sought immediately if time to seek care was more than an hour.
  - f. How did group members who witnessed the care provided feel about the care/treatment? Probe on reasons for satisfaction or dissatisfaction with the treatment provider, place of treatment (if outside home), type of care received?
  - g. What was the condition of the baby?
2. What was done **next** to address this problem?
  - a) If care was sought, from whom (what kind of provider) and where (place of care – facility level, home or other place) was the first level of care sought? What type of treatment/care was given?
  - b) If care was in the home, then probe on what type of treatment/care was given and by whom?
  - c) Who (family members, community members) was involved in the decision-making process for seeking this care, if anyone? Who made the final decision for seeking this care and why did the other approve or disapprove of this decision? *[Probe to get information from each member of the group]*
  - d) What factors were considered in seeking this type of care? If care was provided at home, probe on why care was not sought outside of the home (barriers to seeking care at health facility)?
  - e) How long did it take to seek this care after the recognition of the illness/problem? Probe on why care was not sought immediately if time to seek care was more than an hour.

- f) How did group members who witnessed the care provided feel about the care/treatment? Probe on reasons for satisfaction or dissatisfaction with the treatment provider, place of treatment (if outside home), type of care received?
- g) What was the condition of the baby?

*[Continue asking these questions until last treatment/care was sought]*

3. How is the baby's health now? How long did it take for him to recover from the start of recognition of illness to his recovery?
4. Ask the group to discuss any differences in their memories of the event among themselves.

#### **D: Causes and lessons learned**

12. What does the group think caused or resulted in this problem? Probe to elaborate on any of the reasons given. Also probe on whether this was preventable and if so, what they think could have prevented this from happening and why?
13. If this were to happen again, what would the group members change or do differently? Probe, on whether type of care sought, decision making or timeliness of care seeking would be different and why?
3. Is there anything else you would like to share with me that we haven't discussed?

#### **NEWBORN ILLNESS EVENT TIMELINE**

Diagram the event timeline developed by the group in the space provided below, starting at the time the baby first started feeling sick/unwell until he/she was better or the illness was resolved. On top of the line, record key symptoms and the progression of events. Below the line, include actions taken, including seeking treatment/care.

**Start of illness**

**Resolution**



## Group interview Illness Narrative Guide – Newborn Death

Week :

Interview Date:

Woman NNIPNUM :

Interviewer ID :

Note taker ID :

Woman Ethnicity:

Participant	Present during Interview?	Present during Illness Event?
Newborn main caregiver (focal woman) (relationship to newborn: _____		
Focal woman's mother		
Focal woman's mother-in-law		
Focal woman's daughter		
Focal woman's daughter-in-law		
Focal woman's sister		
Focal woman's sister-in-law		
Focal woman's other relative (define):		
Focal woman's neighbor or friend		
Focal woman's husband		
Focal woman's other (define):		
Birth attendant (define type): _____		
Other (define):		

### **Introduction:**

Namaste! Thank you for meeting with me today. Firstly, I would like to convey my condolence to the family members on the demise of (baby's name). I understand that this is a very difficult time for each of you. As mentioned earlier, this study aims to understand the recognition, care seeking and decision making process during the event of a newborn illness. In order to understand and learn about what happened during the illness events that resulted in a newborn's

death, we have come to hear from your experience. We will be asking questions about what complication or illness (baby's name) experienced and the events that followed before he or she died. Some of the questions we will be asking may be uncomfortable to answer and we completely understand the sensitive nature of this topic. You can either take your time to come back to the question or not answer the question or stop/leave the interview at any time if you are not comfortable. We will be asking questions related to the illness that led to the baby's death. Please take a few minutes to think back to time the baby first showed signs of illness and the events that followed until the baby's demise. We would like to hear from the primary caregiver first and then invite the others to contribute towards each question. It is ok if there are differences in the accounts and opinions as people often see things differently. I will start with some general questions about the pregnancy, labor/delivery and postpartum period related to the birth of (baby's name) and then will ask specific questions related to the illness episode that resulted in his/her death.

[Ask if you can start with the interview]

### **QUESTION GUIDELINE:**

#### **A. General information about baby**

1. Please describe the pregnancy period, labor and delivery and the postpartum period related to the birth of this baby?

a) Probe on whether or not the mother received antenatal care at a health facility.

i. If yes, ask where did she go, how often and why did she seek this service and did she seek this service in her previous pregnancies (if applicable). Also ask her opinion of the quality of care provided (satisfaction with the care provided, cleanliness, timeliness, health worker attitude etc.).

ii. If no, then ask why she did not seek this service and what type of non-health facility service did she seek (if any) and why?

b) Probe on place of delivery.

i. If health facility, ask where did she go, did she plan and why did she seek this service. What type of preparations were made to deliver at the health facility (saved money, transport preparation, clothes etc.) and did she seek this service in her previous pregnancies (if applicable). Ask about her opinion the quality of care provided (satisfaction with the care provided, cleanliness, timeliness, health worker attitude etc.).

ii. If no, then ask why she did not seek this service. If delivery was at home, who assisted with the delivery and the experience of homebirth?

c) Probe on what happened in the days after the delivery in regards to general postpartum care. Ask about what type of care was sought and/or received, how often, her satisfaction with the care provided. If no care sought/received, then ask why not.

2. Ask the group to describe any episode of illness (besides the illness that led to baby's death) that the baby experience in the first 28 days since being born. Probe to elaborate on the signs and symptoms, perceived severity, timing of each illness episode and what care was sought (if any).

### **B: Recognition**

*Now tell the group that the following questions are about the illness event that led to the baby's death.*

*[Take a few seconds to assess the behaviors of the group members. If they seem emotional and uncomfortable, ask them if they would like to take a break before proceeding with the interview. Mention again that they can choose not to reply to any questions if they do not feel comfortable and can also stop or leave the group interview if needed. Ask each of them whether they would like to proceed with this interview]*

6. Please describe the illness event the baby experienced before his/her death.
  - a. When did this start and when they recognized it to be a problem?
  - b. What was it that made you think something was wrong?
    - i. Probe for descriptions of what was seen (symptoms)
    - ii. Probe on whether any of the witnesses have different opinions on their assessment of the problem and how it differed?
  - c. How serious or severe did the witnesses think the problem was? Probe on reasons on why the witnesses thought the problem was or was not serious and if there are differences in their perception of the severity

### **C. Care Seeking and Decision Making**

*Now tell the group that the following questions will be about the sequence of care seeking behaviors and factors related to care seeking that followed after recognizing the illness/problem.*

*[Take a few seconds to assess the behaviors of the group members. If they seem emotional and uncomfortable, ask them if they would like to take a break before proceeding with the interview. Mention again that they can choose not to reply to any questions if they do not feel comfortable and can also stop or leave the group interview if needed. Ask each of them whether they would like to proceed with this interview]*

1. After recognizing the illness/problem, what was done **first** to address this problem?
  - h. If care was sought, from whom (what kind of provider) and where (place of care – facility level, home or other place) was the first level of care sought? What type of treatment/care was given?
  - i. If care was in the home, then probe on what type of treatment/care was given and by whom?
  - j. Who (family members, community members) was involved in the decision-making process for seeking this care? Who made the final decision for seeking this care and why did the others approve or disapprove of this decision? *[Probe to get information from each member of the group]*

- k. What factors were considered in seeking this type of care? If care was provided at home, probe on why care was not sought outside of the home (barriers to seeking care at health facility)?
- l. How long did it take to seek this care after the recognition of the illness/problem? Probe on why care was not sought immediately if time to seek care was more than an hour.
- m. How did group members who witnessed the care provided feel about the care/treatment? Probe on reasons for satisfaction or dissatisfaction with the treatment provider, place of treatment (if outside home), type of care received?
- n. What was the condition of the baby (name) then?

2. What was done **next** to address this problem?

- h) If care was sought, from whom (what kind of provider) and where (place of care – facility level, home or other place) was the first level of care sought? What type of treatment/care was given?
- i) If care was in the home, then probe on what type of treatment/care was given and by whom?
- j) Who (family members, community members) was involved in the decision-making process for seeking this care, if anyone? Who made the final decision for seeking this care and why did the other approve or disapprove of this decision? *[Probe to get information from each member of the group]*
- k) What factors were considered in seeking this type of care? If care was provided at home, probe on why care was not sought outside of the home (barriers to seeking care at health facility)?
- l) How long did it take to seek this care after the recognition of the illness/problem? Probe on why care was not sought immediately if time to seek care was more than an hour.
- m) How did group members who witnessed the care provided feel about the care/treatment? Probe on reasons for satisfaction or dissatisfaction with the treatment provider, place of treatment (if outside home), type of care received?
- n) What was the condition of the baby (name) then?

*[Continue asking these questions until last treatment/care was sought]*

3. At the end, where and when (since the last care was sought) did (baby's name) die? Ask them to elaborate on the duration it took from the onset of illness to the death.

4. Ask the group to discuss any differences in their memories of the event among themselves.

### **D: Causes and lessons learned**

*Now inform the group that we have reached the last few questions of the interview which will be on their opinion of what caused the illness event and what was learnt from this unfortunate event.*

*[Take a few seconds to assess the behaviors of the group members. If they seem emotional and uncomfortable, ask them if they would like to take a break before proceeding with the interview. Ask each of them whether they would like to proceed with this interview]*

- 14. What does the group think caused the illness that resulted in (baby's name) death? Probe to elaborate on any of the reasons given. Also probe on whether this was preventable and if so, what they think could have prevented this from happening and why?
- 15. What have the group members learnt from this experience? Probe: what would the group members change or do differently and why?

16. What would you suggest to friends/family members if you saw another baby with the same symptoms in the future?
17. Is there anything else you would like to share with me that we haven't discussed?

### **NEWBORN DEATH EVENT TIMELINE**

Diagram the event timeline developed by the group in the space provided below, starting at the time the baby first started feeling sick/unwell until his/her death. On top of the line, record key symptoms and the progression of events. Below the line, include actions taken, including seeking treatment/care.

**Start of illness**

**Death**





### Appendix 3. NOMS parent trial questionnaire on newborn morbidity and care seeking

#### NEPAL Oil Massage Study – NEWBORN FOLLOW UP FORM

Week  Date  Worker ID

VDC  Ward  Sector  HH

	NNIPSNUM	First Names	Last Name	VS	1=Alive
Mother	<input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	
Father	<input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	
Child	<input type="text"/> of <input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	

1. NFF VISIT

NFF Visit Number  
01 02 03 04 05 06 07 08 09 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78 79 80 81 82 83 84 85 86 87 88 89 90 91 92 93 94 95 96 97 98 99 100

2. Time of Visit:

→ 1 = 12:00 AM – 11:59 NOON  
2 = 12:00 PM – 11:59 NIGHT  
HH MM

3. Form Status:

1 = Visit Consented  
2 = No One Met before next scheduled visit → STOP

## **Section A: Questions to the mother about the child's health**

- For NFF 01, ask **“Since birth ...”**
- For NFF 03, 07, 10, 14, 21, and 28, ask **“Since my last visit”**

No	Question	Response	
1.	Has your baby been fed breastmilk (from baby's own mother)	<input type="checkbox"/>	<div style="display: flex; align-items: center; justify-content: center;"> <div style="font-size: 4em; margin-right: 10px;">}</div> <div> <p>0 = No</p> <p>1 = Yes</p> </div> </div>
2.	Has your baby been fed breastmilk from another mother?	<input type="checkbox"/>	
3.	Has your baby been fed cow/goat milk?	<input type="checkbox"/>	
4.	Has your baby had difficulty sucking?	<input type="checkbox"/>	
5.	Has your baby had difficulty breathing?	<input type="checkbox"/>	
6.	Has your baby had convulsions?	<input type="checkbox"/>	
7.	Has your baby had stiffness of the back?	<input type="checkbox"/>	
8.	Has your baby been hot to touch?	<input type="checkbox"/>	
9.	Has your baby been cold to touch?	<input type="checkbox"/>	
10.	Has your baby had vomiting (more than half the feed)?	<input type="checkbox"/>	
11.	Has your baby been very lethargic or unconscious?	<input type="checkbox"/>	
12.	Has your baby's body, soles, palms, or eyes become yellow color?	<input type="checkbox"/>	
13.	Has your baby had any skin infection or other skin problem?	<input type="checkbox"/>	
	<b>Note:</b> <b>If answer to any questions 4,5,6,7,11,or 12 is "1=Yes",</b> <b>please refer the baby to the nearest health facility.</b>	<input type="checkbox"/>	<p>0= not referred</p> <p>1= referred to h.f.</p> <p>9= do not know</p>

## **Section B: Newborn Care Practices and Care Seeking:**

- For NFF 01, ask **“Since birth ...”**
- For NFF 03, 07, 10, 14, 21, and 28, ask **“Since my last visit”**

