

Local Perceptions, Traditional Cultural and Religious Beliefs and Practices on Umbilical
Cord Care in Tharu Community of Nepal: A Cross Sectional Study

by

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Thesis submitted in partial fulfillment of
the requirements for the degree of
Master of Science in the Duke Global Health Institute
in the Graduate School
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ABSTRACT

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Abstract

Globally, neonatal sepsis accounts for 15% of neonatal death, and nearly half (48%) of neonatal deaths in Nepal. Interventions such as Chlorhexidine (CHX) gel for umbilical cord care have been widely implemented in Nepal after randomized clinical trials (RCT) demonstrated efficacy and safety to reduce infections of the umbilical cord, omphalitis, and sequelae of unresolved infections which include sepsis. However, local traditional cultural or religious beliefs and practices can reduce or eliminate the efficacy of modern cord care which results in a high prevalence of omphalitis. Successful implementation of the CHX intervention, therefore, requires increased knowledge of the local practices which involve the umbilicus, at and shortly after birth, to identify augmentation strategies to the implementation of CHX. This study was carried out in the western rural Terai region in Nepal and compared three groups: the Tharu omphalitis-positive cases, the non-Tharu omphalitis-positive cases, and the Tharu omphalitis-negative cases. In total, 59 structured and semi-structured interviews with recently delivered women (RDW) (in the last seven months) and 17 health facility surveys with delivery and child care providers were conducted.

Facility delivery was common among the study population, yet seeking health care service from non-facility sources was high in omphalitis-positive cases. Subjects reported application of traditional substances (i.e. mustard oil and ginger powder) was

common in the community and that substances application had three main purposes: 1) application of mustard oil was common amongst all groups for “preventative” (maintain good health) purposes; 2) after infection of umbilical cord, substances were applied for “treatment” purpose in some omphalitis-positive cases; and 3) application to hasten cord separation after cord separation was perceived to be delayed was also reported in some omphalitis-positive cases. Almost all women from the Tharu omphalitis-positive cases reported a “naming ceremony”, giving the child its given names in a religious/culture ceremony with family and friends, should follow the cultural tradition to be held after cord separation, which is reported amongst few women from the Tharu omphalitis-negative cases and half of women from the non-Tharu cases. Holding the naming ceremony before the 12th day after birth was reported as very common amongst the non-Tharu cases. Among all the sub-groups studied, women reported having a limited power to make health-related decisions, as compared to their mother-in-law, father-in-law, and husband who the respondents described as having more power.

This study concludes that traditional cultural/religious beliefs and practices play an important role, particularly as they relate to cord care, in the western rural Terai region of Nepal. The introduction of CHX intervention do not replace but integrate into the existing traditional practices. In the discussion, an interaction is observed where CHX gel formulation, onset of omphalitis, and traditional cord care practices may delay

cord separation which postpones the naming ceremony for tradition-observing the Tharu peoples. It would be useful as a follow up study to compare dry and gel formulations of CHX, in single and multi-dose regimens, in conditions where traditional cord care practices are used and not used. This would provide even greater insight into how best to proceed to reduce omphalitis and its complications. The current study is underpowered to make conclusive observations, but it is clear that in spite of CHX single dose being applied in the clinic at birth, infections are occurring at higher rates among those peoples who use traditional cord care practices. Subjects in this study report they have been counseled on the use of CHX and the desirability of not using any other agents on the cord stump, but they continue to do so in the belief it may prevent infection, may treat infection and may accelerate cord separation. Given that cord separation is linked to a socially significant cultural admission of the child into the community, the “naming ceremony”, it is not surprising that traditional practices continue given the high social valence of the ceremony. This study also provide implication for policy and practice that a redesign of community campaign to destigmatize delayed naming ceremony and empower women in making healthcare decisions. This study suggests that the efficacy of CHX to reduce infections may be reduced in the natural setting where traditional cord care continues after CHX is applied in a single dose administration. Determining the best formulation and dosing of CHX that can be effective in conjunction with traditional cord care practices is needed to

reduce infections among the Tharu and other traditional peoples who use cord care practices. This is particularly needed where cord separation is linked to a cultural significant event such as the “naming ceremony” and the likelihood of completely extinguishing traditional cord care practices is low.

Dedication

I dedicate this thesis to everyone who has supported me, believed in and nurtured me through me master study in Duke. I also dedicate this thesis to many friends and villagers in Baridya District, Nepal who have supported me throughout the data collection.

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1. Introduction

1.1 *Global Neonatal Mortality*

Globally, 5.9 million deaths occur every year in the five years of life, among them 2.7 million deaths occur in the first month of life (UNICEF, 2015). While under-five mortality has declined in recent decades, from 91 deaths per 1000 live births in 1990 to 43 in 2015, the bulk of this improvement has been concentrated at later ages whereas deaths during the neonatal period have not significantly improved (UNICEF, 2015). Neonatal mortality rate fell from 36 deaths per 1000 live births in 1990 to 19 in 2015, and almost all (99%) of neonatal death occur in low and middle-income countries (35% in south Asia) (UNICEF, 2015). In 2015, of the estimated 2 million child deaths during the first week of life, almost 1 million occur in the first day of life (UNICEF, 2015).

Yet, despite the substantial improvement in Millennium Development Goal 4 (Reducing Child Mortality by two-thirds), the 53% decline in child mortality is far from the target (UNICEF, 2015). Child mortality has been identified as one of the post-2015 priorities, with the regional focus on sub-Saharan Africa and South Asia (Feleke & Samuel, 2008; UNICEF, 2015).

Globally, the three leading causes of overall neonatal death (0-27 days) are preterm (35%), intrapartum (24%) and sepsis (15%). Many of these deaths, however, are caused by diseases that are readily prevented by simple, proven and affordable interventions (United Nations (UN), 2014; Victora et al., 2016). One such preventable

cause of death is neonatal sepsis, which is typically observed as a complication of untreated omphalitis: infections originating in the umbilical cord (Mullany, Darmstadt, Khatry, Katz, et al., 2006; Soofi et al., 2012). Sepsis claims the lives of more than 520,000 newborns around the world every year (Walsh, Norr, Sankar, & Sipsma, 2015). Since blood vessels of the umbilical stump are exposed during the first few days after delivery, these vessels become a portal for invasive bacteria that can cause systemic infection in newborns (WHO, 1998). About 30%-40% of infections that lead to neonatal sepsis occur at the time of birth, and early-onset sepsis can manifest within the first 72 hours of life (Ganatra, Stoll, & Zaidi, 2010).

The WHO promotes delivery practices such as clean cord care (cutting the umbilical cord with a sterilized instrument and tying it with a thread), thermal care (drying and wrapping the newborn immediately after delivery and delaying the newborn bath for at least 6 hours to reduce the risk of hypothermia) and initiating breastfeeding within the first hour after delivery (Bhutta, Darmstadt, Hasan, & Haws, 2005; Darmstadt et al., 2005; WHO, 1993). Universal (99%) adoption of these practices has been estimated to reduce neonatal deaths due to sepsis by 15% for home births and 27% for facility births (Blencowe et al., 2011). Preventing infection through clean delivery practices is an important strategy to reduce sepsis-related deaths (WHO, 1996).

The WHO recommends the use of topical antiseptics to the umbilical cord stump in settings where the risk of infection is high which contrasts with dry cord care which is

the standard of care in settings where the risk of infection is low (WHO, 1998). Among the topical anti-infectives is chlorhexidine, a broad-spectrum antiseptic that has been used extensively in hospitals and other clinical settings for decades. Recent community-level randomized control studies conducted in several low-income countries (i.e. Nepal, Bangladesh, Pakistan) have shown that daily applications of 7.1% CHX digluconate (delivering 4% CHX) to the newborn's umbilical stump during the first week of life can prevent a substantial number of cases of omphalitis and neonatal sepsis (Mullany, Darmstadt, Khatri, Katz, et al., 2006; Mullany, Darmstadt, & Tielsch, 2003; Oestergaard et al., 2013; Soofi et al., 2012). Together with promising results from similar randomized control trials in Bangladesh and Pakistan, the WHO released a new recommendation on postnatal care of the mother and newborn: use of daily CHX is recommended to newborns who are born at home in settings with high neonatal mortality rate; and use of CHX may be considered only to replace application of a harmful traditional substances, such as cow dung, to the cord stump (WHO, 2013).

Recently, some countries with high infection rates started to introduce CHX, i.e. Bangladesh, Democratic Republic of Congo, Ethiopia, Kenya, Liberia, Madagascar, Malawi, Pakistan, Senegal, and Uganda. CHX for umbilical cord care was first introduced nationwide in Nepal beginning in 2011 as part of routine government essential newborn care program for both home and facility birth. The Nigerian Ministry

of Health included CHX as a priority commodity for newborn health in 2014 (Chlorhexidine Working Group, n.d.).

1.2 Traditional Cultural & Religious Neonatal Care Worldwide

Social groups across the globe have their own cultural practices and beliefs regarding the treatment of illness (Gebrekirstos, Abebe, & Fantahun, 2014). Newborns have particular significance in the life of families and communities so it is unsurprising to observe religious, cultural, and other practices for the neonate (Alparslan & Demirel, 2013; Gebrekirstos et al., 2014). Jordan (1981) observes: “Childbirth is an intimate and complex transaction whose topic is physiological and whose language is culture”. Child care practices were described by Bouchard as “transmission of the tradition, belief, culture and cognitive actions from parents to the offspring” (Bouchard, 1994). Some practices based on the tradition, culture, religion or superstition involving young children or infants can increase health risks (Mead & Newton, 1967). A summary of the practices and beliefs that can introduce health risks to mothers includes uvula cutting and milk teeth extraction, forced feeding, female genital cutting as well as practices on the umbilical cord cutting and care (Gebrekirstos et al., 2014). There is debate regarding “cultural relativity”: should practices that introduce risks be viewed with an ethical neutrality following the argument that if local practices support risk-inducing practices it is the prerogative of that local community to continue those practices. By contrast, others argue that some practices are violations of human rights and should be opposed

regardless of local custom (e.g. female genital cutting) (Feleke & Samuel, 2008). In the case of traditional umbilical cord care, these practices can introduce risks of infection to the neonate.

Applying substances to the neonate is highly prevalent amongst people across differing continents. In Nigeria, researchers found that potentially harmful substances such as cow urine, oil, Vaseline, hot balms, powder, chalk, etc. were applied to the cord of the newborns (Opara, Jaja, Dotimi, & Alex-Hart, 2012). Putting Babies on heated soil has been the practice for centuries in Anatolia, Turkey (Alparslan & Demirel, 2013). Herbal treatments are applied to the umbilical cord to hasten the cord stump separation in West Africa (Towns, Eyi, & van Andel, 2014). In Tanzania, an array of substances including saliva, dirty door powder, shells, charcoal powder, banana steam and fish bone are applied to the umbilical cord after delivery. In Tanzania, local people apply the ash of the a burned food item to the cord stump, following a the local perception that cord infection occurs when the mother eats certain kinds of fish or other food items (Dhingra et al., 2014). In South Asian countries, namely India, Pakistan, Nepal, and Bangladesh, certain oils (coconut oil, commercial baby oil Ayurveda oil, mustard oil, antibiotic ointment) are applied to the baby's body, including the umbilical cord during massage, sometimes along with other substances such as garlic, fenugreek, caraway seed (Ayaz & Saleem, 2010; Cacodcar, Dubhashi, & Joglekar, 2015; Darmstadt & Saha, 2002; Ghosh & Sharma, 2010; S. Sharma, Van Teijlingen, Hundley, Angell, & Simkhada, 2016;

Thatte et al., 2009; Upashe, 2014; Winch et al., 2005). Studies conducted in Zambia, Uganda, Turkey, Haiti, and South Asian countries also describe substances, including dust, charcoal powder, cow dung, chicken feces, vinegar water, butter, and herbs being applied to the umbilical cord (Alparslan & Demirel, 2013; Ayaz & Saleem, 2010; Grant et al., 2014; J. M. Herlihy et al., 2013; Uygulamaları, 2011; Walsh et al., 2015). These traditional and cultural practices, especially the substances applied to the umbilical cord are associated with the increased risks of omphalitis, tetanus, and sepsis (Darmstadt & Saha, 2002; Mullany et al., 2007). The mustard oil has a proven toxic effect on newborn skin structure and functions, including increased losses of water through the skin, delayed recovery of skin barrier function, and ultrastructural changes in epidermal keratinocytes, indicative of stress and toxicity (Darmstadt et al., 2005; Thatte et al., 2009).

Harmful traditional cultural or religious practices have been a concern of the United Nations. The Commission on Human Rights adopted its first resolution on “traditional practices affecting the health of women and children” in 1984. However, there is a lack of scientific evidence about the harms these local traditional cultural or religious practices may introduce. The scarcity of evidence regarding the nature and extent of the harms and best responses to mitigate those risks at the community level for intervention was the major barrier to enacting changes (UN, 2010).

1.3 Theory in Traditional Cultural & Religious Neonatal Care

Theories in health behavior offer an appealing framework in which to interpret those practices with respect to the care of the neonate. Several models have been developed to account for health behavior (i.e. people's following of traditional cultural or religious child care practices), such as the Theory of Reasoned Action (Ajzen & Fishbein, 1980), the Triandis Model (Triandis, 1979), Multi-Attribute Utility Model (Carter, Beach, & Inui, 1986), and the Subjective Expected Utility Model (Weinstein, 1993) the Health Belief Model (Becker, 1974). For the purposes of this research to understand health behavior in traditional settings, the Rite of Passage Model (Van Genep, 2011), Dualism and Parallelism Theory (Kim & Berry, 1993) and Innovation Diffusion Theory (Rogers Everett, 1995) have provided the greatest utility and applicability.

Van Genep (2011) first introduced the term "rite of passage" as ceremonies which accompany and dramatize major events such as birth, puberty, marriage and death; which culturally mark a person's transition from one stage of social and cultural life to another. Van Genep (2011) classifies the rites of passage into three stages: 1) "separation from the social group or previous identify"; 2) "a liminal or marginal stage in which the previous identity has been abandoned, but the new identify has yet to be assumed"; 3) "a stage of admission or initiation into a new role, and acceptance as a full member of society". In the case of the newborn, the stage of separation is clearly the

delivery, and the third stage of incorporation into a new status is marked by a ceremony signifying acceptance of the neonate as a member of the society (Van Gennep, 2011). However, the second stage of the newborn is ambiguous, during which people from many cultures worldwide regard the newborn as susceptible to misfortunes, malevolent forces and illnesses (Bang, Bang, Baitule, Reddy, & Deshmukh, 1999; Ganapathy, Ramakrishna, & Matthews, 2000; Matthews, Ramakrishna, Mahendra, Kilaru, & Ganapathy, 2005). This approach suggests that mothers and family members are compelled to enact traditional practices upon the neonate in the belief that s/he will successfully ward off illness, misfortune; and be accepted into their culture of origin. An example of the “rite of passage” theory regarding newborns is the naming ceremony in Nepal, which follows all three stages. After the delivery, the mother and the baby are confined at home for a certain period, which varies by different regions or ethnic groups, and they are not allowed to be near a deity’s statue or a temple until a naming ceremony has been held to accept the mother and newborn into society (Maiti, 2004; S. Sharma et al., 2016; Subba, 2015).

In his Innovation Diffusion Theory, Rogers Everett (1995) states that there are five assumptions when a health intervention is introduced in certain settings: “1) adoption takes times; 2) people pass through various stages in the adoption process; 3) people can modify the innovation and sometimes discontinue its use; 4) the perceived characteristics of the innovation influence its adoption; 5) and individual characteristics

influences its adoption". As the theory describes, when a health intervention is introduced in certain communities, the community is not an empty vessel to adopt without adaptation such an intervention. A new practice is created which is neither traditional nor the modern practice but a mix or adaptation of both. Kim and Berry (1993) contrasts the adaptive model with "dualism": a situation where one portion of the community adopts westernized healthcare practices and the other sector maintains traditional healthcare practices; the two differing practices exist in parallel to each other. Studies conducted in Vietnam and Zimbabwe provided evidence of adaptation and dualism in terms of healthcare service practices (Subba, 2015). The diffusion approach suggests that in the case of CHX for umbilical cord care, CHX will used in a dualistic fashion and in an adaptive modality where both CHX and traditional substances will be applied to the umbilical cord. This adaptive response could influence the efficacy of CHX where its efficacious results observed in clinical trials did not include the use of traditional substances on the cord stump.

In the Nepalese setting the diffusion adaptation model is most applicable to the introduction of CHX as it blends with existing traditional cord care practices.

1.4 Traditional Cultural & Religious Neonatal Care in Nepal

Nepal has seen a great decline in neonatal and infant mortality over the past two decades, yet it remains one of the countries with a high neonatal mortality rate (S. Sharma et al., 2016). In 2011, infant mortality rate was 46 per 1,000 live birth, whereas

under-five mortality rate was 64 per 1,000 live birth (Demographic and Health Survey, 2011). Thus, the majority (71.9%) of deaths occurred between birth and first birthday. Neonatal sepsis accounts for nearly half (48%) of neonatal deaths in Nepal, followed by birth asphyxia (16%), pre-term birth (13%) and low birth weight (5%) (Khanal & GC VS, 2011).

In a traditional Hindu society, such as Nepal, there are four elements that justify traditional and cultural practices in terms of maternal and child care, especially during the second stage of the rite of passage (Jeffery, Jeffery, & Lyon, 1985; Thompson, 1985; Winch et al., 2005).

- 1) Mother and baby are considered to be in a state of ritual pollution after delivery, and other family and community members can be defiled by them.
- 2) Mother and baby are especially vulnerable to cold after delivery, so people tend to avoid winds, certain food and substances that are religiously or culturally viewed as “cold” or utilize certain food and substance that are viewed as “hot”.
- 3) Mother and baby are also vulnerable to the malevolent forces such as spirits and “evil eye”, so they should be mitigated with protective measures such as restrictions on movement or bearing amulets.
- 4) Mother can transmit illness caused by malevolent spirits or cold to the baby.

Studies conducted in four Hindu dominant countries (namely, Nepal, Indian, Bangladesh, and Sri Lanka) observed similar elements (Blanchet, 1984; Goodburn, Gazi, & Chowdhury, 1995; Jeffery et al., 1985; Nichter, 1987; Reissland & Burghart, 1987; Thompson, 1985; Winch et al., 2005).

A variety of traditional care systems and practices such as Ayurveda, Tibetan medicine, family care (home treatment), and faith healing exist in Nepal. Subba (2015) found the co-existence and co-operation between different forms of therapeutic practices at the community level in Nepal. Even though modern medicine has been introduced into Nepal since the 17th (seventeenth) century and the practice of seeking health care from modern medical practices is rising, traditional cultural or religious beliefs and practices regarding infant and neonatal care are deeply rooted in Nepali community, especially in rural area (S. Sharma et al., 2016; Subba, 2015; Thatte et al., 2009). Cultural beliefs in Nepal have a strong impact on non-utilization of postnatal care (Dhakal et al., 2007; Mesko et al., 2003). Some traditional cultural or religious practices remain very strong even among women who have relatively highly education level (S. Sharma et al., 2016).

The freshly cut umbilical cord is a fecund site for bacterial colonization, which causes omphalitis, which when it does not resolve can progress to neonatal sepsis and death. As the infection progresses it is accompanied by symptoms of pus discharge, redness, swelling, or foul odor at the umbilical cord. The risk factors for omphalitis

include the type of birthing surface cord care (tying, cutting, topical applications), infant-bathing practices, attendants' hand-washing practices, skin-to-skin contact between mother and newborn, and thermal care of the newborn (Bennett et al., 1995; Bennett, Schooley, Traverso, AGHA, & Boring, 1996; Garner, Lai, Baea, Edwards, & Heywood, 1994; Quddus, Luby, Rahbar, & Pervaiz, 2002). Additional distal risk factors include the caretaker and mother's literacy levels, socioeconomic status, ethnicity, or caste may also be associated with cord infection (Mullany et al., 2007).

Considering these realities of culture and observing high rates of omphalitis and neonatal death after the introduction of CHX in Nepal, an investigation into the adaptation of CHX into local traditional practices was deemed useful. Some broad research questions emerge: Following the dualism v. adaptive response models, how is the introduction of CHX interacting with the traditional cultural or religious practices for umbilical cord care? What changes, if any, have taken place in traditional umbilical cord care practices after the national scale-up of chlorhexidine? What people in Nepalese culture are experiencing umbilical cord complications (e.g. infections and other problems) in spite of having CHX application at birth? What people in Nepalese culture are experiencing umbilical cord complications (e.g. infections and other problems) in spite of having CHX application at birth? The Tharu people are one people who unfortunately are experiencing continuing infection and complications for neonates and have traditional practices that carry significant religious meanings associated with

umbilical cord practices. John Snow International staff based in Nepal had observed the Tharu peoples and recommended that cord care research be conducted.