1.	Have you applied anything to the umbilical cord?	0 = No 1 = Yes (go to 1a) 9 = Don't Know	<input type="checkbox"/>
----	--	--	--------------------------

	<b>1a.</b> What was applied to the cord? (record up to 2 responses)	1 = CHX from Kawach Tube 2 = NNIPS oil 3 = Other oil (specify) 4 = Mud 5 = Ash 6 = Other (specify)	<input type="checkbox"/> _____ <input type="checkbox"/> _____
<b>2.</b>	Has the baby been placed skin-to-skin with mother (or father) to keep him/her warm?	0 = No 1 = Yes 9 = Don't Know	<input type="checkbox"/>
<b>3.</b>	Has the baby worn a hat or other covering on his/her head?	0 = No 1 = Yes 9 = Don't Know	<input type="checkbox"/>
<b>4.</b>	Has the baby been given a bath?	0 = No 1 = Yes 9 = Don't Know	<input type="checkbox"/>
<b>5.</b>	Has the baby received any health care at home or outside the home?	0 = No 1 = Yes (Go to 5a) 9 = Don't Know	<input type="checkbox"/>
	<b>5a.</b> Who did the baby get care from?  (Up to 3 Responses)	1=Dhami Jhankri/TBA 2=Medicine shop/local (non MBBS) doctor 3=Subhealth post or auxillary health worker 4=Health post/health assistant/ private practitioner / staff nurse 5=Primary health center/MBBS doctor/nursing home 6=Hospital 9= Don't know	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
	<b>5b.</b> Was any drug or medication given to the child?	0 = No 1 = Yes (Specify) 9 = Don't Know	<input type="checkbox"/> _____

### **Section C: Examination of the Baby →**

**Child  
Met  
Status**

☐

1=Met → Continue with Examination

2=Not Met → GO TO SECTION D

<b>1.</b>	Record the respiratory rate of the baby (number of breaths in one minute)	000 – 150 breaths/minute 999 = Don't Know	<input type="text"/> <input type="text"/> <input type="text"/>
<b>2.</b>	Does the baby have severe chest indrawing? (look and record)	0 = No 1 = Yes 9 = Don't Know	<input type="checkbox"/>
<b>3.</b>	Record the axillary temperature of the baby	085.0 – 106.0 °F 666.6 = Refused 999.9 = Don't Know	<input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/>



11.	Does the child have raised bumps with clear fluid (vesicle)?	<input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
12.	Does the child have raised bumps with pus (pustule)?	<input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
13.	Does the child have an ulcer (a wound with a raised or swollen border, and a depression within)?	<input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
14.	Does the child have crusting of lesions?	<input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
15.	Does the child have discharge from any of the lesions?	<input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
16.	Does the child have scratch marks (excoriations)?	<input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
<b>Note:</b> If answer to any questions from 9 or 13 is "1=Yes", refer the baby to the nearest health facility.				0= not referred 1= referred to h.f. 9= do not know

### **Section D: Oil Massage Practices**

- For NFF 01, ask “**Since birth ...**”
- For NFF 03, 07, 10, 14, 21, and 28, ask “**Since my last visit**”

1.	Has the baby been massaged with oil?	0 = No ( <b>Go to SECTION E</b> ) 1 = Yes (go to 1a) 9 = Don't Know ( <b>Go SECTION E</b> )	<input type="checkbox"/>
1a	How many times has the baby been massaged with oil?	Number of times	<input type="checkbox"/> <input type="checkbox"/>

	<b>1b.</b>	In the last 24 hours (one full day) how many times has the baby been massaged with oil?	Number of times	<input type="text"/> <input type="text"/>
<b>Now I want to ask ONLY about the <u>last time</u> the baby was massaged with oil</b>				
	<b>1c.</b>	When was the last time the baby was massaged with oil?	<b>DD/MM/YY</b> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/>	
			<b>Time (hh:mm)</b> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> 1 = 12:00am – 11:59 noon	
	<b>1d.</b>	Who massaged the baby with oil?	1 = Mother 2 = Grandmother 3 = Other family member 4 = TBA/Chamain 5 = Neighbor 6 = Other (Specify)	<input type="text"/>
	<b>1e.</b>	What oil was used?	1 = NNIPS Oil 2 = non-NNIPS mustard oil 3 = non-NNIPS sunflower oil 4 = non-NNIPS other oil 5 = NNIPS oil and non-NNIPS oil mixed together	<input type="text"/>
	<b>1f.</b>	Was the oil heated?	0 = No 1 = Yes 9 = Don't Know	<input type="text"/>
	<b>1g.</b>	Was anything added to the oil?	0 = No 1 = Yes ( <b>Go to 1g-1</b> ) 9 = Don't Know	<input type="text"/>
		<b>1g-1.</b> What was added to the oil? (Up to 3 responses)	1 = Garlic 2 = Fenugreek 3 = Nutmeg 4 = Cloves 5 = Caraway Seed 6 = Other (Specify)	<input type="text"/> <input type="text"/> <input type="text"/>
	<b>1h.</b>	How long did it take to massage the baby?	00-60 = number of minutes 61 = More than 1 hour 99 = Don't Know	<input type="text"/> <input type="text"/>
	<b>1i</b>	During massage, was oil placed in the baby's		
		<b>1i-1: Eyes?</b>	0 = No 1 = NNIPS Oil	<input type="text"/>

		<b>1i-2: Nose?</b>	2 = non-NNIPS Oil 9 = Don't Know	<input type="checkbox"/>
		<b>1i-3: Mouth?</b>		<input type="checkbox"/>
		<b>1i-4: Ears?</b>		<input type="checkbox"/>
		<b>1i-5: Umbilical Cord?</b>		<input type="checkbox"/>
	<b>1j.</b>	Was the sun shining on any part of the baby's skin during the massage?	0 = No 1 = Yes 9 = Don't Know	<input type="checkbox"/>

### **Section E: NNIPS Oil Supply**

- 1. Fill out appropriate column on Form 27 – Oil Monitoring Form**
- 2. Comment on Oil Supply or any Problem :**

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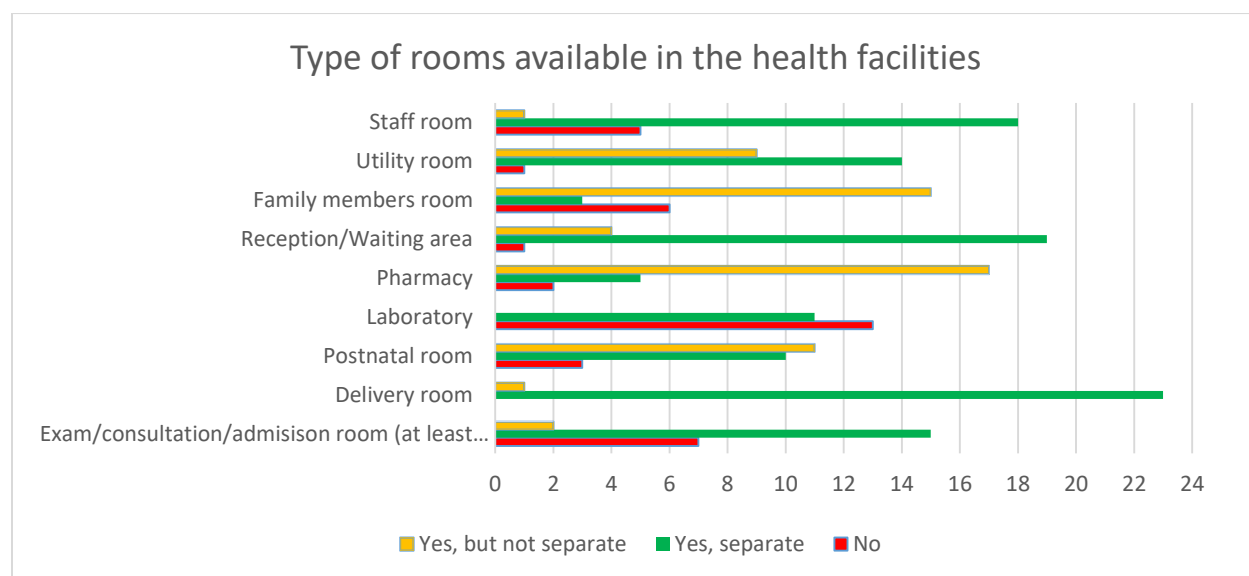
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## Appendix 4. Detailed results on the health facility readiness and health worker knowledge

### Appendix 4.1. Health facility audit supplementary results

**Figure 4.1.1.** Types of rooms available in the health facilities (N=24)





**Table 4.1.1.** Heath facility Infrastructure

	<b>PHCC</b> <b>(N=5)</b>	<b>HP</b> <b>(N=16)</b>	<b>Private</b> <b>(N=2)</b>	<b>District Hospital</b> <b>(N=1)</b>	<b>Total</b> <b>(N=24)</b>
<b>Ambulance</b>					
No	4	10	0	0	14
Yes, functioning with fuel	0	3	2	1	6
Yes, not functioning or no fuel	1	3	0	0	4
<b>Walk to the nearest motorable road for four wheel vehicle</b>					
0 minutes	5	14	1	1	21
Between 1 to 5 minutes	0	2	1	0	3
<b>Birthing center owned or rented</b>					
Owned	4	15	2	1	22
Rented	1	1	0	0	2
<b>Working Phone to call outside that is available at all times client services are offered</b>					
Yes, onsite or within 5 min walk	2	0	2	0	4
Only pay phone or personal phone	3	16	0	1	20
<b>Usual mode of transport the people use to bring the woman in labor at the birthing center</b>					
Ambulance	1	2	2	0	5
Bullock Cart	2	10	0	1	13
Rickshaw	1	0	0	0	1
Own motor vehicle	0	2	0	0	2
Brought manually in basket/stretchers	1	2	0	0	3
<b>Person skilled in conducting deliveries present at the health facility or on call 24 hours/7days a week</b>	<b>PHCC</b> <b>(N=5)</b>	<b>HP</b> <b>(N=16)</b>	<b>Private</b> <b>(N=2)</b>	<b>District Hospital</b> <b>(N=1)</b>	<b>Total</b> <b>(N=24)</b>
Yes, Present and Schedule Observed	1	0	0	1	2
Yes, present, Schedule reported, not seen	1	11	2	0	14
Yes, on call and schedule observed	1	0	0	0	1
Yes, on call, schedule reported, not seen	2	4	0	0	6
None of the above	0	1	0	0	1
<b>Electricity backup (inverter, solar or generator)*</b>	5	12	2	1	20

\*Observed or reported but not seen

**Table 4.1.2.** Facilities of the labor and delivery room

<b>Facilities of the Labor and Delivery room</b>	<b>PHCC (N=5)</b>	<b>HP (N=16)</b>	<b>Private (N=2)</b>	<b>District Hospital (N=1)</b>	<b>Total (N=24)</b>
<b>Delivery room setting</b>					
Private room with visual and auditory privacy	4	14	2	1	21
<b>Condition of the Delivery room</b>					
Clean	4	15	2	1	22
Dirty	1	1	0	0	2
<b>Toilet for client use, near the delivery room</b>					
Yes, attached to the delivery room	2	2	1	0	5
Yes, but not attached to the delivery room	3	14	1	1	19
Toilet functioning (clean and water available)	2	13	2	1	18
<b>Other elements to support quality*</b>					
24hr coverage for deliveries (staff present or on-call, schedule Observed or reported but not seen )	5	15	2	1	23
Guidelines for normal delivery	3	12	0	1	16
Guidelines for emergency obstetric care	3	12	0	1	16
Blank partographs	5	16	2	1	24
All elements available	3	12	0	1	16

*\*Observed or reported not seen AND functioning*

**Table 4.1.3.** ANC setting and infrastructure

	<b>PHCC</b> <b>(N=5)</b>	<b>HP</b> <b>(N=16)</b>	<b>Private</b> <b>(N=2)</b>	<b>District Hospital</b> <b>(N=1)</b>	<b>Total</b> <b>(N=24)</b>
<b>ANC examination room setting</b>					
Private room with visual and auditory privacy	4	14	2	1	21
Non private room with visual and auditory privacy	1	1	0	0	2
Visual privacy only	0	1	0	0	1
<b>Condition of the ANC examination room</b>					
Clean	5	13	2	1	21
Dirty	0	3	0	0	3
<b>Toilet for client use near the ANC service area</b>	5	16	2	1	24
<b>Toilet is functioning (clean, water availability/bucket)</b>	3	13	2	1	19
<b>Waste receptacle with plastic liner</b>					
No waste bin	1	1	0	0	2
Waste bin with neither lid nor plastic liner	3	8	1	1	13
Waste bin with lid but no plastic liner	1	7	0	0	8

*\*Observed or reported not seen AND functioning*

*†Observed in the ANC, delivery or waiting area of the health facility*

**Table 4.1.4.** Basic EmONC signal functions ever performed and performed in the past 3 months

<b>Emergency Obstetric and Newborn Care</b>	<b>PHCC (N=5)</b>	<b>HP (N=16)</b>	<b>Private (N=2)</b>	<b>District Hospital (N=1)</b>	<b>Total (N=24)</b>
<b>Emergency Obstetric and Newborn Care Ever Performed</b>					
Assisted deliveries like use vacuum extractor	2	6	0	1	9
Use of parenteral oxytocic drug for pregnancy-related hemorrhage	5	12	2	1	20
Use of parenteral anticonvulsants for pregnancy related hypertension	3	4	1	1	9
Use of parenteral antibiotics for pregnancy related infections	3	11	2	1	17
Manual removal of placenta	5	8	2	1	16
Newborn resuscitation	5	15	2	1	23
<i>All six BEmONC functions ever performed</i>	<i>0</i>	<i>3</i>	<i>0</i>	<i>1</i>	<i>4</i>
<b>Emergency Obstetric and Newborn Care Performed in the Past 3 months</b>					
Assisted deliveries like use vacuum extractor	1	2	0	1	4
Use of parenteral oxytocic drug for pregnancy-related hemorrhage	4	8	2	1	15
Use of parenteral anticonvulsants for pregnancy related hypertension	1	0	1	0	2
Use of parenteral antibiotics for pregnancy related infections	2	5	2	1	10
Manual removal of placenta	1	3	1	1	6
Newborn resuscitation	4	7	2	1	14
<i>All six BEmONC functions performed</i>	<i>0</i>	<i>0</i>	<i>0</i>	<i>0</i>	<i>0</i>

**Table 4.1.5.** Availability of items to support infection prevention

<b>Infection Prevention</b>	<b>PHCC (N=5)</b>	<b>HP (N=16)</b>	<b>Private (N=2)</b>	<b>District Hospital (N=1)</b>	<b>Total (N=24)</b>
<b>Infection prevention items*</b>					
Soap for handwashing	5	14	2	1	22
Water for handwashing	5	14	2	1	22
Soap and water	5	12	2	1	20
Disinfecting solution	4	15	2	0	21
Puncture proof container	5	14	2	1	22
Clean and Sterile gloves	5	14	2	1	22
All items for infection control†	4	10	2	0	16
<b>Initial handling of contaminated equipment that will be reused</b>					
Disinfectant soak, then soap & water scrub	4	14	2	1	21
Soap & water scrub, then disinfectant soak	0	1	0	0	1
Soap & water brush scrub only	1	0	0	0	1
Disinfectant soak and then scrub and dry	0	1	0	0	1
Wiping with spirit before autoclaving	1	0	0	0	1
<b>Final Process for disinfecting or sterilizing equipment that will be reused</b>					
Autoclaving	5	14	2	1	22
Steam sterilization	0	2	0	0	2
<b>Sterilization Equipment ‡</b>					
Electric autoclave (pressure and wet heat)	0	3	2	0	5
Non-Electric autoclave (pressure and wet heat)	5	12	0	1	18
Non-electric pot with cover (for steam/boil)	3	9	0	0	12
Heat source for non-electric equipment	5	15	0	1	21
TST indicator strip or other item that indicates when sterilization is complete	4	11	2	1	18
Fully functioning sterilization equipment††	4	14	2	1	21

\*All items observed or reported but not seen

†Soap, water, disinfecting solution, puncture proof container, and clean & sterile gloves

‡ All equipment that were observed or reported but not seen AND functioning

†† A working indicator to indicate when sterilization is complete for either the electric or non-electric autoclave with heat source OR a non-electric pot with cover with heat source

**Table 4.1.6.** Availability of the medicines and supplies required to perform the BEmONC signal functions

<b>Medicines and Supplies to perform various BEmONC signal functions*</b>	<b>PHCC (N=5)</b>	<b>HP (N=16)</b>	<b>Private (N=2)</b>	<b>District Hospital (N=1)</b>	<b>Total (N=24)</b>
<b>Medicine and supplies for common complications</b>					
Syringes	5	15	2	1	23
Needles	5	15	2	1	23
Injectable oxytocin 1IU/mL	5	15	2	1	23
Intravenous solutions	5	16	2	1	24
IV Cannula (1 set)	5	15	2	1	23
Perineal/vaginal/cervical repair set	4	11	2	1	18
<i>All meds &amp; supplies for common complications</i>	4	10	2	1	17
<b>Medicine and supplies for serious complications</b>					
Injectable anticonvulsant (magnesium sulfate or diazepam)	3	8	1	1	13
Injectable antibiotic (ampicillin or gentamicin)	3	9	2	1	15
<i>All serious complications supplies present</i>	3	4	1	1	9
<b>Assisted Delivery</b>					
Ventouse (Vacuum extractor manual or electrical)	0	11	1	1	13
<i>Percent Score for assisted delivery</i>	0%	68.8%	50%	100%	54.2%
<b>Removal of retained products of conception</b>					
Manual/electric vacuum aspirator or dilation and curettage kit	2	2	2	1	7
Injectable oxytocin	5	15	2	1	23
Syringes and needles	5	15	2	1	23
Ringer's lactate, D5NS or NS infusion	5	16	2	1	24
<i>Mean percent score for removal of retained products or conception</i>	85%	75%	100%	100%	79.2%
<b>Use of parenteral antibiotics for infection</b>					
Injectable ampicillin or gentamicin	3	9	2	1	15
Syringes and needles	5	15	2	1	23
Ringer's lactate, D5NS or NS infusion	5	16	2	1	24
<i>Mean percent score for parenteral antibiotics use</i>	86.7%	83.4%	100%	100%	86.1%

<b>Use of parenteral oxytocic drugs</b>					
Injectable oxytocin	5	15	2	1	23
Syringes and needles	5	15	2	1	23
Ringer's lactate, D5NS or NS infusion	5	16	2	1	24
<i>Mean percent score for parenteral oxytocin use</i>	<i>100%</i>	<i>93.8%</i>	<i>100%</i>	<i>100%</i>	<i>95.8%</i>
<b>Use of parenteral anti-convulsants for PE/E</b>					
Injectable magnesium sulfate	3	9	1	1	15
Syringes and needles	5	15	2	1	23
Ringer's lactate, D5NS or NS infusion	5	16	2	1	24
<i>Mean percent score for parenteral anti-convulsants</i>	<i>86.7%</i>	<i>81.3%</i>	<i>83.3%</i>	<i>100%</i>	<i>82%</i>
<b>Manual Removal of Placenta</b>					
Injectable ampicillin	2	9	2	1	13
Injectable oxytocin	5	15	2	1	23
Syringes and needles	5	15	2	1	23
Ringer's lactate, D5NS or NS infusion	5	16	2	1	24
<i>Mean percent score for MRP</i>	<i>85%</i>	<i>86%</i>	<i>100%</i>	<i>100%</i>	<i>86.4%</i>
<b>Newborn resuscitation</b>					
Bag/tube and mask (infant size)	5	14	2	1	22
Foot suction or delee suction or electric suction‡	4	12	1	1	18
Suction apparatus for use with catheter	0	2	1	0	3
Resuscitation table for newborn	4	11	2	1	18
<i>Mean percent score for newborn resuscitation</i>	<i>65%</i>	<i>61%</i>	<i>75%</i>	<i>75%</i>	<i>63.5%</i>

**Table 4.1.7.** Availability of supplies for immediate newborn care

<b>Supplies for immediate newborn care *</b>	<b>PHCC (N=5)</b>	<b>HP (N=16)</b>	<b>Private (N=2)</b>	<b>District Hospital (N=1)</b>	<b>Total (N=24)</b>
Sterile scissors or blade	5	16	2	1	24
Sterile cord clamp or tie	5	13	2	1	21
Suction machine (Foot or electric or deelees suction)	4	12	1	1	18
Towel or blanket to wrap baby	4	15	2	1	22
Heat source for premature infant	1	6	1	1	9
Chlorhexidine (CHX)	5	12	2	1	20
Resuscitation table for baby	4	11	2	1	18
Bag and mask (infant size) for resuscitation	5	14	2	1	22
Oxygen cylinder	2	7	2	1	12
Oral thermometer	3	9	2	1	15

*\*Observed or reported not seen and functioning*



**Table 4.1.8.** Health worker posts filled as per required quota

<b>Health worker post filled as per required quota</b>	<b>PHCC (N=5)</b>	<b>HP (N=16)</b>	<b>Private (N=2)</b>	<b>District Hospital (N=1)</b>	<b>Total (N=24)</b>
Medical Doctor [1]*	3	NA	1	0	4
Staff Nurse [2]	1	NA	0	0	1
Health Assistants [3]	5	12	1	0	18
Auxiliary Health Worker / Sr AHW [4]	3	9	2	0	15
auxiliary Nurse Midwife / Sr ANM [5]	3	12	1	1	17

\* The medical doctor position for the maternity ward which is one OB/GYN was fulfilled

[1] The designated number of MBBS doctors is 8 for district hospitals, one for PHCC level and private clinics have their own rules with Namuna hospital requiring two doctors and FPAN requiring only one.

[2] The designated number of staff nurse is eight nurses for district hospital, one for PHCC and one for both the private hospitals

[3] The designated number of health assistant staff is three for district hospital, one for PHCC, one for HP, two for Namuna hospital, and 0 for FPAN clinic

[4] The designated number of Sr AHW/AHW is none for district hospital, 3 for Namuna hospital, 0 for FPAN clinic, varying numbers for HP and PHCC

[5] The designated number of Sr ANM/ANM staff are three for district hospital, three for FPAN and five for Namuna clinic, three for PHCCs and two for HPs.

## Appendix 4.2: Health worker interview and knowledge assessment supplementary results

**Table 4.2.1.** Distribution of Health Workers by the Type of Health Facility

<b>TYPE OF HEALTH FACILITY</b>	<b>NUMBER (%)</b>
<b>Primary health care center (PHCC)</b>	13 (20.6%)
<b>Health post (HP)</b>	33 (52.4%)
<b>Private clinic</b>	6 (9.5%)
<b>District Hospital</b>	11 (17.5%)
<b>Total</b>	63 (100%)

**Table 4.2.2A.** Distribution of training and experience working in ANC, delivery care and newborn care by type of health facility

<b>Training and Experience</b>	<b>DH (%)</b>	<b>PHCC (%)</b>	<b>HP (%)</b>	<b>Private (%)</b>	<b>Total (%)</b>
<b>ANC service and training</b>	<b>N=1</b>	<b>N=13</b>	<b>N=33</b>	<b>N=6</b>	<b>N=53</b>
<b>Years of ANC service provided</b>					
1 year and below	0	15.4	21.2	16.7	18.9
2-5 years	0	15.4	36.4	0	26.4
6-10 years	100	30.8	18.2	16.7	22.6
11 and more years	0	38.5	24.2	66.8	32.1
<i>Median number of years</i>	<i>10 years</i>	<i>6 years</i>	<i>4 years</i>	<i>11.5 years</i>	<i>6 years</i>
<b>Received pre or in-service ANC training in past 3 years*</b>					
No	100	7.7	12.1	50	17
Yes	0	92.3	87.9	50	83
<b>Delivery care service and training</b>	<b>N=11</b>	<b>N=13</b>	<b>N=33</b>	<b>N=6</b>	<b>N=63</b>
<b>Years of Delivery care service provided*</b>					
Less than 1 year	54.5	7.7	9.1	0	15.9
1-2 years	18.2	15.4	33.3	16.7	25.4
3-5 years	9.1	30.8	36.4	0	27
6-10 years	9.1	15.4	9.1	33.3	12.7
11 years and above	9.1	30.8	12.1	50	19.1
<i>Median number of years</i>	<i>0 year</i>	<i>5 years</i>	<i>3 years</i>	<i>10.5 years</i>	<i>3 years</i>
<b>Received pre or in-service Delivery care training in past 3 years*</b>					
No	54.5	0	15.2	83.3	25.4
Yes	45.5	100	84.8	16.7	74.6
<b>How often partograph is used in normal vaginal delivery</b>					
Never	0	0	3.0	0	1.6
Rarely	0	0	0	0	0
Sometimes	9.1	0	0	0	1.6
Most of the time	9.1	0	15.2	0	9.5
Always	81.8	100	81.8	100	87.3
<b>How often Active Management of Third Stage of Labor (AMTSL) used in normal vaginal delivery</b>					