1.5 Tharu Community

The Tharu community, an indigenous community mainly living in the Terai landscapes, takes up 6.7% of the total population of Nepal and is well known for their traditional healthcare knowledge and practices and Hindu culture (Maharjan, Sigdel, Sthapit, & Regmi, 2011). Studies conducted after 2010 found that traditional medicines still play an important role in the healthcare practices in the Tharu community (J. Sharma, Gairola, Sharma, & Gaur, 2014). Many research studies have focused on ethnobotany, ethno-medicines, phytotherapeutic, and phytochemical among the Tharu communities in many districts in Nepal and neighboring regions in India. These studies found that the Tharu people frequently utilize medicinal plants for burns, cuts, wounds, skin diseases, coughs, stomach-ulcers, dysentery, stomachache, etc. yet the safety and scientific efficacy of medicinal plants remains unknown (Acharya & Acharya, 2009; Dangol & Gurung, 1991; A. Kumar, Pandey, Singh, & Tewari, 2013; R. Kumar & Bharati, 2014; J. Sharma et al., 2014).

1.6 Aims & Objectives

The aim of this research is to:

- 1) Describe the traditional/cultural newborn care practices of the Tharu and the non-Tharu people in the Bardiya region of rural Nepal,
- 2) Identify practices that are associated with adverse and non-adverse medical outcomes for neonates (involving the umbilical cord)
- 3) Identify adaptations of the CHX umbilical cord care regime that are not proving to be as efficacious as those observed in previous clinical trials.
- 4) Specify the beliefs, motivations, and situational constraints which maintain behavior patterns in terms of recently delivered women (RDW) and newborns, and an exploration of the interactions between traditional cultural or religious practices and modern practices in order to further explain why the prevalence of omphalitis remains high after the intervention of CHX.

2. Methods

2.1 Study Setting

Nepal, a Himalayan country, has three topographical, geo-ecological and climate setting, which are mountain region, hill region and Terai region. The study was conducted in one of the Terai region, Bardiya District, situated 550 kilometers southwest of the capital city, with a population of nearly half a million. The Tharu community accounts for 51% of the total population in Bardiya district, and the rest of population belongs to ethnic groups such as Brahmin, Yadav, Chetry, Kewat, Chamar, Gurung, Kami, Muslim Teli, Newar, Kurmi, Magar, Koiri, Damai, Sonar, Thakuri (District Health Office, 2015). The Tharu community and the Magar community are the only two ethnic groups in Bardiya that have traditional knowledge of medicine, but the Magar community only represents a very small population (2.9%) in Bardiya district (District Health Office, 2015; J. Sharma et al., 2014).

Following guidelines from WHO and UNICEF, Nepal has adopted the Community Based Integrated Management of Childhood Illness (CB-IMCI) program since 1994. CB-IMCI program is an integrated package of child-survival interventions that addresses major diseases that threaten newborn lives, such as, pneumonia, infection, jaundice, and hypothermia and provides counseling service on newborn care, including the application of CHX. Since 2007, with the implementation of this package, children are diagnosed early and treated appropriately for major childhood illnesses at

the health facility and community level. At the community level, health workers are the main vehicle of service delivery while Female Community Health Volunteers (FCHV) play a key supporting role to increase access to services through counseling and community mobilization.

According to the description in the Handbook on Integrated Management of Childhood Illness (IMCI), there are two possible classifications for bacterial infection: Possible Severe Bacterial Infection (PSBI) and Local Bacterial Infection (LBI). The distinction between PSBI and LBI is based on seriousness of umbilical redness and size and number of pustules. If umbilical redness is extending to the skin or there are many or severe skin pustules, then the baby will be diagnosed as PSBI and recorded in Nepal Integrated Management of Neonatal and Childhood Illness (IMNCI) Register by health worker in village health facility. Otherwise, the diagnoses will be LBI. (WHO, 2005)

Figure 1 (below) shows child mortality rate in different regions in Nepal. The Terai region has a 15% higher infant mortality rate than the national average level, and the rural region has a 20% higher infant mortality rate than the national average level (Demographic and Health Survey, 2011).

Even though CB-IMCI program has been implemented in Bardiya since 2007, according to the Nepal Annual Health Service Report (MoHP, 2014), prevalence of PSBI and LBI among infant aged 0-2 months are still high in southwestern districts. Of all 75

districts in Nepal, Bardiya District has the highest LBI rate and the highest PSBI rate, which is more than seven times higher than the national average level.

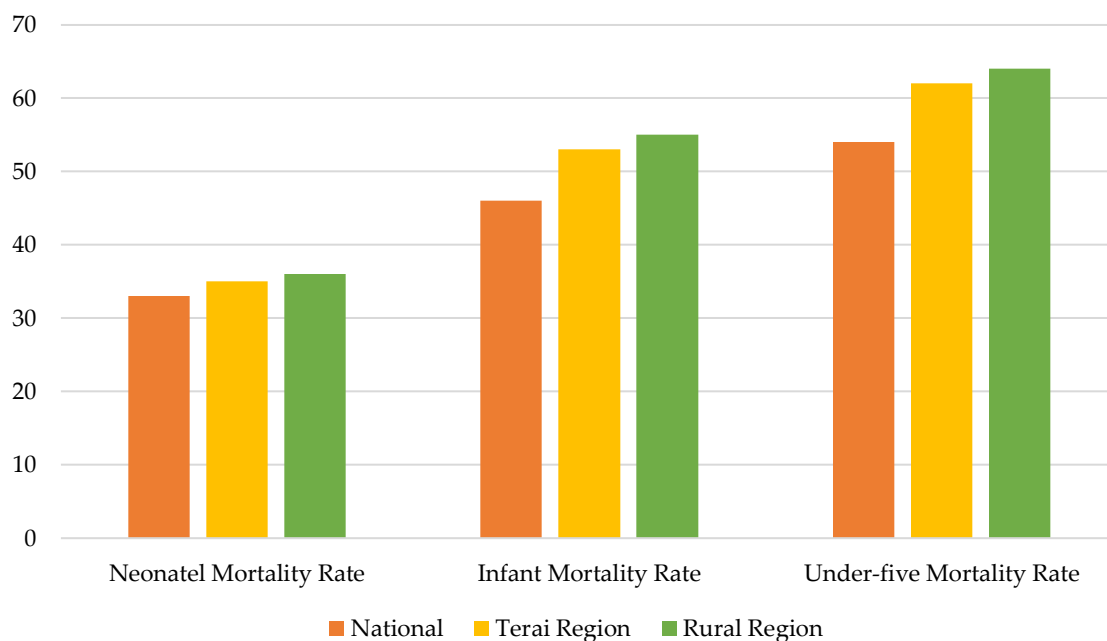


Figure 1: Child Mortality Rate in Nepal (Demographic and Health Survey, 2011)

Bardiya has 32 Village Development Committees (VDC) and one municipality.

This study was conducted in 18 VDCs where the Tharu community makes up 20% - 80% of the total village population (District Health Office, 2015). The selected 18 VDCs account for 55% of the total district population and 51% of total Tharu population in Bardiya (District Health Office, 2015). In 18 VDCs, there are two Primary Health Centers, 12 Health Posts, and three Sub-health Posts (District Health Office, 2015).

2.2 Study Design

Qualitative and quantitative research methods were utilized to provide a more holistic picture of newborn care practices as these practices have significant cultural overtones.

This study interviewed recently delivered women (RDW) (women delivered in the last seven months) with a structured interview questionnaire and semi-structured interview guidelines. The structured interview questionnaire was constructed based on the Nepal Demographic and Health Survey, in order to gauge mother's family, education and wealth background, while the semi-structured interview guideline was constructed based on studies in related literature to probe into traditional cultural or religious child care practices, especially cord care practices. The guideline was pretested among RDW from the Tharu community in rural Baridya District, and revisions were made. Such alterations include: adding more exploratory questions, changing the order and wordings of some questions, inclusion of alternative options. Results from pretest were discarded.

This study also conducted a health facility survey by interviewing the person-in-charge and sister-in-charge from the health facility. The health facility survey was designed based on the previous literature and Nepal Demographic and Health Survey, and contains questions regarding logistics and inventory related to delivery and

newborn care services, and health worker's knowledge of newborn care, in order to assess CB-IMCI service availability and quality

The structured interview questionnaire and the semi-structured interview guideline were developed and translated into Nepali and then back-translated into English.

2.3 Sampling & Sample Size

The participants in the interview were selected using a combination of purposive and random sampling. Based on health records of last sixth months (Feb 1 – July 31, 2016) in IMNCI Register in each health facility, this study identified in total 125 umbilical infection cases (43 PSBI cases, 82 LBI cases). Amongst the 125 umbilical infection cases, 60.8% (n=76) cases were from the Tharu community (26 PSBI cases, 47 LBI cases), the rest 39.2% (n=49) cases were from the non-Tharu community (17 PSBI cases, 35 LBI cases). Figure 2 (below) demonstrate the distribution of the types of umbilical infection cases across ethnic groups.

Amongst the 125 umbilical infection cases, 60 cases have incomplete names or address (41 cases have missing names, 10 cases have missing addresses, and 9 cases have both missing names and addresses), 23 cases were not at home during our attempted visits, which occurred at least three times in all cases. (Figure 2, below) The Demographic and Health Survey (2011) reported a high migration rate among female residents in the rural Terai region, which may explain some of the reasons that this

study found 23 cases were not at home during attempted visits. Among the female respondents who migrated within 1 year, 74.9% of them aged 15-39 years, 89.1% of them migrated from the rural area, 50% of them come from the Terai regions, and 64.2% of them migrated for marriage or family reasons (Demographic and Health Survey, 2011).