<b>Training and Experience</b>	<b>DH (%)</b>	<b>PHCC (%)</b>	<b>HP (%)</b>	<b>Private (%)</b>	<b>Total (%)</b>
Never	0	0	0	0	0
Rarely	0	0	3.0	0	1.6
Sometimes	0	0	3.0	16.7	3.2
Most of the time	0	0	6.1	33.3	6.4
Always	100	100	87.9	50	88.9
<b>Newborn Care service and training</b>	<b>N=11</b>	<b>N=13</b>	<b>N=33</b>	<b>N=6</b>	<b>N=63</b>
<b>Years of Newborn care service provided*</b>					
Less than 1 year	45.4	7.7	9.1	0	14.3
1-2 years	18.2	15.4	33.3	16.7	25.4
3-5 years	18.2	23.1	36.4	0	27
6-10 years	9.1	23.1	6.1	33.3	13
11 years and above	9.1	30.8	15.1	50	20.6
<i>Median number of years</i>	<i>1 year</i>	<i>6 years</i>	<i>3 years</i>	<i>10.5 years</i>	<i>4 years</i>
<b>Received pre or in-service Newborn care training in past 3 years</b>					
No	54.5	23.1	27.3	66.7	34.9
Yes	45.5	76.9	72.7	33.3	65.1

\*Fishers exact test  $p$ -value < 0.05

**Table 4.2.2B.** Distribution of training and experience working in ANC, delivery care and newborn care by health worker who received and did not receive additional SBA training

<b>Training and Experience</b>	<b>Non-SBA trained (%)</b>	<b>SBA trained (%)</b>	<b>Total (%)</b>
<b>ANC service and training</b>	<b>N=24</b>	<b>N=29</b>	<b>N=53</b>
<b>Years of ANC service provided</b>			
1 year and below	29.2	10.3	18.9
2-5 years	29.2	24.1	26.4
6-10 years	16.7	27.6	22.6
11 and more years	25	37.9	32.1
<i>Median number of years</i>	<i>3.5 years</i>	<i>7 years</i>	<i>6 years</i>
<b>Received pre or in-service ANC training in past 3 years</b>			
No	20.8	13.8	17
Yes	79.2	86.2	83
<b>ANC training contents (among those who reported receiving training)</b>	<b>N=19</b>	<b>N=25</b>	<b>N=44</b>
Training on ANC screening	78.9	88	84.1
Training on ANC Counseling	100	100	100
Training on PMTCT or HIV/AIDS related	42.1	64	54.5
Training on Management of pre-eclampsia/eclampsia	94.7	100	(97.7)
Training on other ANC related topics†	36.8	44	40.9
<b>Delivery Care Service and Training</b>	<b>N=31</b>	<b>N=32</b>	<b>N=63</b>
<b>Years of Delivery care service provided</b>			
Less than 1 year	25.8	6.3	10 (15.9%)
1-2 years	32.3	18.8	16 (25.4%)
3-5 years	22.6	31.3	17 (27%)
6-10 years	6.5	18.8	8 (12.7%)
11 years and above	12.9	25	12 (19%)
<i>Median number of years</i>	<i>2 years</i>	<i>5 years</i>	<i>3 years</i>
<b>Received pre or in-service Delivery care training in past 3 years</b>			
No	41.9	9.4	25.4)
Yes	58.1	90.6	74.6
<b>Delivery care training contents (among those who reported receiving training)</b>	<b>N=18</b>	<b>N=29</b>	<b>N=47</b>
Routine care for labor and normal vaginal delivery	17 (94.4%)	28 (96.6%)	45 (95.7%)
Partograph use	18 (100%)	29 (100%)	47 (100%)

Active Management of Third Stage of Labor	18 (100%)	29 (100%)	47 (100%)
Sterile cord care and CHX use	18 (100%)	24 (82.8%)	42 (89.4%)
Management of sepsis (parenteral antibiotic use)	7 (38.9%)	17 (58.6%)	24 (51.1%)
MgSO4 use for severe pre-eclampsia or eclampsia	18 (100%)	29 (100%)	47 (100%)
Postpartum Hemorrhage (PPH) management	18 (100%)	29 (100%)	47 (100%)
Removal of placenta or products of conception	6 (33.3%)	17 (58.6%)	23 (48.9%)
Manual removal of placenta	15 (83.3%)	26 (92.9%)	41 (89.1%)
Special delivery care for PMTCT	5 (27.8%)	11 (37.9%)	16 (34%)
<i>Assisted vaginal delivery**</i>	<i>7 (38.9%)</i>	<i>25 (86.2%)</i>	<i>32 (68.1%)</i>
Newborn resuscitation with bag and mask	18 (100%)	29 (100%)	47 (100%)
Kangaroo Mother Care for LBW babies	17 (94.4%)	28 (96.6%)	45 (95.7%)
Maternal death or near miss review/audits	8 (44.4%)	16 (55.2%)	24 (51.1%)
Quality improvement approaches like standards based management	16 (88.9%)	21 (72.4%)	37 (78.7%)
<b>How often partograph is used in normal vaginal delivery</b>	N=31	N=32	N=63
Never	3.2	0	1.6
Rarely	0	0	0
Sometimes	0	3.1	1.6
Most of the time	6.5	12.5	9.5
Always	90.3	84.4	87.3
<b>How often Active Management of Third Stage of Labor (AMTSL) used in normal vaginal delivery</b>			
Never	0	0	0
Rarely	3.2	0	1.6
Sometimes	6.5	0	3.2
Most of the time	6.5	6.3	6.3
Always	83.9	93.8	88.9
<b>Newborn care service and training</b>	N=31	N=32	N=63
<b>Years of Newborn care service provided</b>			
Less than 1 year	19.4	9.4	14.3

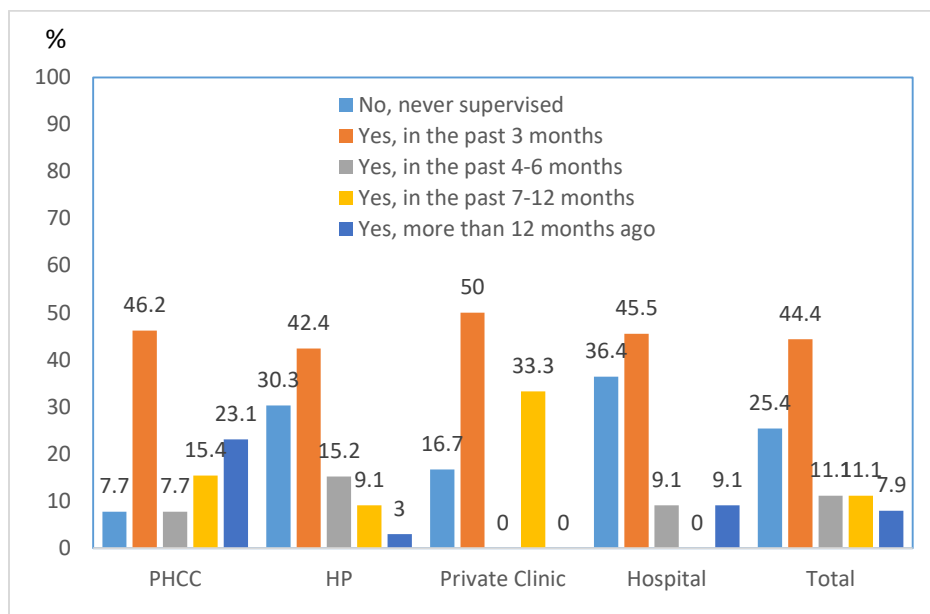
1-2 years	35.5	15.6	25.4
3-5 years	22.6	31.3	27
6-10 years	9.7	15.6	12.7
11 years and above	12.9	28.1	20.6
<b>Median number of years</b>	<b>2 years</b>	<b>5 years</b>	<b>4 years</b>
<b>Received pre or in-service Newborn care training in past 3 years*</b>			
	N=31	N=32	N=63
No	51.6	18.8	34.9
Yes	48.4	81.3	65.1

**\*\*Significant at  $p=0.001$  in both chi square test and Fishers exact test**

**\*Significant difference at Chi square test  $p$ -value=0.006**

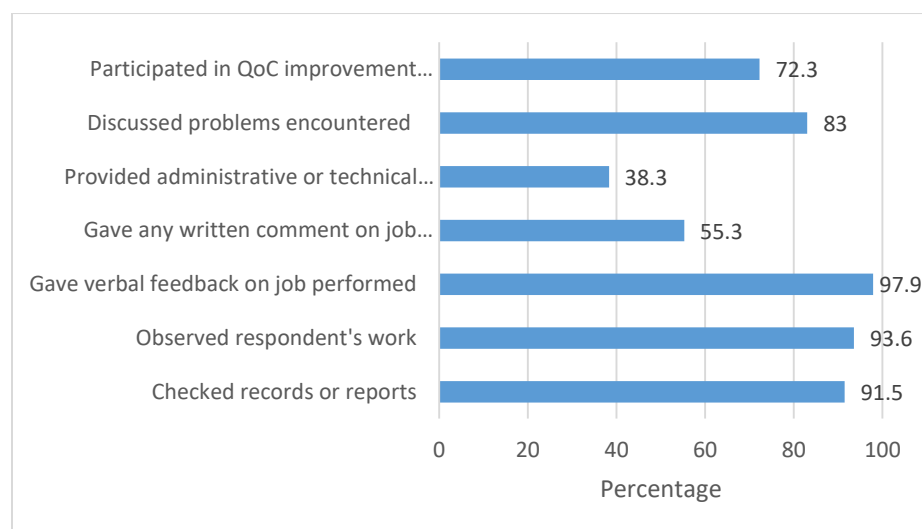
**† Other training topics reported (number of health workers reported):** required four ANC visits (9 HWs), danger signs during pregnancy (4 HW), when to give deworming and iron tablets (2 HW), financial incentive on completing 4 ANC visits and facility birth (2 HWs), birth preparedness counseling (1 HW), other sexually transmitted disease screening (1 HW), antepartum hemorrhage management (1 HW), various pelvic examinations to identify normal and abnormal pregnancies (1 HW), and abortion related (1 HW)

**Figure 4.2.1.** Distribution of reported most recent supervision or technical support received at work among health workers by type of health facility



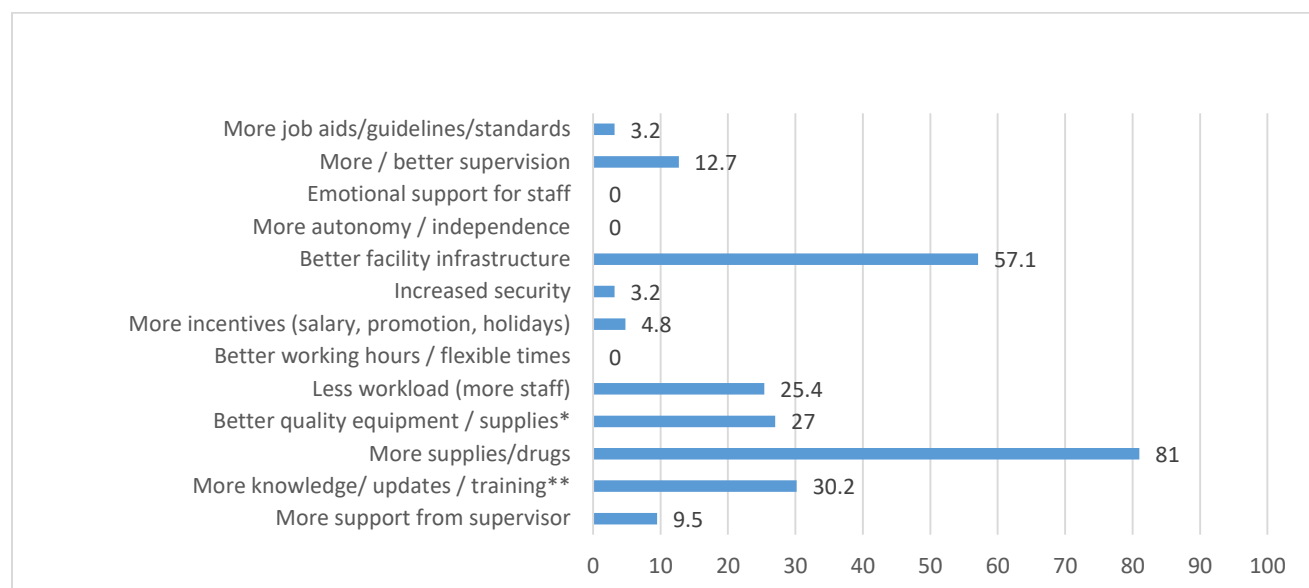


**Figure 4.2.2.** Areas of supervision received in the most recent supervision visit (N=63)



Overall, about 75% of the health workers (47 out of the 63) reported receiving some level of supervision or technical support. Of the 16 health workers who reported not having had any supervision or technical support at the health facility, 7 were newer staff and had started working at the facility in the year 2016 itself and another 7 had started working since 2011 till 2015 (data not shown). A large proportion (36.4%) of the district hospital health workers reported not received any type of supervision/technical support. The majority of the health workers in each type of health facility reported having received supervision/technical support in the past three months but this proportion was not more than 50%. In the private health facilities, out of the six health workers interviewed, three (50%) reported having been supervised in the past 3 months, two (33.3%) reported having been supervised in the past 7-12 months and one (16.7%) reported never been supervised.