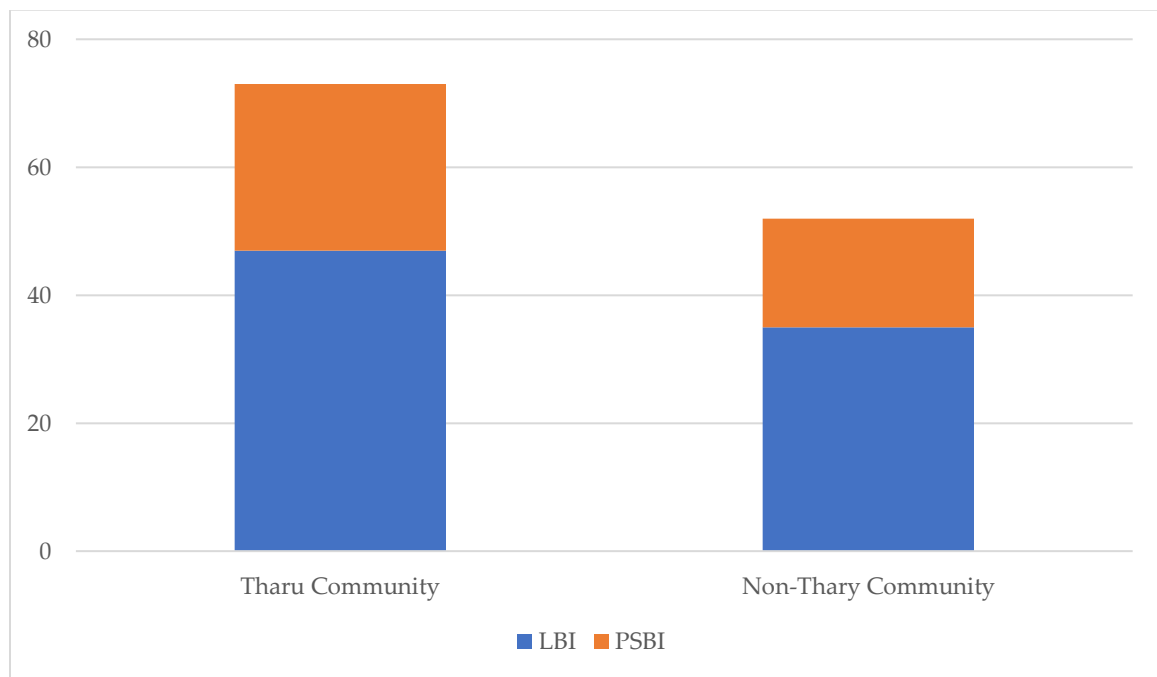


Figure 2: Distribution of the Types of Umbilical Infection Cases among Ethnic Groups

In the end, this study recruited 21 RDW from the Tharu community whose babies were diagnosed with umbilical infection (the Tharu Umbilical Infection Positive, TUIP), and 21 RDW from the non-Tharu community whose babies were diagnosed with umbilical infection (the Non-Tharu Umbilical Infection Positive, NTUIP). Two TUIP interview results were discarded due to incomplete data. Additional 19 RDW from the Tharu community whose babies were healthy (the Tharu Umbilical Infection Negative,

TUIN) were recruited to match each TUIP in the same VDC through random sampling from Maternal and Child Health Service Register.

2.4 Data Collection

This study recruited four interviewers, living in neighborhoods near the study sites, who had previous experience in conducting social science surveys, and were fluent in Nepali and English. The interviewers went through an intensive field-training program with support from John Snow Inc., and were closely supervised to maintain the quality control of the data.

The interviews were conducted in the Nepali language at the house of RDW, and lasted for about one hour each. A paper-based structured interview session was conducted first, followed by a tape-recorded semi-structured interview session. Health facility survey was conducted in the facility and lasted for half an hour each. The study did not have non-response participants.

2.5 Data Analysis

Members of the field data collection team went through the questionnaire, survey and audio tape in the evening to transcribe the content into English. A Nepali senior public health practitioner who speaks fluent English was hired to proofread the translations.

Demographic information from the structured questionnaire was analyzed using STATA 14.0. Investigators used double entry data input in Microsoft Excel 2016 and

imported the data into STATA 14.0. Conditional logistic regression or Fisher's exact test was used to investigate the relationship between a case or a control and a set of demographic factors. A p-value that is equal to or less than 0.05 was considered statistically significant. A thematic approach was used to analyze the transcripts, based on identifying patterned meaning across the whole content. Codes were developed and coded along thematic issues. Investigator applied 13 pre-developed codes to the transcripts using Nvivo 11.3 qualitative data analysis software, regarding pregnancy, delivery, newborn and umbilical cord care, cord separation and naming ceremony.

The investigator selected the representative quotes that were considered relevant to this publication.

2.6 Ethical Approval

The study was approved by the Nepal Health Research Council and the Duke University Human Subjects Administration. Verbal informed consent was taken prior to interview and survey from all the participants.

3. Findings & Results

3.1 Population Characteristics

The study population of the interview consists of 59 Recently Delivered Women (RDW) who agreed to participate in the study (0% refusal rate).

The mean age of the study population was 23.0 years. The youngest RDW was at age of 17 and oldest RDW was at age of 33. Few RDW were younger than age 20 (15.3%) and older than age 30 (8.5%), and the majority of them (76.3%) were between the ages of 20-29 years. In order to put the study population into the context (western rural Terai region), the married female aged 15-34 and children born alive in the last 12 months in Bardiya district were compared to the study population, and according to Bardiya District Health Office (2015) 16.8 % of them were younger than age 20, few (9.6 %) of them were older than age 30, the majority (73.5%) of them were between the ages of 20-29 years. Thus, the study population has a good representation of the close target population in terms of age. Figure 3 presents the comparison between the study population and close target population in terms of the mother's age (Figure 3, below).

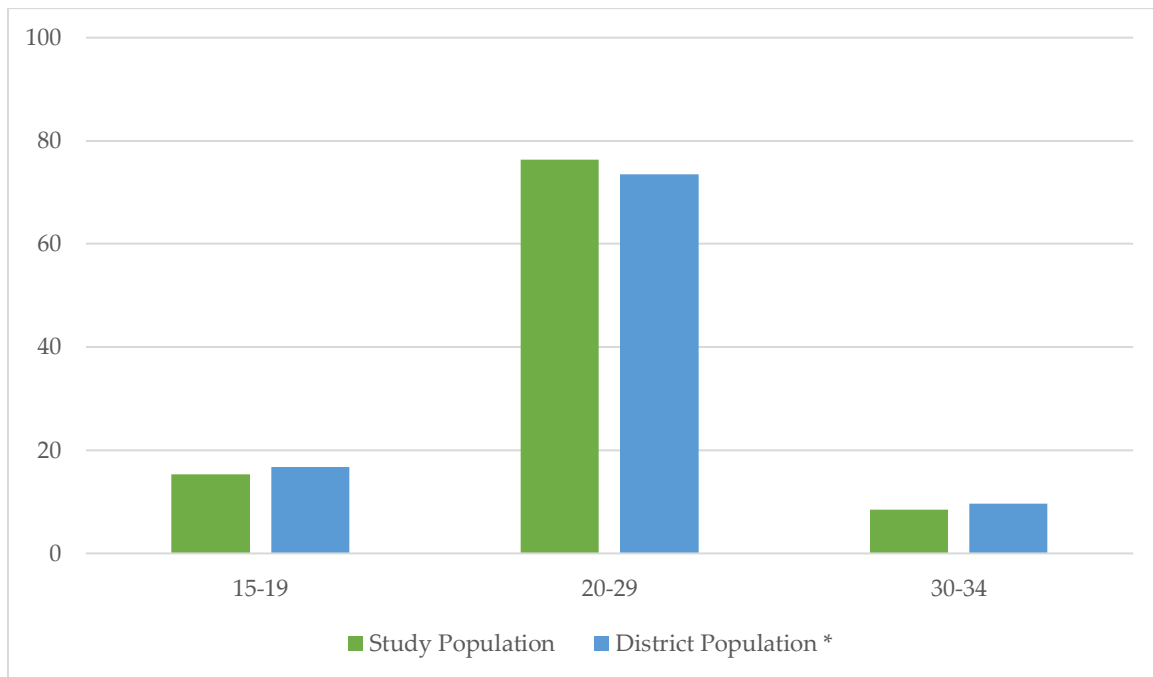


Figure 3: Age Comparison between the Study Population & District Population

Note: * Female population aged 15 - 34 and children born alive in the last 12 months in Bardiya district (District Health Office, 2015)

The majority (82.4%) of the study population received some level of secondary education or higher. The education level of the study population represents the trend of education attainment among the female population aged 15 - 34 over the last 10 years in the western Terai region. The percentage of the female population aged 15 - 34 with no education or primary education decreased dramatically, while the percentage of the

female population aged 15 - 34 who received secondary education and higher increased significantly (Figure 4, below).

The majority (76.3%) of the study population were living with their husbands, slightly higher than 71.0% of the female respondents were living with their husbands in the rural region in 2011 (Demographic and Health Survey, 2011).

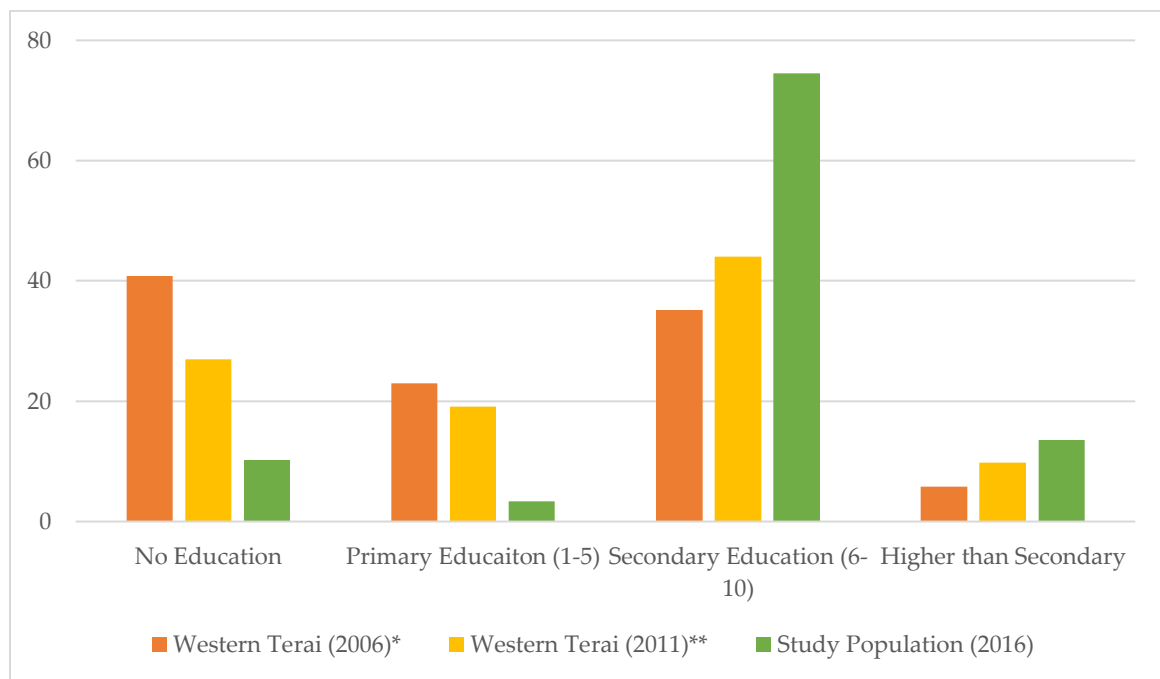


Figure 4: Comparison between Study Population & Population in the Context (Education)