**Figure 4.2.3.** Distribution of areas of improvement in the current working situation reported by the health workers



Each health worker was asked to give up to three responses on the work situation that they would like to see improved in order to be able to provide good quality of care services. Majority of the health workers (81%) reported the need for more supplies/drugs especially drugs such as iron tablets which was not available for about a year and also warm clothes for baby/mother (Nyano jhola). Many of the staff reported the need for oxygen cylinder, suction machine and vacuum set for obstructed labor. Better facility infrastructure was reported as an area of improvement by majority of the health workers in the health post (about 69%) and PHCC (about 61%). Among the areas for better facility infrastructure reported the most common responses was the need for more rooms for the birthing center as there was not enough rooms required for the birthing center and some places did not have separate staff living quarters within the facility. The need for ambulance and lab services was also reported. Infection prevention such as the lack of cleanliness either due to lack of cleaner or the poor sterilization of medical equipment because of non-functioning autoclaves. Overall about 30% of the health workers reported the need for more knowledge/updates/training and a significantly larger proportion of the health workers in the district hospital (72.7%) and private clinics (66.7%) reported this (data not shown). About 30% of the health workers working in the PHCC (4 out of 11) and HP (10 out of 33) reported the need for more staff in order to have less workload. More incentives was reported by only 3 staff all from the HP facility and mentioned the need for night allowance to be paid when on night duty, better management from VDC level for hiring of new temporary staff and incentives for patients like the “nyano jhola” program and timely payment of the financial incentive for patients who come to deliver at the health facility and for the four ANC visits. Increased security were of concern to 2 HP staffs and it was to do with the need to build a wall and gate around the health facility.

**Table 4.2.3A.** Distribution of knowledge of key topics of maternal health among health workers by type of health facility

<b>Maternal Health Knowledge Topics</b>	<b>DH (%)</b> N=11	<b>PHCC (%)</b> N=13	<b>HP (%)</b> N=33	<b>Private (%)</b> N=6	<b>Total (%)</b> N=63
<b>Actions to be taken to reduce PMTCT during labor &amp; delivery</b>					
PMTCT counseling	18.2	0	6.1	0	6.3
Provide ARV prophylaxis to woman in early labor*	36.4	0	9.1	16.7	12.7
Wipe nose, mouth, eyes of newborn with gauze, suction only if necessary	0	7.7	3	0	3.2
No routine episiotomy*	27.3	0	3	16.7	7.9
Minimize instrument delivery	18.2	15.4	3	0	7.9
Hibitane vaginal cleansing	0	0	0	0	0
Minimize vaginal exam	0	15.4	0	0	3.2
Minimize artificial rupture of membranes	0	15.4	6.1	0	6.3
Avoid milking cord/ immediate clamp cord	9.1	30.8	24.2	0	20.6
Appropriate use of partograph	0	0	0	0	0
Active mgt of 3rd stage labor	0	7.7	0	0	1.6
Provide ARV prophylaxis to infant	27.3	0	15.2	16.7	14.3
Don't know	27.3	53.8	57.6	83.3	54
<i>Mean Percent Score</i>	11.4	7.7	5.8	4.2	7
<b>Key steps for performing AMTSL</b>					
Administration of a uterotonic immediately/ within 1 minute of delivery	100	100	97	66.7	95.2
Controlled cord traction	90.9	92.3	93.9	66.7	90.5
Uterine massage*	100	100	93.9	50	92.1
All three components of AMTSL*	90.9	92.3	90.9	33.3	85.7
<b>When should artificial rupture of membranes be done by the provider</b>					
<i>To check color of fluid/liquor when fetal distress is noted*</i>	36.4	23.1	6.1	0	14.3
As part of augmentation of labor	36.4	15.4	36.4	0	28.6
<i>Mean percent score</i>	36.4	19.25	21.25	0	21.4
<i>WRONG: At start of second stage*</i>	63.6	23.1	69.7	2	55.6
WRONG: Immediately prior to delivery when they are bulging in vagina	54.5	84.6	48.5	4	58.7
WRONG: Routinely during active phase of labor	0	0	0	1	1.6
WRONG: Upon admission for all women	9.1	0	0	0	1.6
WRONG: Not to be ruptured	0	7.7	3	0	3.2
Don't know	9.1	0	0	0	1.6

<b>Maternal Health Knowledge Topics</b>	<b>DH (%)</b> N=11	<b>PHCC (%)</b> N=13	<b>HP (%)</b> N=33	<b>Private (%)</b> N=6	<b>Total (%)</b> N=63
<b>Actions appropriate for heavy bleeding postpartum from atonic / uncontracted uterus</b>					
Massage the fundus	90.9	92.3	84.8	50	84.1
Empty urinary bladder	45.5	7.7	39.4	50	34.9
Give uterotonics IM or IV	100	92.3	93.9	100	95.2
<i>Perform bimanual compression of uterus</i>	27.3	38.5	9.1	33.3	20.6
Perform abdominal compression of aorta	18.2	38.5	21.2	0	22.2
Start IV fluids	100	84.6	84.8	83.3	87.3
Take blood for hb, grouping and x-matching	9.1	7.7	6.1	0	6.3
Insert condom tamponade	9.1	0	0	0	1.6
Refer to doctor or hospital	18.2	38.5	30.3	33.3	30.2
Raise foot of bed	0	0	9.1	0	4.8
<i>Mean Score Percent</i>	<i>41.83</i>	<i>40.01</i>	<i>37.87</i>	<i>35</i>	<i>38.7</i>
<b>Actions most appropriate in managing a woman with severe pre-eclampsia at term</b>					
Provide magnesium sulphate	90.9	100	75.8	66.7	82.5
Provide diazepam	9.1	7.7	15.2	33.3	14.3
Provide anti-hypertensives	54.5	38.5	42.4	50	44.4
Prepare to deliver within 24 hours	63.6	38.5	27.3	0	33.3
Don't know	9.1	0	9.1	0	6.4
<i>Mean Score Percent (excluding diazepam and DK)</i>	<i>69.7</i>	<i>59.0</i>	<i>48.5</i>	<i>30</i>	<i>36.2</i>
<b>Antibiotics used after delivery</b>					
Ampicillin	63.6	30.8	12.1	0	23.8
Metronidazole	9.1	30.8	27.3	0	22.2
Amoxicillin	63.6	76.9	69.7	66.7	69.8
Other antibiotic	54.5	46.2	66.7	33.3	57.1
Don't know	0	0	3	0	1.6
<b>Diagnosis to the case of pre-eclampsia *</b>					
Severe pre-eclampsia	90.9	100	63.6	16.7	71.4
Eclampsia	9.1	0	33.3	66.7	25.4
Don't Know	0	0	3.0	16.6	3.2

\*Fishers exact test p-value < 0.05

**Table 4.2.3B.** Distribution of knowledge of maternal health among health workers by health worker who received and did not receive additional SBA training

<b>Maternal Health Knowledge Topics</b>	<b>Non-SBA trained (%) N=31</b>	<b>SBA trained (%) N=32</b>	<b>Total (%) N=63</b>
<b>Actions to be taken to reduce PMTCT during labor &amp; delivery</b>			
PMTCT counseling	2 (6.5%)	2 (6.3%)	4 (6.3%)
Provide ARV prophylaxis to woman in early labor*	1 (3.2%)	7 (21.9%)	8 (12.7%)
Wipe nose, mouth, eyes of newborn with gauze, suction only if necessary	1 (3.2%)	1 (3.1%)	2 (3.2%)
No routine episiotomy	2 (6.5%)	3 (9.4%)	5 (7.9%)
Minimize instrument delivery	3 (9.7%)	2 (6.3%)	5 (7.9%)
Hibitane vaginal cleansing	0 (0%)	0 (0%)	0 (0%)
Minimize vaginal exam	0 (0%)	2 (6.3%)	2 (3.2%)
Minimize artificial rupture of membranes	1 (3.2%)	3 (9.4%)	4 (6.3%)
Avoid milking cord/ immediate clamp cord	9 (29%)	4 (12.5%)	13 (20.6%)
Appropriate use of partograph	0 (0%)	0 (0%)	0 (0%)
Active mgt of 3rd stage labor	1 (3.2%)	0 (0%)	1 (1.6%)
Provide ARV prophylaxis to infant	2 (6.5%)	7 (21.9%)	9 (14.3%)
Don't know	16 (51.6%)	18 (56.3%)	34 (54%)
<i>Mean Percent Score</i>	<i>5.9%</i>	<i>8.1 %</i>	<i>7%</i>
<b>Key steps for performing AMTSL</b>			
Administration of a uterotonic immediately/ within 1 minute of delivery	28 (90.3%)	32 (100%)	60 (95.2%)
Controlled cord traction	28 (90.3%)	29 (90.6%)	57 (90.5%)
<i>Uterine massage†</i>	<i>26 (83.9%)</i>	<i>32 (100%)</i>	<i>58 (92.1%)</i>
Don't know	1 (3.2%)	0 (0%)	1 (1.6%)
All three components of AMTSL	25 (80.6%)	29 (90.6%)	54 (85.7%)
<b>When should artificial rupture of membranes be done by the provider</b>			
To check color of fluid/liquor when fetal distress is noted	4 (12.9%)	5 (15.6%)	9 (14.3%)
As part of augmentation of labor	6 (19.4%)	12 (37.5%)	18 (28.6%)
<i>Mean percent score</i>	<i>16.15%</i>	<i>26.55%</i>	<i>21.45%</i>
WRONG: At start of second stage	14 (45.2%)	21 (65.6%)	35 (55.6%)
<i>WRONG: Immediately prior to delivery when they are bulging in vagina‡</i>	<i>23 (74.2%)</i>	<i>14 (43.8%)</i>	<i>37 (58.7%)</i>
WRONG: Routinely during active phase of labor	0 (0%)	1 (3.2%)	1 (1.6%)
WRONG: Upon admission for all women	1 (3.2%)	0 (0%)	1 (1.6%)

Maternal Health Knowledge Topics	Non-SBA trained (%) N=31	SBA trained (%) N=32	Total (%) N=63
WRONG: Not to be ruptured	1 (3.2%)	1 (3.2%)	2 (3.2%)
Don't know	1 (3.2%)	0 (0%)	1 (1.6%)
<b>Actions appropriate for heavy bleeding postpartum from atonic / uncontracted uterus</b>			
Massage the fundus <sup>††</sup>	23 (74.2%)	30 (93.8%)	53 (84.1%)
Empty urinary bladder	8 (25.8%)	14 (43.8%)	22 (34.9%)
Give uterotonics IM or IV	30 (96.8%)	30 (93.8%)	60 (95.2%)
Perform bimanual compression of uterus	4 (12.9%)	9 (28.1%)	13 (20.6%)
<i>Perform abdominal compression of aorta<sup>††</sup></i>	3 (9.7%)	11 (34.4%)	14 (22.2%)
Start IV fluids	27 (87.1%)	28 (87.5%)	55 (87.3%)
Take blood for hb, grouping and x-matching	2 (6.5%)	2 (6.3%)	4 (6.3%)
Insert condom tamponade	0 (0%)	1 (3.1%)	1 (1.6%)
Refer to doctor or hospital	9 (29%)	10 (31.3%)	19 (30.2%)
Raise foot of bed	0 (0%)	3 (9.4%)	3 (4.8%)
<i>Mean Score Percent</i>	<i>34.20%</i>	<i>43.15%</i>	<i>38.72%</i>
<b>Actions most appropriate in managing a woman with severe pre-eclampsia at term</b>			
<i>Provide magnesium sulphate<sup>†</sup></i>	<i>22 (71%)</i>	<i>30 (93.8%)</i>	<i>52 (82.5%)</i>
Provide diazepam	5 (16.1%)	4 (12.5%)	9 (14.3%)
Provide anti-hypertensives	13 (41.9%)	15 (46.9%)	28 (44.4%)
Prepare to deliver within 24 hours	7 (22.6%)	14 (43.8%)	21 (33.3%)
Don't know	4 (12.9%)	0 (0%)	4 (6.3%)
<i>Mean Score Percent (excluding diazepam)</i>	<i>45.20%</i>	<i>61.50%</i>	<i>53.40%</i>
<b>Antibiotics used after delivery</b>			
Ampicillin	6 (19.4%)	9 (28.1%)	15 (23.8%)
Metronidazole	6 (19.4%)	8 (25%)	14 (22.2%)
Amoxicillin	21 (67.7%)	23 (71.9%)	44 (69.8%)
Other antibiotic	17 (54.8%)	19 (59.4%)	36 (57.1%)
Don't know	1 (3.2%)	0 (0%)	1 (1.6%)
<b>Diagnosis to the case of pre-eclampsia</b>			
Severe pre-eclampsia	19 (61.3%)	26 (81.3%)	41 (71.4%)
Eclampsia	10 (32.3%)	6 (18.7%)	16 (21.4%)
Don't Know	2 (6.5%)	0 (0%)	2 (3.2%)