Note: *(Demographic and Health Survey, 2006), ** (Demographic and Health Survey, 2011)

Results from Figure 5 (below) demonstrate the trend of household possession of communication tools over the last 10 years in rural Nepal. Less than half of the study population households possesses radios (38.9%) or TVs (49.2%), and the majority (93.2%)

of households possess telephones and majority (83.1%) of RDW possess personal cell phones. According to NDHS in 2006 and 2011, over the last 10 years, in rural Nepal, the percentage of households possessing radio is steadily decreasing, while households possessing TV is steadily increasing, and especially, the percentage of households possessing telephone is increasing dramatically (Demographic and Health Survey, 2006; Demographic and Health Survey, 2011).

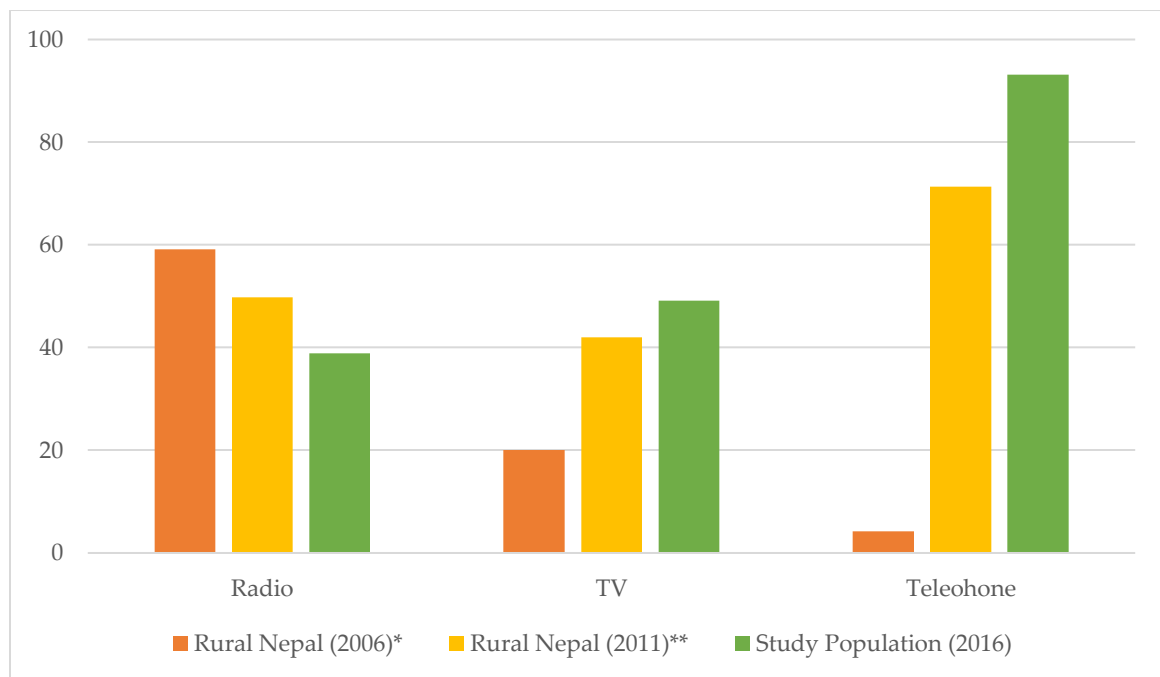


Figure 5: Comparison between Study Population & Rural Population (Communication Tools)

Note: *(Demographic and Health Survey, 2006), ** (Demographic and Health Survey, 2011)

The majority (83.1%) of the households in the study population possess livestock, compared to 78.4% of rural households in 2011 (Demographic and Health Survey, 2011).

The majority (83.1%) of the households in the study population possess agricultural land, compared to 71.3% of the rural households in 2011 (Demographic and Health Survey, 2011).

The comparison between the study population and general population in the context of study site, shows that this study population has a relatively good representativeness in terms of age and education level of RDW, the percentage of RDW living with their husband, and the household possession of communication tools. However, the households in the study population have a slightly higher percentage of livestock and agricultural land possession compared to rural households in NDHS 2011.

This study also found that there are no significant differences between the TUIP, TUIN, and NTUIP, in terms of age of the mother, the occupation of the mother, living with their husband, communication tools, house materials and ownership of agricultural land.

However, the NTUP group (7.3) has a slightly lower education level than TUIP (8.6) and TUIN (8.1). All the RDW from TUIP group possess livestock compared to NTUIP group (71.4%) and TUIN group (78.9%). Among the RDW whose households own agriculture land, the TUIN group has a significantly higher mean land area (1.20), compared to TUIP group (0.83) and NTUIP group (0.54) (Table 1, below).

Table 1: Characteristics of RDW Participants (N=59)

Characteristics	TUIP (N=19)	NTUIP (N=21)	TUIN (N=19)	Total (N=59)
Mother's Age in Year				
<20	2	3	4	7 (11/9%)
20-29	17	15	13	48 (81.4%)
>= 30	0	3	3	4 (6.8%)
Mean	23.2	23.2	22.7	23.1
Education				
No Formal Education	1	3	2	6 (10.2%)
Primary Education	0	1	1	2 (3.4%)
Secondary Education	15	16	13	44 (74.5%)
Higher than Secondary Education	3	2	3	8 (13.6%)
Mean	8.6	7.3	8.1	8.0
Occupation				
Housewife	17	18	18	53 (89.8%)
Living with Husband				
Yes	15	17	13	45 (76.3%)
Communication				
Tools				

Radio	14	13	5	23 (38.9%)
TV	11	11	7	29 (49.2%)
Family Phone	18	18	19	55 (93.2%)
Personal Phone	16	20	13	49 (83.1%)
<hr/>				
House Materials				
Metric				
3-5	1	4	2	7 (11.9%)
6-8	16	11	15	42 (71.2%)
9-10	2	6	2	10 (16.9%)
<hr/>				
Ownership of	19	15	15	49 (83.1%)
Livestock				
<hr/>				
Ownership of				
Agriculture Land				
Yes	16	18	15	49 (83.1%)
Mean Area (Bigha)	0.83	0.54	1.2	0.84
<hr/>				

3.2 Pregnancy Related Questions

The study population has a high antenatal care coverage (92.6%) during pregnancy, which substantiates the overall trend in the western Terai region during the last 10 years. Only five RDW (7.4%) (2 cases had no antenatal visit, 3 cases had three

antenatal visits) in this study reported less than four times of antenatal care visit.

According to NDHS 2006 and 2011, the percentage of pregnant women reported no antenatal care dropped from 33.4% in 2006 to 5.8% in 2011 (Demographic and Health Survey, 2006; Demographic and Health Survey, 2011).

Notably, all (N=19) RDW from TUIN group reported contacted FCHV and sought at least four times of antenatal care visits. However, one RDW from TUIP and one RDW from NTUIP did not contact FCHV, and one RDW from TUIP and two RDW from NTUIP sought three times of antenatal care visits.

Additionally, the TUIP has the lowest percentage of RDW who had heard of CHX (63.2%) and demonstrated knowledge of CHX usage (42.1%). Among RDW in NTUIP group, 76.2% had heard of CHX and 57.1% demonstrated knowledge about CHX usage. The TUIN has the highest percentage of RDW who had heard of (78.9%) and demonstrated knowledge about CHX usage (63.2%) than the other two groups. Notably, some (36.8%) RDW from TUIP group received CHX during pregnancy, whereas few (19.0%) RDW from NTUIP group received CHX, and nearly half (47.4%) of RDW from TUIN group received CHX (Table 2&3, end of the discussion section).

In Nepal, the mother group were formed across the country in 2006, engaging in wide activities regarding to improve social development, peace, and prosperity for all. Among the study population, 57.9% of RDW from TUIP group, 52.4% of RDW from NTUIP group and 63.2% from TUIN group heard of the mother group. Among the RDW

who heard of the mother group, one RDW from TUIP group, three RDW from NTUIP group, and four RDW from TUIN group did not attend the mother group. In total 26 RDW in this study attended the mother group, and the content discussed in the mother group includes:

“(We Discussed) The Caring of the baby, like their food, nutrition, and sanitation.” (RDW, age 22, finished lower secondary education).

“I learnt how to give birth only in the health post and not delivery baby at home.” (RDW, age 24, finished secondary education).

3.3 Delivery Related Questions

Facility-based deliveries were very common (93.2%) amongst the study population, and only four RDW (6.8%) (two in TUIP group and two in NTUIP group) delivered at home due to emergency. All four non-facility delivered RDW contacted FCHV and sought antenatal care visits at the health facility at least four times during pregnancy. One home-delivery case was facilitated by a traditional birth attendant and neighbors, and the remaining three home-delivery cases were facilitated by FCHV and neighbors. (Table 9, end of the discussion section)

In the western Terai region, the percentage of facility born saw a dramatic increase from 15.9% in 2006 to 48.4% in 2011 (Demographic and Health Survey, 2006; Demographic and Health Survey, 2011). Additionally, since 2011, financial incentive

(1000-1500 NRP) was given to women who delivered at a health facility in Bardiya district. One RDW described home delivery as:

“Because the home delivery is bad and we will get facility help in the health post.” (RDW, aged 24, received some level of secondary education).

The two reasons for facility birth were proximity and quality and availability of medical equipment at the health facility. The majority (78%) of RDW arrived at a health facility within one hour, the major transportation tools were bullock cart (36.4%) and ambulance (20%); and the majority (60%) of RDW stayed in health facility less than one day (Table 6, 7, 8, end of the discussion section).

3.4 Newborn Care & Cord Care Related Questions

The health facility survey presents provisional results on the availability and preparedness of the health facility regarding delivery and especially newborn care services. This study found that in all 17 health facilities, soapy water or disinfectant was used to treat the contaminated equipment after delivery, autoclaving or sterilization (boiling or steam) was used to treat the medical equipment before delivery. There was no CHX “stock out” in all 17 health facilities in the last 12 months before the interview, and all the health workers interviewed reported CHX was applied to all the babies

delivered in the last 12 months. All the health facilities had clean and sterile gloves, alcohol, rub, sterile scissors/blade, towel/blanket, and CHX instruction poster available in the delivery room; one health facility did not have a sharps container in the delivery room; and three health facilities did not have sterile disposable cord ties or clamps available in the delivery room.

The health facility survey also shows that all newborn care providers reported washing hands with soap and wearing gloves, and applying CHX on the tip of the cord, stump, and the surrounding area.

Information from the RDW interview also sheds light on newborn care practices. WHO recommends early initiation of breast milk within one hour of birth. Amongst the study population, 96.6% of RDW gave thermal care to the newborns, 94.9% of RDW started breastfeeding within one hour of birth. The interview also found that mustard oil, ginger powder and ashes were the most frequently applied substances in the community where the study population lives. (Table 9&10, end of the result section)

The interview substantiates the previous study about underlying beliefs associated with substances application: mustard oil and ginger powder were perceived as “hot” in Hindu cultural and application of these substances prevent or cure diseases (S. Sharma et al., 2016). Some RDW interview results voiced the similar beliefs:

“Lotions & oil, maybe they cure (diseases) or beneficial (to baby).” (RDW, age 28, no formal education)

“I used oil daily so that umbilical cord will not get infected.” (RDW, age 19, finished primary education)

Amongst the 40 omphalitis positive cases (19 TUIP and 21 NTUIP), once RDW noticed some problem on baby’s umbilical cord or surrounding areas, the first person contacted was mostly health workers (60%) at the health facilities. If not, FCHV (25%), family or relatives (10%), neighbors (5%) were the first person contacted. In the end, all RDW from the 40 omphalitis positive cases went to the health facility for further treatment. Notably, nearly half (52.6%) of RDW from TUIP group sought assistance from health worker directly after notice of problem on babies’ umbilical cord, whereas two-thirds (66.7%) of RDW from NTUIP group sought assistance from health workers directly (Table 11&12, end of the result section).

“FCHV and health worker told us to keep the cord dry and clean.” (RDW, age 22, received some level of secondary education).

However, nine RDW (4 from TUIP, 5 from NTUIP) among 40 omphalitis positive cases reported that they conducted some home treatments, and mustard oil (in seven

cases) and ginger powder (in five cases) were most frequently applied substances, and cow dung was applied in one case.

“It is our tradition to apply something after cutting the cord, like oil.”

(RDW, age 23, finished secondary education).

“After I noticed the problem, my mother (in law) told me to put some oil and cow dung on the umbilical cord.” (RDW, age 24, finished secondary education).

3.5 Umbilical Cord Separation & Naming Ceremony

The previous study has described the naming ceremony in different ethnic groups in Nepal, as a purification ceremony since birth is believed to be unclean (S. Sharma et al., 2016). The date of the naming ceremony usually takes place between 3 to 12 days after birth (S. Sharma et al., 2016). Before the ceremony, the RDW cannot go outside of the house and visit the Hindu temple, and sometimes no other members of the community will touch her or take the newborn directly from her (S. Sharma et al., 2016). Only, after the naming ceremony, is the RDW accepted back into the society (S. Sharma et al., 2016).

This study found that some RDW thought that it is not acceptable to hold the naming ceremony before the separation of the cord. Our interview

“It (cord separation) took very long time to fall off. We do not practice holy activities (naming ceremony) before cord fell off.” (RDW, age 21, finished lower secondary education).

“Because of our tradition and god will not accept this (holding naming ceremony without cord fell off).” (RDW, age 23, finished secondary education).

3.5.1 Date of Cord Separation

Among 59 cases in this study, cord separation occurred from days four to 22, with a mean of 10.3 ± 1.0 days. Infants from TUIP were found to have the shortest mean interval as 9.5 ± 2.0 days, whereas infants from NTUIP had the longest mean interval as 11.2 ± 1.6 days, and infants from TUIN had a mean interval of 10.1 ± 1.7 days. In total, 17 newborns (28.8%) in this study had a cord separation date on or later than the 12th day after birth, among them four were from TUIP group, nine were from NTUIP group and four were from TUIN group. Figure 6-8 (below) present the dates of cord separation among infants from three groups.

3.5.2 RDW Feelings about Interval for Cord Separation

Among the study population, 25 RDW (42.4%) felt the separation was late, 10 RDW (16.9%) felt the separation was too late, 13 RDW (22.0%) felt the separation was early, and the rest (18.6%) had a neutral opinion about cord separation.

Notably, amongst 12 RDW in TUIP group that cord detached after 9 days of birth, the majority of RDW (83.3%) felt cord separation was “late” or “too late”, and a quarter of (25.0%) RDW felt cord separation was “too late”. Amongst seven RDW in TUIP group that cord detached before 9 days of birth, all RDW felt cord separation was “early”. Thus, in this study the 9th day of birth is the cutoff-point for the Tharu RDW perception of the interval for cord separation in the study population.

For the 19 RDW in NTUIP group, the cutoff-point is observed at the 7th day of birth. After the 7th day of birth, the majority of RDW (72.2%) felt cord separation was “late” or “too late”, and the rest (27.8%) had a neutral opinion. Before the 7th day of birth, two-third of RDW felt cord separation was “early” and the rest (33.3%) had a neutral opinion.

Among the TUIN group, after the 8th day of birth, except for one RDW (6.7%) felt cord separation was “early”, the majority of them (80.0%) felt cord separation was “late” or “too late”, and the rest (13.3%) had a neutral opinion.

Notably, in three cases (two from TUIP group, one from NTUIP group), when RDW felt cord separation was “late” or “too late”, substances were applied to the cord and the cord was pulled. However, no such activity was found among RDW in the TUIN group who felt cord separation was late or too late.

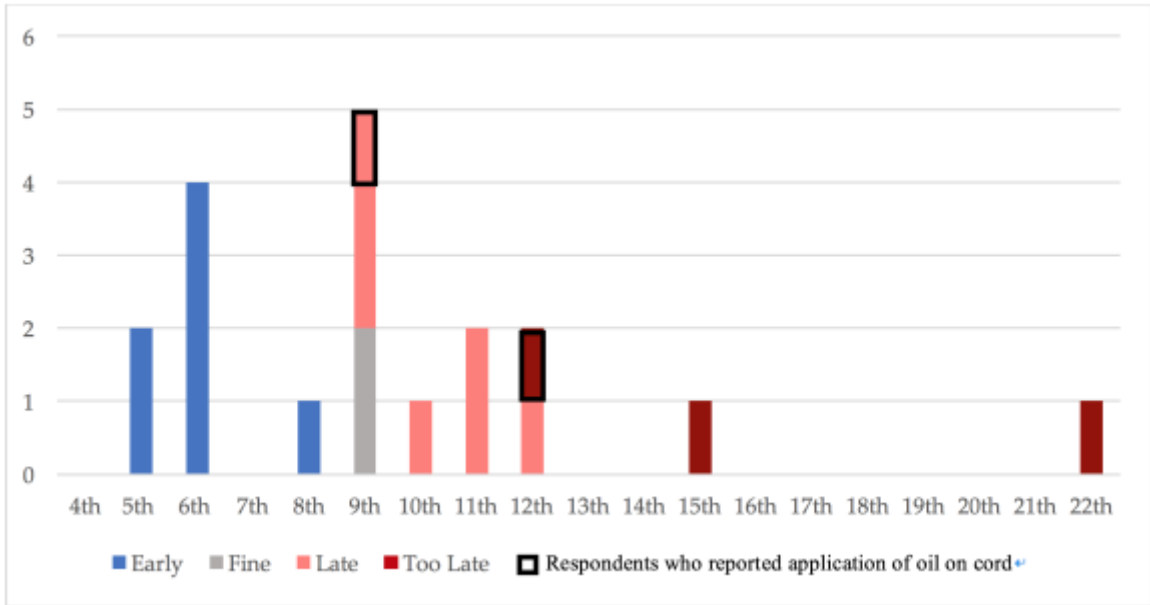


Figure 6: TUIP Feeling of Interval for Cord Separation (N=19)

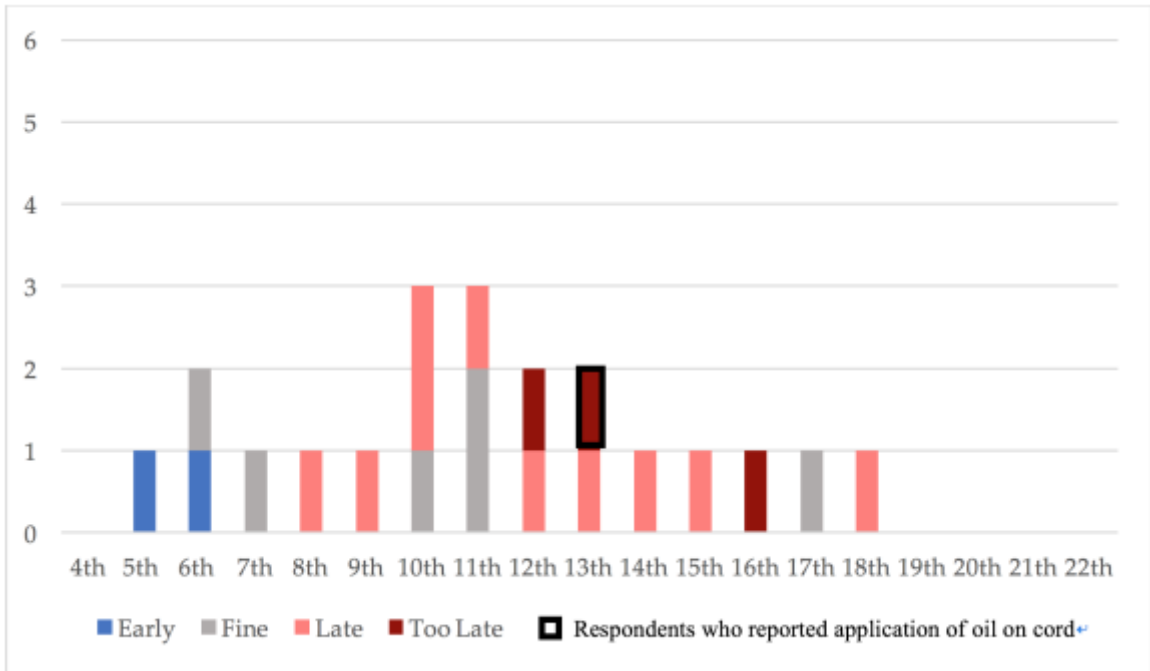


Figure 7: NTUIP Feeling of Interval for Cord Separation (N=21)