\*Fishers exact test p-value is 0.053; <sup>†</sup> Fishers exact test p-value is 0.02; <sup>††</sup> Fishers exact test p-value <0.05

<sup>‡</sup> Chi square test p-value = 0.014

**Table 4.2.4.A. Newborn Health Knowledge by type of health facility**

<b>Newborn Health Knowledge Topics</b>	<b>DH (%) N=11</b>	<b>PHCC (%) N=13</b>	<b>HP (%) N=33</b>	<b>Private (%) N=6</b>	<b>Total (%) N=63</b>
<b>Equipment and Supplies considered necessary to ensure appropriate immediate newborn care</b>					
Dry warm towels or cloths	72.7	100	93.9	83.3	90.5
Sterile blade or scissors	36.4	23.1	33.3	16.7	30.2
Sterile or disposable cord ties/ clamps	72.7	53.8	66.7	50	63.5
Cap for baby	0	7.7	0	0	1.6
Source of warmth: heating lamp or incubator	54.5	76.9	45.5	66.7	55.6
Self-inflating ventilation bag	100	76.9	66.7	66.7	74.6
Newborn face mask size 1	54.5	53.8	54.5	16.7	50.8
Newborn face mask size 0	45.5	38.5	54.5	0	44.4
Mucus extractor/ simple suction/ bulb syringe	100	100	81.8	83.3	88.9
Flat surface	0	7.7	24.2	0	14.3
Clock or watch	0	7.7	12.1	0	7.9
Don't know	0	0	3	0	1.6
<i>Mean Percent Score</i>	<i>48.8</i>	<i>49.6</i>	<i>48.5</i>	<i>31.9</i>	<i>43.6</i>
<b>Immediate newborn care after birth and within the first hour for baby delivered with no complications</b>					
Wipe face after birth of head	18.2	18.2	39.4	16.7	36.5
Ensure baby was breathing/ crying	72.7	72.7	42.4	33.3	46.0
Provide thermal protection (skin to skin)	63.6	63.6	75.8	83.3	79.4
Ensure mother initiates breast feeding within 1 hour	100	100	93.9	100	95.2
Assess/examine newborn within 1 hour	54.5	54.5	60.6	66.7	61.9
Provide eye prophylaxis /antibiotic ointment	0	0	6.1	50	9.5
Cut cord with sterile blade/scissors	36.4	36.4	36.4	33.3	38.1
Apply antiseptic or other material to cord stump	81.8	81.8	81.8	50	76.2
WRONG: Suction newborn with bulb	9.1	9.1	18.2	66.7	25.4
WRONG: Weigh newborn	27.3	27.3	54.5	33.3	47.6
WRONG: Give prelacteal feed/ water	9.1	9.1	0	0	1.6
<i>Mean Percent Score</i>	<i>53.4</i>	<i>53.4</i>	<i>54.55</i>	<i>54.2</i>	<i>55.3</i>
<b>Signs and symptoms of severe newborn infection (sepsis)</b>					
Poor/ no breastfeeding	90.9	76.9	72.7	66.7	76.2
<i>Restlessness/irritability†</i>	<i>54.5</i>	<i>7.7</i>	<i>27.3</i>	<i>83.3</i>	<i>33.3</i>
<i>Breathing difficulty</i>	<i>54.5</i>	<i>69.2</i>	<i>39.4</i>	<i>50</i>	<i>49.2</i>

Newborn Health Knowledge Topics	DH (%) N=11	PHCC (%) N=13	HP (%) N=33	Private (%) N=6	Total (%) N=63
<i>Hypothermia</i> †‡	18.2	76.9	48.5	0	44.4
Hyperthermia	90.9	92.3	78.8	66.7	82.5
Breathing rating >60/minute	18.2	15.4	21.2	16.7	19.1
Convulsions	9.1	7.7	12.1	0	9.5
Pus/ redness around umbilicus	63.6	61.5	69.7	16.7	61.9
Abscess on any part of body	0	15.4	9.1	0	7.9
<i>Skin pustules</i> †‡	9.1	53.8	69.7	16.7	50.8
Lethargy/ no movement (conscious)	36.4	61.5	39.4	33.3	42.9
Unconscious	0	7.7	15.2	0	9.5
<i>Mean Percent Score (all)</i>	<i>37.1</i>	<i>45.5</i>	<i>41.9</i>	<i>29.2</i>	<i>40.6</i>
<i>Mean percent score (first five symptoms)</i>	<i>61.8</i>	<i>64.6</i>	<i>53.34</i>	<i>53.34</i>	<i>57.12</i>

‡ Fishers exact test *p*-value <0.05

† Fishers exact test *p*-value < 0.01



**Table 4.2.4.B.** Newborn health knowledge by health worker who received and did not receive additional SBA training

Newborn Health Knowledge Topics	Non-SBA trained (%) N=31	SBA trained (%) N=32	Total (%) N=63
<b>Equipment and Supplies considered necessary to ensure appropriate immediate newborn care</b>			
Dry warm towels or cloths	27 (87.1%)	30 (93.8%)	57 (90.5%)
Sterile blade or scissors	10 (32.3%)	9 (28.1%)	19 (30.2%)
Sterile or disposable cord ties/ clamps	18 (58.1%)	22 (68.8%)	40 (63.5%)
Cap for baby	0 (0%)	1 (3.1%)	1 (1.6%)
Source of warmth: heating lamp or incubator	15 (48.4%)	20 (62.5%)	35 (55.6%)
Self-inflating ventilation bag	20 (64.5%)	27 (84.4%)	47 (74.6%)
Newborn face mask size 1	12 (38.7%)	20 (62.5%)	32 (50.8%)
Newborn face mask size 0	10 (32.3%)	18 (56.3%)	28 (44.4%)
Mucus extractor/ simple suction/ bulb syringe	26 (83.9%)	30 (93.8%)	56 (88.9%)
Flat surface	4 (12.9%)	5 (15.6%)	9 (14.3%)
Clock or watch	2 (6.5%)	3 (9.4%)	5 (7.9%)
Don't know	1 (3.2%)	0 (0%)	1 (1.6%)
<i>Mean Percent Score</i>	<i>39%</i>	<i>48.20%</i>	<i>43.70%</i>
<b>Immediate newborn care after birth and within the first hour for baby delivered with no complications</b>			
Wipe face after birth of head	13 (41.9%)	10 (31.3%)	23 (36.5%)
Ensure baby was breathing/ crying	12 (38.7%)	17 (53.1%)	29 (46%)
<i>Provide thermal protection (skin to skin)‡</i>	<i>21 (67.7%)</i>	<i>29 (90.6%)</i>	<i>50 (79.4%)</i>
Ensure mother initiates breast feeding within 1 hour	29 (93.5%)	31 (96.8%)	60 (95.2%)
Assess/examine newborn within 1 hour	16 (51.6%)	23 (71.9%)	39 (61.9%)
Provide eye prophylaxis /antibiotic ointment	4 (12.9%)	2 (6.3%)	6 (9.5%)
Cut cord with sterile blade/scissors	11 (35.5%)	13 (40.6%)	24 (38.1%)
Apply antiseptic or other material to cord stump	22 (71%)	26 (81.3%)	48 (76.2%)
WRONG: Suction newborn with bulb	7 (22.6%)	9 (28.1%)	16 (25.4%)
WRONG: Weigh newborn	15 (48.4%)	15 (46.9%)	30 (47.6%)
WRONG: Give prelacteal feed/ water	1 (3.2%)	0 (0%)	1 (1.6%)
<i>Mean Percent Score</i>	<i>51.60%</i>	<i>59%</i>	<i>55.40%</i>
<b>Signs and symptoms of severe newborn infection (sepsis)</b>			
Poor/ no breastfeeding	22 (71%)	26 (81.3%)	48 (76.2%)
Restlessness/irritability	14 (45.2%)	7 (21.9%)	21 (33.3%)
Breathing difficulty	58.1	40.6	49.2

Newborn Health Knowledge Topics	Non-SBA trained (%) N=31	SBA trained (%) N=32	Total (%) N=63
<i>Hypothermia</i> †	9 (29%)	19 (59.4%)	28 (44.4%)
Hyperthermia	23 (74.2%)	29 (90.6%)	52 (82.5%)
Breathing rating >60/minute	5 (16.1%)	7 (21.9%)	12 (19%)
Convulsions	2 (6.5%)	4 (12.5%)	6 (9.5%)
Pus/ redness around umbilicus	17 (54.8%)	22 (68.8%)	39 (61.9%)
Abscess on any part of body	3 (9.7%)	2 (6.3%)	5 (7.9%)
Skin pustules	12 (38.7%)	20 (62.5%)	32 (50.8%)
<i>Lethargy/ no movement (conscious)</i> ††	9 (29%)	18 (56.3%)	27 (42.9%)
Unconscious	1 (3.2%)	5 (15.6%)	6 (9.5%)
<i>Mean Percent Score (all)</i>	36.3%	44.8%	40.6%
<i>Mean Percent score (first five only)</i>	55.5%	58.8%	57.1%

‡ Fishers exact test  $p$ -value =0.03

† Chi-square test  $p$ -value=0.015

†† Chi-square test  $p$ -value=0.03

**Table 4.2.5.** Routine labor and delivery services provided at birthing centers by type of health facility

<i><b>Routine Labor and Delivery Services Provided at Birthing Centers</b></i>	<b>PHCC N=13</b>	<b>HP N=33</b>	<b>Private Clinic N=6</b>	<b>Hospital N=11</b>	<b>Total N=63</b>
Artificial rupture of membrane	0 (0%)	1 (3%)	0 (0%)	0 (0%)	1 (1.6%)
Active management of third stage of labor	13 (100%)	33 (100%)	6 (100%)	11 (100%)	63 (100%)
Episiotomy	0 (0%)	0 (0%)	2 (33.35)	0 (0%)	2 (3.2%)
Perineal shaving	0 (0%)	1 (3%)	1 (16.6%)	0 (0%)	2 (3.2%)
Maternal blood pressure monitoring	13 (100%)	33 (100%)	6 (100%)	11 (100%)	63 (100%)
Administration of prophylactic antibiotics	1 (7.7%)	8 (24.2%)	2 (33.3%)	0 (0%)	11 (17.5%)
Enema	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)
Suctioning nose and mouth of newborn	3 (23.1%)	14 (42.4%)	4 (66.7%)	3 (27.3%)	24 (38.1%)
Fetal heart rate monitoring	13 (100%)	33 (100%)	6 (100%)	11 (100%)	63 (100%)

## Appendix 5: Illness recognition, decision-making and care-seeking for maternal and newborn complications: A qualitative study in Sarlahi district, Nepal

**Table 5.1.** Maternal Death Event Narrative Summaries

Case type	Pregnancy Profile	Illness Symptoms	Outcome
<b>MD-1</b>  Kabilasi VDC  20 years old  PPH	First pregnancy, pregnant with twins (not aware ahead of time), and 4 ANC visits done.  During her seventh month she went into labor and day before she had water flowing One twin (son) born breech at home and died, the second baby birth was stillborn and delivered at district hospital (Malangwa)	Focal woman was screaming after second baby was born and then heavy bleeding started	Died at the hospital 7 hours after symptom recognition
<b>MD-2</b>  Sundarpur VDC  17 years old  Pre-eclampsia	First pregnancy, 3 ANC visits reported.  Illness event took place when the focal woman was six months pregnant	Focal woman complained of headache and was sleeping. Later had vomiting, shivering, eyes turning, became unconsciousness and swollen body  High BP (240) reported after getting checked at health facility	Died at the hospital 14 hours after symptom recognition
<b>MD-3</b>  Pharahadawa VDC  20 years old  Eclampsia	First pregnancy, 3 ANC visits reported  Illness event took place when the focal woman was eight months pregnant	Focal woman suddenly started vomiting, blood in vomit  She then started convulsing and stiffness of body. Also had swelling of her feet were very big	Died at the hospital approximately 18 hours after symptom recognition
<b>MD-4</b>	First pregnancy, no ANC checkup	Focal woman complained of headache and then	Died at the hospital