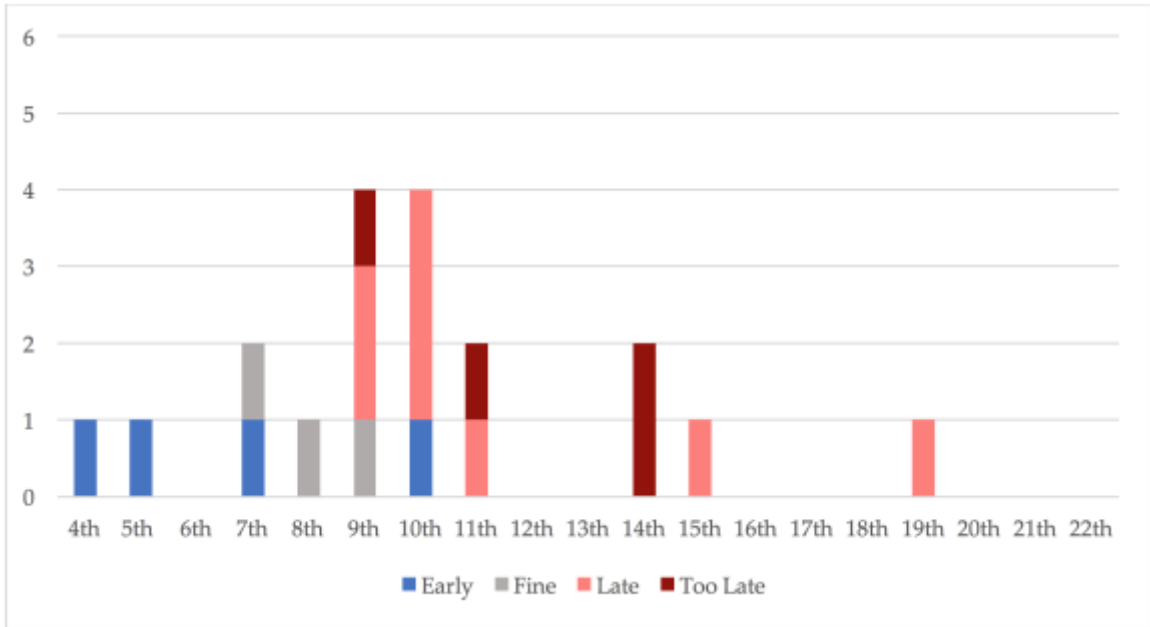


Figure 8: TUIN Feeling of Interval for Cord Separation (N=19)

3.5.3 Date of Naming Ceremony

By the time of the interview, more than half (61%) of newborns in this study had held the naming ceremony, and the remaining newborns (eight from TUIP, four NTUIP, 11 from TUIN) did not hold the naming ceremony prior to the interview. The interview results suggest that there might be three reasons for not holding the naming ceremony:

1) Two RDW (one from TUIP, one from NTUIP) specifically mentioned that economic issue as the reason.

“We did not hold Naming ceremony because we don’t have money to buy things, and it is associated (with cord fell off).” (RDW, age 19, received some secondary education).

“We did not have a naming ceremony, since we are poor, where can we get money for all the things.” (RDW, age 19, finished primary education).

2) Two RDW from TUIP group specifically mentioned that the traditional cultural or religious issue is the reason.

“It took very long time to fell off. We do not practice holy activities (naming ceremony) before cord fell off.” (RDW, age 21, finished lower secondary education).

“Because of our tradition and god will not accept this (holding naming ceremony without cord fell off).” (RDW, age 23, finished secondary education).

3) Three newborns (two from TUIP, one from TUIN), who were born in less than 2 weeks, might not be old enough to conduct the naming ceremony.

Of all the 36 cases that held the naming ceremony, only few cases (8.3%) were held after the 12th day of birth, and all the rest (91.7%) cases held before the 12th day of birth. Notably, nearly half cases (48.5%) held the naming ceremony at the 11th day of birth.

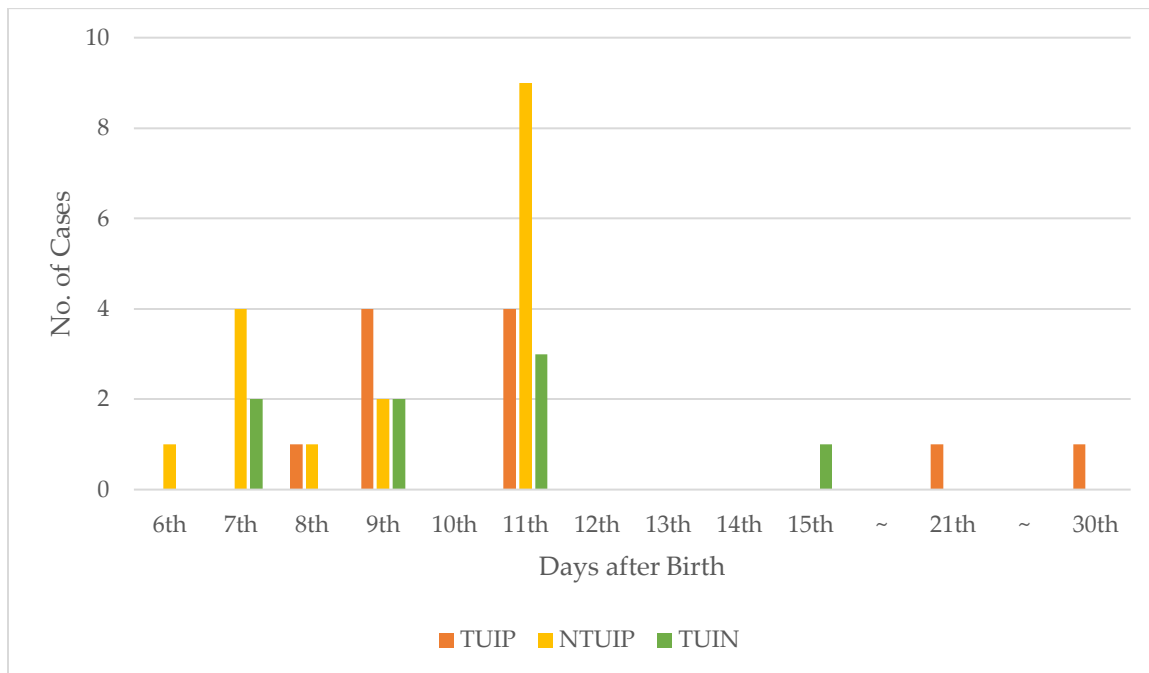


Figure 9: Dates of the Naming Ceremony

3.5.4 Association between Naming Ceremony & Cord Separation

This study found that among TUIP group, there was no naming ceremony held before the cord separation. Among NTUIP group, the majority (64.7%) of cases had the naming ceremony before the cord separation, some (23.5%) cases had the naming ceremony after the cord separation and few (11.8%) cases had the naming ceremony at the same day with the cord separation. Among TUIN group, half (50.0%) the cases had the naming ceremony after the cord separation, a quarter (25.0%) of the cases had the naming ceremony before the cord separation, and a quarter (25.0%) of the cases had the naming ceremony at the same day with the cord separation.

Overall, among the study population, half (50.0%) of the cases had the naming ceremony after the cord separation, 36.1% of the cases had the naming ceremony before

the cord separation and 13.9% of the cases had the naming ceremony at the same day with the cord separation (Figure 10).

This study found that 13.6% of the study population recognized the association between the date of the naming ceremony and the date of the cord separation. This percentage is higher among TUIP group (26.3%) and among NTUIP group (14.2%), whereas no RDW from TUIN group recognized such association (Table 4).

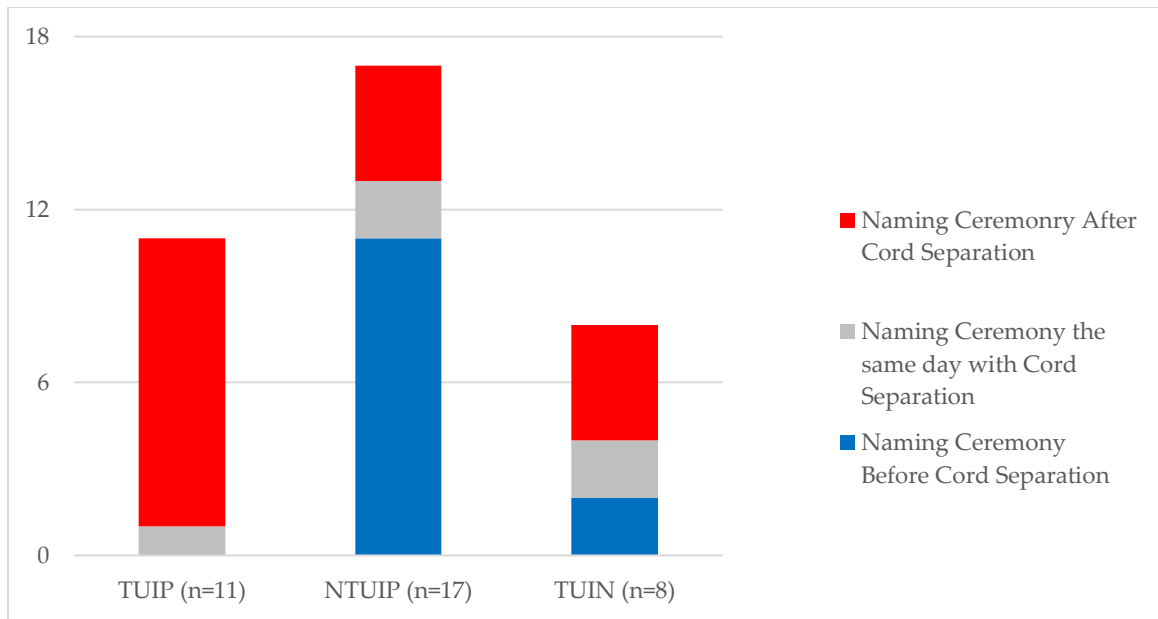


Figure 10: Timing of Naming Ceremony and Cord Separation

Table 2: Summary of RDW's Perception about the Association between Naming Ceremony and Cord Separation

	TUIP (N=19)	NTUIP (N=21)	TUIN (N=19)	Total (N=59)
Yes	5	3	0	8
No	14	18	19	51

3.6 Decision Making Related Questions

This study also interviewed RDW about power of decision making inside a family, in order to investigate how traditional cultural and religious beliefs affect healthcare related behavior inside a family. This study confirmed the result found in NDHS 2011, that married women have limited power to make many decisions regarding healthcare access, and found that the mother-in-law, the husband of RDW, and the father-in-law have more participation than RDW in those decisions regarding healthcare access.