Ishwarpur VDC  16 years old  Eclampsia	Illness event took place when the focal woman was eight months pregnant	started convulsing, limbs became stiff and fever	approximately 26 hours after symptom recognition
<b>MD-5</b>  Pipariya VDC  30 years old  PPH	Seven previous pregnancies (6 daughters and 1 miscarriage)  Gone for three ultrasounds total but no ANC checkup. Facility birth – Janaki Healthcare Research Center (Private)  Prolonged labor and high BP and doctor said if C-section delayed then she may have convulsions so had to do C-section	Excessive bleeding after C-section	Died at the hospital 15 hours after symptom recognition
<b>MD-6</b>  Mahinathpur VDC  20 years old  PPH	Two previous pregnancies, No ANC checkup Home birth	Breech birth and baby had a large head and thin body. Baby died shortly after and excessive bleeding	Died on the way to hospital in India  Died two hours after symptom recognition

**Table 5.2.** Maternal Illness Event Narrative Summaries

<b>Case type</b>	<b>Pregnancy Profile</b>	<b>Illness Symptoms</b>	<b>Outcome</b>
<b>MC-1</b>  Sundarpur VDC  16 years old  PPH	First pregnancy, 3 ANC visits, Home birth	Excessive bleeding soon after delivery for seven days according to the focal woman	Illness resolved around 7 days from symptom recognition
<b>MC-2</b>  Salempur VDC  16 years old  Eclampsia	First pregnancy, 6 ANC visits Facility birth (C-section) – Janakpur Janaki Hospital (Private)	Convulsions in 9 <sup>th</sup> month of pregnancy and later body was swollen	Cesarean section performed on day 5 since symptom recognition and then resolved
<b>MC-3</b>  Gadaiya VDC  23 years old  Prolonged labor	Third pregnancy, 4 ANC visits, Facility birth – Majorganj, India (Private)  Had symptoms of night blindness in last month of pregnancy  Had water & blood discharge 4-5 days prior to baby birth	Labor pains for three days and became unconscious	Illness resolved around 13 hours from symptom recognition
<b>MC-4</b>  Ishwarpur VDC  23 years old  PPH	Third pregnancy, 4 ANC visits Facility birth – Ishwarpur Birthing Center  Ultrasound done	Focal woman had heavy bleeding soon after delivery while at the birthing center  Bleeding continuously and lost consciousness. She was also vomiting and could not open her eyes but could hear. Eyes were sunken in	Illness resolved within 6 days from symptom recognition

<b>MC-5</b>  Mohanpur VDC  22 years old  PPH	Second pregnancy, 6 ANC visits, Facility birth – District hospital (Malangwa)	Heavy bleeding 5 minutes after baby was born in the hospital  Bleeding lasted for four days continuously and she felt weak (discharged from hospital on second day after delivery)	Illness resolved within 5 days from symptom recognition
<b>MC-6</b>  Hempur VDC  20 years old  Sepsis	First pregnancy, 4 ANC visits Facility birth – Jamuniya Birthing Center Had done two ultrasound visits  She reported being 20 days past her due date at the time of delivery	Water discharge a bit smelly in the morning  Stomach pain, water leakage, and back pain	Illness resolved 32 hours since symptom recognition
<b>MC-7</b>  Manpur VDC  40 years old  PPH	Fifth pregnancy, One ANC visit, Home birth  Watery discharge for 3-4 days prior to delivery	Heavy bleeding and body was shivering two hours after giving birth, became unconscious	Illness resolved at 7 hours from symptom recognition
<b>MC-8</b>  Ishwarpur VDC  Pahadi (Hill person)  20 years old  PPH	First pregnancy, 6 ANC visits Facility birth – Ishwarpur Birthing Center  Ultrasound was done and said baby was breech position	Heavy bleeding, vomiting then became unconscious, eyes were rolled over (only white of eyes seen) half an hour after baby was born	Illness resolved in 24 hours from symptom recognition
<b>MC-9</b>	Third pregnancy, 4 ANC visits,	Excessive bleeding soon after giving birth and also	Illness resolved in 3 hours from

<p>Salempur VDC</p> <p>22 years old</p> <p>PPH and possible Eclampsia</p>	<p>Home Delivery (Maiti)</p> <p>Ultrasound also done</p>	<p>had stiffness of jaws and then convulsions simultaneously</p>	<p>symptom recognition</p>
<p><b>MC-10</b></p> <p>Babargunj VDC</p> <p>16 years old</p> <p>PPH</p>	<p>First pregnancy, 6 ANC visits,</p> <p>Facility birth - Janakpur zonal hospital (Pubic)</p> <p>Had done ultrasound</p>	<p>Had a lot of bleeding after delivery for several hours and focal woman recognized it as unusual as it was not decreasing and the type of blood was also of concern (pieces of flesh and murky red color)</p>	<p>Illness resolved by 11 days from symptom recognition</p>



**Table 5.3.** Newborn Death Event Narrative Summaries

Case type	Pregnancy Profile	Illness Symptoms	Outcome
<b>ND-1</b>  Kishanpur VDC  Daughter	First pregnancy; 5 ANC visits Ultrasound also done twice  Home birth had called local doctor from neighboring VDC who gave injections day before baby was delivered and then TBA came to help. Both called due to problem.	On the 16 <sup>th</sup> day since birth, the baby had fever first and also signs of cold and crying non-stop and chest in-drawing  Baby had distended abdomen and noise coming from abdomen like ‘dhui dhui’	Newborn died on the way to health facility in about 42 hours of symptom recognition and was 18 days old
<b>ND-2</b>  Janakinagar VDC  Daughter	First pregnancy; 5 ANC visit Ultrasound home visit by NNIPS.  Facility birth – Bharatwa Birthing Center  Baby did not cry immediately after birth and with steam treatment from nearby medical shop and help of BC nurse, it started crying	On day 2 after birth, the baby started making fists tight and body became stiff and eyes were rolled over, and had fever  Fever (102 degrees) and baby crying and also had chest indrawing.	Newborn died on the way to health facility in 10 hours from symptom recognition and was 3 days old
<b>ND-3</b>  Laxmipur VDC  Son	Second pregnancy, 4 ANC visits Ultrasound done and knew about the twins (both sons)  At home labor pain began and delivery was at home at 7 months pregnant (pre-term).  <u>Twins</u> – first baby was fine but died after a month @ 1100 gms  Second baby had problems	Second twin born was not crying, not moving limbs, or drinking milk , eyes closed, and only breathing slightly, weak heartbeat  Baby skin color kept changing from yellow to white then black and tongue was cold	Newborn died on the way to the hospital in about 9 hours from symptom recognition and was less than a day old
<b>ND-4</b>	First pregnancy, 4 ANC visits		Newborn died a home about 10

Babargunj VDC  Daughter	Baby girl born at home with help of traditional birth attendant Baby was thin, weak and lethargic when born	On day 6 since birth, baby was weak and lethargic and had cold symptoms Not drinking milk on day 12 and same condition as before	days from symptom recognition was 16 days old
<b>ND-5</b>  Kishanpur VDC  Son	Fifth pregnancy (1 son had died) No ANC visits  Home birth - help of local doctor who was called to give injection. Baby was stuck for a bit and then came out.	Baby was not breathing or crying after birth  Stomach was deflate and like attached to the back  Baby was cold to touch	Newborn died on the way to the hospital about an hour from symptom recognition and was less than a day old
<b>ND-6</b>  Pipariya VDC  Son	Fifth pregnancy; 5 ANC visits No ultrasound done due to bandh but did ultrasound in Malangwa during the time of labor and found out about the twins  Facility birth – district hospital, Malangwa  <u>Twin</u> births Baby girl (2010 gms) born in Malangwa hospital  Baby bi was born 4 hours after the first twin and had problems	Baby was weak, not breathing for 1-2 hours when born  Then after it started breathing but with difficulty  Baby's hands and body were quivering like a little convulsions  Body kept shivering, eyes were dull	Newborn died a home about 58 hours from symptom recognition and was less than 3 days old

**Table 5.4.** Newborn Illness Event Narrative Summaries

Case type	Pregnancy Profile	Illness Symptoms	Outcome
<b>NC-1</b>  Bela VDC  Son	First pregnancy, No ANC visits  Home birth due to lack of money for transport, no transport of own and no male family members to take them	Baby was not breathing when it was born  Later had pneumonia, fever, wheezing, cough  Becomes sick and then all right again sick and all right	Newborn illness resolved within day 13 from symptom recognition
<b>NC-2</b>  Barahathawa VDC  Daughter	First pregnancy 4 ANC visits  Labor pains started 7 days before baby was born Taken to the BC when labor pain started at  Facility birth: Barahathawa BC	Fever, crying differently and stomach distended from day 3 after birth  The same symptoms fever, stomach ache and cough reoccur after 6-7 days	Newborn illness no resolved as the baby is still taken for care and given medicines from the same local doctor every week  *Note: interview was done when baby was almost 6 months old
<b>NC-3</b>  Salempur VDC  Son	Sixth pregnancy (1 son died), 2 ANC visits  Home birth	Day 11 since birth had fever, cold and cough, not sucking milk, difficulty breathing	Newborn illness resolved on 5 <sup>th</sup> day from symptom recognition
<b>NC-4</b>  Barahathawa VDC  Daughter	Forth pregnancy (1 son died), 5 ANC visits  Home birth	From one day after birth Cold and cough, fever, nose blocked  Difficulty breathing and sucking milk as nose was blocked due to cold.	Newborn illness not yet resolved as cold and cough still giving medicine for but fever and blocked nose gone
<b>NC-5</b>	Third pregnancy, 1 ANC visit	Baby was not moving after birth	Newborn illness resolved on same

Pipariya VDC  Son	ultrasound to check the position whether breech or not  Home birth	Then baby had difficulty breathing / stuffy nose and shivering	day in 6 hours of illness recognition
NC-6  Babargunj VDC  Son	Second pregnancy 3 ANC visits  Home birth	After birth, Baby was having difficulty breathing made heavy breathing grunting noise and was cold when it was born , baby's limbs went limp, mouth and ears had turned black	Newborn illness resolved within 12 days of illness recognition
NC-7  Kabilasi VDC  Daughter	Third pregnancy 2 ANC visits  Facility birth – Laxmipur Birthing Center	When child was born had fever  High fever and not breast feeding next day	Newborn illness resolved on 6 <sup>th</sup> day of illness recognition
NC-8  Babargunj VDC  Daughter	First pregnancy 0 ANC visit  Home birth	The day after the baby was born, the baby had convulsions, difficulty breastfeeding and jaundice	Newborn illness resolved on 3 <sup>rd</sup> day of illness recognition
NC-9  Barahathawa VDC  Daughter	Third pregnancy (one stillborn) 4 ANC visits  Ultrasound was also done  Home birth	On the 7 <sup>th</sup> day (a week after birth) Baby had cough and cold and due to that had difficulty breathing, looked somewhat green, body was hot	Newborn illness resolved on 6 <sup>th</sup> day of illness recognition
NC-10	Fifth pregnancy		

Gadaiya VDC  Daughter	3 ANC visits  Home birth	Baby was not breathing and body was cold when it was born	Newborn illness was resolved after one month so about day 28 from illness recognition
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# Curriculum Vitae

## TSERING PEMA LAMA

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### PROFILE

Doctor of Philosophy (PhD) student in the International Health department with a strong interest in maternal, neonatal and child health, infectious diseases like HIV/AIDS and TB, mobile health and health service research and evaluations. Epidemiologist with five years of experience in public health research especially community based research, data analysis, and monitoring and evaluation. Strong skill set in research study design and quantitative and qualitative data analysis.

### EDUCATION

#### Doctor of Philosophy (PhD) in International Health

Expected August 2017

Johns Hopkins School of Public Health, Baltimore, MD

Dissertation: "Recognition of and care seeking behavior for newborn and maternal complications and facility and health worker readiness to provide quality antenatal, intrapartum and postpartum care in rural Nepal"

#### Master of Science in Epidemiology

May 2010

Harvard School of Public Health, Boston, MA

Thesis: Revisiting Trends in Tuberculosis Incidence and their Determinants in 134 countries

#### Bachelor of Arts in Biochemistry

May 2007

Mount Holyoke College, South Hadley, MA

Honors: Mary Lyon Scholar

Thesis: Differential Apoptosis Responses in a Murine Acquired Immunodeficiency Syndrome (MAIDS) Model

### RESEARCH AND WORK EXPERIENCE

#### Research Assistant

Nepal Nutrition Intervention Project-Sarlahi (NNIPS)

Sarlahi, Nepal

August 2015-May 2017

- Assisting the principal investigators as one of the Co-investigators in an ongoing mixed-methods study on maternal and newborn complication recognition and care seeking behavior in rural Nepal
- Coordinated, organized and helped to develop protocols and guides for qualitative study
- Lead the training and supervision of data collection for this community based research
- Conducted the health worker knowledge assessment interviews and health facility audit in 24 health facilities with a birthing center in Sarlahi district

- Cleaned and analyzed the data
- Prepared presentations for meetings and manuscript writing

### **Teachers Assistant**

Johns Hopkins Bloomberg School of Public Health, Baltimore, MD      September 2013-May 2014

- Assisted the lead professor in the Introduction to International Health course in conducting increased learning experience and course design
- Lead a small group of 20 students in group discussions, provided clarifications, and was liaison for the students and professor
- Assisted the lead professor in developing the quiz questions and assignments
- Grading of the assignments and quizzes of assigned small group

### **Research Assistant**

Johns Hopkins Bloomberg School of Public Health, Baltimore, MD      February 2013-February 2014

- Selected for the doctoral student publication initiative for Project SEARCH: Research to Prevention (“R2P”) HIV prevention project
- Work with an R2P-affiliated faculty member to analyze existing data from the HIV Serological and Behavioral Surveillance among Alcohol Venue Patrons in Botswana
- Publish the findings in a peer-review journal article

### **Surveillance and Research Specialist**

April 2012 – August 2012

Saath-Saath Project, FHI 360, Kathmandu, Nepal

- Supported the Senior Surveillance and Research Specialist (SSRS) in the design and development of research, studies, protocol and guidelines to support national HIV and AIDS program
- Provided technical assistance to the National Center for AIDS and STD Control (NCASC) of Ministry of Health and Population on estimation and projection of HIV infections, population size estimation studies of most at risk populations.
- Assisted in planning and facilitating round table discussions at the national level to discuss research findings, program implications and next steps in the field of HIV/AIDS and STI.
- Assisted in the design and implementation of Integrated Biological and Behavioral Surveillance (IBBS) surveys and Second Generation Surveillance (SGS) related training program in Nepal.
- Managed database and files of FHI research results and data which provide evaluation and monitoring indicators for FHI Nepal.
- Coordinated with research ethical committees like Nepal Health Research Council and FHI’s Protection of Human Subjects Committee (PHSC) to ensure that research protocols are internally acceptable standards.
- Conducted in-depth analysis of HIV related epidemiological, research and program process data.
- Provided support in coordination and communication with research agencies, and other collaborators; NCASC and liaising with other government and nongovernment organization which conduct research and surveillance in Nepal.

### **Research Officer**

October 2011 – March 2012

Saath-Saath Project, FHI 360, Kathmandu, Nepal

- Supported the Senior Surveillance and Research Specialist (SSRS) in the design and development of research, studies, protocol and guidelines to support national HIV and AIDS program

- Conducted field visits to monitor studies being implemented, to interact with program implementing agencies (IAs) to share study recommendations and to ensure that study recommendations are understood and adopted in the programs properly.
- Assisted in planning and facilitating round table discussions at the national level to discuss research findings, program implications and next steps in the field of HIV/AIDS and STI.
- Assisted in the design and implementation of Integrated Biological and Behavioral Surveillance (IBBS) surveys and Second Generation Surveillance (SGS) related training program in Nepal.
- Managed database and files of FHI research results and data which provide evaluation and monitoring indicators for FHI Nepal.
- Coordinated with research ethical committees like Nepal Health Research Council and FHI's Protection of Human Subjects Committee (PHSC) to ensure that research protocols are internally acceptable standards.
- Conducted in-depth analysis of HIV related epidemiological, research and program process data.
- Carryout background research to understand global and regional developments in HIV related research work including research topics and methodologies.
- Contributed to the development of Country Office annual work plan and proposals as requested.

### **Strategic Information Officer**

June 2010-September 2011

ASHA Project, FHI 360, Kathmandu, Nepal

- Assisted with the design, implementation, monitoring and reporting of IBBS surveys among most at risk population
- Analyzed IBBS findings by selecting key variables that are key to successful program implementation
- Manage database and files of FHI 360 research data
- Assisted with the application for IRB ethical approval for research studies and communicate with Nepal Health Research Council and FHI's Protection of Human Subjects Committee (PHSC)
- Provided technical assistance to the National Center for AIDS and STD Control (NCASC) of the Ministry of Health and Population (MoHP) on estimation and projection of HIV infections for 2010
- Conducted regular monitoring and evaluation (M&E) of the ASHA Project programs, research, and surveillance studies on HIV/AIDS and STI
- Performed regular data collection, analysis and reporting of program data
- Developed analysis of accomplishments and progress of implementing agencies.
- Supported the data quality audit process by carrying out field visits and by helping prepare initial reports in partnership with Program Officers.
- Supported M&E related capacity-building with implementing agencies through trainings and workshops
- Developed research tools, operational mapping and carried out gap analysis for program improvements
- Trained local implementing agencies in data analysis and M&E
- Supported the Senior Strategic Information Advisor in designing and developing research (quantitative and qualitative), studies, protocol and guidelines
- Assisted with the study design, implementation, monitoring and reporting of research studies being implemented
- Provided support in coordination and communication with research agencies, and other collaborators; NCASC and liaising with other government and non government organization which conduct research and surveillance in Nepal.

### **OTHER EXPERIENCES**

**Research Intern**

Summer 2009

ASHA Project FHI 360, Kathmandu, Nepal

- Analyzed trends of the key behavioral indicators using data from the Integrated Bio-Behavioral Surveys (IBBS) that studied HIV/AIDS prevalence among Most at Risk Population such as Injection Drug Users (IDUs) and Men who have Sex with Men (MSMs)
- Conducted the analysis using SAS and SPSS software
- Wrote an extensive report on the use of Respondent Driven Sampling (RDS) method for sampling MSMs and IDUs for the Integrated Bio-Behavioral Surveys conducted in alternate years

**Research/Teacher's Assistant**

Fall 2008-January 2009

Harvard School of Public Health, Boston, MA

- Assisted instructors with the curriculum design and provided ideas on various individuals to interview for the Public Health and Peace Building in Nepal Field Study
- Arranged meetings with various governmental, NGOs and INGOs during the course trip
- Communicated directly with all the correspondents and assisted the students with their queries

**Student Health Aide at the Health Center**

Fall 2004-Spring 2007

Mount Holyoke College, South Hadley, MA

- Assisted the health staff on duty by taking the patient's vital signs, retrieving patient's medical charts, making appointments and restocking pamphlets.
- Filed patient's confidential health information and helped with the annual health surveys conducted.

**Summer Research Intern**

Summer 2006

Beth Israel Deaconess Medical Center, Boston, MA

- Cultured both adherent and non-adherent cells and maintained cell cultures
- Helped optimize conditions for a new cell-based erythropoietin bioassay and transfected two different mammary epithelial cell lines with the human erythropoietin receptor (EpoR), in order to determine how EpoR expression affects cell tumorigenicity.

**Intern**

Summer 2005

Alapot health post, Hands for Help Nepal, Kathmandu, Nepal

- Assisted the health officer in giving direct primary health care to the villagers and fundraised money to buy medicines and medical supplies for the clinic so as to improve the health care facilities
- Assisted with the monthly sub health post report analysis and observed the TB DOTS program
- Recorded the results from the health surveys for annual report

**Howard Hughes Undergraduate Summer Research Fellow**

Summer 2004

Mount Holyoke College, South Hadley, MA

- Explored five different research topics in the field of Biology and Biochemistry under the supervision and guidance of various biology academic professors and acquired experience in the field of research
- Presented on one of the research topics in the Science Symposium

**AWARDS**

International Health Departmental Scholarship

JHSPH, 2012-2016

Harvard South Asia Initiative Research Grant

Harvard University, Summer 2009



Elaine Marieb Science Fund	Mount Holyoke College, May 2006
Louisa Stone Stephenson Prize	Mount Holyoke College, May 2006
Margaret Andrews Winters Fund	Mount Holyoke College, May 2005
Mildred L Sanderson Prize Math	Mount Holyoke College, May 2004
Merrill Prize-Freshman Prize	Mount Holyoke College, May 2004
Howard Hughes Summer Research Fellowship	Howard Hughes Medical Institute, Summer2004

## COMMUNITY SERVICE AND OTHER ACTIVITIES

- Student Assembly Member, Johns Hopkins Bloomberg School of Public Health, MD, Fall 2012-Present
- Volunteer, ChangeFusion Nepal, October 2010-Present
- Public Relations Coordinator, South Asian Student Organization, Harvard School of Public Health, MA, Fall 2009-Present
- Volunteer, Spinal Injury Rehabilitation Center, Kathmandu, Nepal, March – May 2008
- Events Coordinator, Sistahs in Science, Mount Holyoke College, MA, Fall 2005-Spring 2007
- Biochemistry Department Student Liaison, Mount Holyoke College, MA, Fall 2006-Spring 2007
- Co-chair, Student for A Free Tibet, Mount Holyoke College, MA, Fall 2005-Spring 2007
- Volunteer, Emergency Medical Technician, Mount Holyoke College, MA, Spring 2005-Fall 2006

## RESEARCH PAPERS AND PUBLICATIONS

- Lama, T. P., Khatry, S. S., Katz, J., LeClerq, S.C., and Mullany, L. C. (2017). Illness recognition, decision-making and care-seeking for maternal and newborn complications: A qualitative study in Sarlahi district, Nepal (sent for publication)
- Lama, T. P., Kumoji, E. K., Ketlogetswe, D., Anderson, M., & Brahmabhatt, H. (2015). Alcohol Consumption and Risky Sexual Behavior among Persons Attending Alcohol Consumption Venues in Gaborone, Botswana. *Prevention Science*, 1-10.

## PRESENTATIONS

- Co-author. Poster presentation. Increased access to prevention of mother to child transmission (PMTCT) services through a community based approach in a rural district of Nepal, 19<sup>th</sup> International AIDS Conference, Washington, D.C., USA, July 22-27, 2012
- Co-author. Poster presentation. Consistent condom use is a challenge for female sex workers in Kathmandu: revisit the strategy?, 10th International Congress on AIDS in Asia and the Pacific (ICAAP10), Busan, South Korea, October 26-30, 2011
- Co-author. Poster presentation. Challenges of Universal Access to Services for At-risk Adolescents in Nepal, 10th International Congress on AIDS in Asia and the Pacific (ICAAP10), Busan, South Korea, October 26-30, 2011
- Lama, T. P. Oral Presentation. Factors associated with consistent condom use among Female Sex Workers in 22 Terai Highway Districts of Nepal, Mini-International Conference on HIV/AIDS in Nepal-2010, Pokhara, Nepal, September 3-4, 2010.

## WORKSHOPS, TRAININGS AND CERTIFICATIONS

- Certificate of Completion, Collaborative Institutional Training Initiative (CITI) Human Research Curriculum. JHSPH Human Subject Research. 19 October, 2012

- Certificate of Completion, Collaborative Institutional Training Initiative (CITI) Human Research Curriculum. Good Clinical Practice and ICH. 14 October, 2012
- Facilitator, Research Capacity Building Workshop, by FHI 360 Nepal and Headquarters, Kathmandu, Nepal 31 January – 3 February, 2012
- Certificate of Completion, Online course on Family Planning Legislative and Policy Requirements. Global Health eLearning Center. USAID. 31 July, 2011
- Certificate of Completion, Research Ethics Training Curriculum, Second Edition. FHI 360. 14 September, 2010
- Participant, Research Grant Writers Retreat Workshop, by FHI 360 Asia Pacific Regional Office, Bangkok, Thailand, 5-7 September, 2011
- Facilitator, Capacity Building Workshop on Basics of HIV Infections Estimation and Projection, by National Center for AIDS and STD Control, Kathmandu, Nepal 10-11 August 2011
- Participant, Technical Assistance Provider Training, by FHI 360 Head Quarters, Kathmandu, 20-21 July, 2011
- Participant, Training Workshop on HIV/AIDS Estimate and Projections, by UNAIDS and WHO, Bangkok, Thailand, 9-13 May, 2011
- Facilitator, Integrated Biological and Behavioral Surveillance (IBBS) surveys capacity building workshop, by National Center for AIDS and STD Control, Kathmandu, Nepal, 30-31 March, 2011
- Participant, Learning Site Exchange Program at FHI 360 Asia Pacific Regional Office (APRO), by FHI 360 APRO, Bangkok, Thailand, 22-28 August, 2011

## **SKILLS**

**Computer:** SAS, STATA, SPSS, Epi Info, EPP/Spectrum, Altas Ti, MS Access, Microsoft Office

**Language:** English (Fluent), Nepali (Native), Tibetan (Native), Hindi (Fluent), Spanish (Basic)

**Date of Birth:** October 25, 1984

**Place of Birth:** Kathmandu, Nepal

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