3.6.1 Delivery Location

In terms of the delivery location decision, RDW themselves are the key person, 12 out of 55 facility born cases were decided by RDW. The mother-in-law is the most influential person (15/55), closed followed by the husband of RDW (12/55). Amongst other family members, the father-in-law (6/55) and FCHV (6/55) were the major influencers, and the sister-in-law (4/55) and friends of RDW (1/55) were the minor influencer (Table 13, end of the result section).

Notably, regarding delivery location decision, TUIP group has least participation from FCHV, but most participation from the father-in-law than the two other groups. TUIN group has least participation from RDW.

3.6.2 Major Household Purchases

In terms of the decision about major household purchases the father-in-law (24/59) is the most influential person, and the mother-in-law (18/59), the husband (17/59), and husband together with RDW (18/59) were key influencers. RDW (4/59) and sister-in-law (2/59) were the least influential persons. (Table 14, end of the result section)

RDW and husband together with RDW from TUIP group have least power in decision making about household purchases compared to two other groups. Whereas, the mother-in-law and the father-in-law from TUIN group have least power compared to two other groups.

3.6.3 RDW Visiting Maid Home or Relatives

In terms of the decision about RDW visiting maid home or relatives, the husband (33/59) has the most power, and the father-in-law (29/59), the mother-in-law (28/59), and husband together with RDW were key persons. RDW (4/59) and the sister-in-law (0/59) were the least influential persons. (Table 15, end of the result section)

RDW from TUIP group have least decision power than the other two groups, and the mother-in-law from TUIP group and NTUIP group have more decision power than the mother-in-law from TUIN group.

3.6.4 Healthcare Access

Among the study population, four healthcare barriers were identified as major barriers, namely permission from family members to see a doctor (49/59), getting money

needed for healthcare services (47/59), distance to health facility (49/59), and going alone to health facility (36/59), and Seeking service from a male health worker was identified as minor barrier (36/59) (Table 16, end of the result section).

More RDW (78.9%) from TUIN group identified seeking service from a male health worker as barrier than RDW from TUIP (57.9%) group and NTUIP (47.6%) group, and less RDW (66.7%) from NTUIP group identified going along to health facility as barrier than RDW from TUIP (84.2%) group and TUIN (94.7%) group.

4. Discussion

This retrospective cross-sectional study conducted in Bardiya district, identified harmful traditional cultural or religious newborn care among the Tharu community, and highlighted the underlying beliefs, motivations and situational constraints. Traditional cultural or religious newborn care practices operate parallel with modern neonatal care practices and may offset the efficacy of modern care practices through the application of potentially harmful traditional substances. These substances were applied for preventive, curative, and acceleration of cord separation purposes based on traditional cultural or religious beliefs. Traditional practices and beliefs (i.e. the naming ceremony) play a substantial role today in the western rural Terai region.

In the present study, RDW were generally aware that delivery should take place in the health facility due to an availability of the quality assured medical equipment in the health facility. However, the present study could not rule out the possibility that unhygienic cord cutting and tying exist in the western rural Terai region, due to the non-random nature of the present study. The present study also found that the Tharu omphalitis-negative cases were more active in seeking antenatal services and contacting FCHV, demonstrated more knowledge in CHX and its usage, and received CHX more than the Tharu omphalitis-positive cases and the non-Tharu omphalitis-positive cases. Thus, the RDW's acceptance for modern health care services is positively associated with the health outcome of the baby.

Despite remarkable achievement that has been made regarding increasing coverage of facility delivery and antenatal service among the study population and in the western rural Terai region, amongst 40% of the omphalitis cases in the present study, health workers were not the first person contacted after notice of infection on umbilical cord of the newborns. Instead, family members, FCHV, relatives or neighbors were contacted, and 25% of RDW amongst the omphalitis cases conducted home treatment. These findings substantiate the “Innovation Diffusion Theory” and “Dualism and Parallelism Theory” that the local community is not an empty vessel into which the modern health care practices are introduced, and the traditional health care practices operates parallel with the modern health care practices. The introduction of CHX intervention is blended with traditional cord care practices (e.g. application of traditional substances). Thus, women should be further encouraged to seek healthcare services from health facility in the time of healthcare needs.

The present study identified three conditions in which mustard oil was applied in rural Bardiya, particularly amongst the Tharu community.

Firstly, mustard oil is applied for preventive purposes. Mustard oil was perceived as “hot” religiously, so as to prevent illness which was perceived as associated with “cold”. Application of “hot” substances (e.g. mustard oil) to the baby’s umbilical cord is perceived to provide preventive benefits to the baby. This result substantiates findings from previous studies that mustard oil was commonly applied in South Asia.

Secondly, mustard oil is applied for curative purposes. In some omphalitis-positive cases among the Tharu community and the non-Tharu community, mustard oil was applied after RDW noticed some problem on umbilical cord of the newborn, and the application of “hot” substances is the cornerstone of the traditional practices to keep the baby away from illness.

Thirdly, mustard oil is applied for the purpose of accelerating cord separation. In some omphalitis-positive cases among the Tharu community and the non-Tharu community, when RDW felt the cord detachment was delayed, mustard oil was applied, sometimes with the physical action of pulling the cord stump.

These results suggest that the introduction of CHX intervention in an adaptation with existing traditional practices, the application of traditional substances. Traditional cultural or religious beliefs affect both the Tharu community and other ethnic groups in the rural Bardiya: application of substances commonly exists across different ethnic groups among the study population. Moreover, amongst the Tharu omphalitis-negative cases, only 42.2% of them reported substances being applied in the community the respondents live in, compared to 68.4% in the Tharu omphalitis-positive cases and 76.2% in the non-Tharu omphalitis-positive cases. Thus, the application of traditional substances is positively associated with onset of omphalitis, whereas dry cord care is negatively associated with the onset of omphalitis.

Additionally, the interplay between the naming ceremony and cord separation put RDW in a constrained situation. The naming ceremony was viewed as purification ceremony and should be held only after cord separation based on the local traditions. Also, the naming ceremony is usually held between the 3rd and 12th days postpartum (S. Sharma et al., 2016). The present study found that among all the Tharu omphalitis-positive cases, not a single naming ceremony was held before cord separation, whereas among the Tharu omphalitis-negative cases, 25% of the naming ceremonies were held before cord separation. Particularly, all the non-Tharu omphalitis-positive cases held the naming ceremony before the 12th day of birth, regardless of whether the cord detached or not (64.7% of the naming ceremony was held before cord separation).

These are intriguing findings when comparing the case group with two control groups. The most logical explanation for these differences is that the Tharu cases were more constrained by the tradition of holding the naming ceremony after cord separation, especially the Tharu omphalitis-positive cases, compared to the non-Tharu omphalitis-positive cases; the non-Tharu cases, on the other hand, were more constrained by the tradition of holding the naming ceremony before the 12th day of birth compared to the Tharu cases. Thus, the “rites of passages” (e.g. naming ceremony) which signifies the acceptance of the newborn into the society still plays an important role in the rural Bardiya.

The present study also found the cord separation interval among the Tharu omphalitis negatives cases was longer than the Tharu omphalitis positives cases, but shorter than non-Tharu omphalitis positive cases, thus this study cannot find association between omphalitis and time to cord separation. However, three RDW (two were Tharu omphalitis-positive cases, one was non-Tharu omphalitis-positive case) tried to accelerate cord separation by applying traditional substance, sometimes with the physical action of pulling the cord. Thus, increased interval of cord separation was associated with increased infection risks resulting from the application of traditional substances.

In seeking to understand RDW's power in making decision regarding access to health care services, the present study sought to determine the key persons in family involved in the decisions about delivery location, major household purchases, and RDW visiting maid house or relatives. The results substantiate the findings from the Nepal Demographic Health Survey in 2006 and 2011, that the RDW has limited power in decision making. Instead, mother-in-law, father-in-law, and husband participated more in decision making. RDW's power in decision making about seeking healthcare services alone and getting money for healthcare services were largely influenced by their husband, father-in-law, and mother-in-law. The present study also found that traditional cultural or religious beliefs and practices regarding cord care were inherited from elder female family members.

4.1 Implications for Policy and Practice

The present study has obtained important information about traditional cultural or religious cord care beliefs and practices in rural Bardiya, particularly the interaction between traditional cord care practices and modern ones. This information can inform public health interventions which seek to change behaviors of key persons involved. Some of the practices reported in the present study benefit the newborns and hence should be encouraged. These include facility delivery, seeking healthcare service directly from health workers, and keeping the cord clean and dry. Unfortunately, some harmful behaviors undermine the efficacy of health intervention and expose newborns to risks associated with the application of traditional substances. Thus, these results suggest a redesign of community health campaigns through advocating modern cord care without any substances being applied after CHX, informing mothers as well as family and community members that CHX may increase time for cord separation, and mobilizing community, traditional or religious leaders about destigmatizing delayed naming ceremony that are potentially caused by the application of CHX.

The study also sheds light on the power of RDW regarding making decisions about getting healthcare services and home treatment, thus it is crucial to include the mother-in-law, father-in-law and husband in the household as the target audience for health education campaigns.

4.2 Implications for Further Research

The present study suggest that future studies should investigate the factors associated with increased interval for cord separation. There is a lack of understanding of the impact of application of traditional substances and onset of omphalitis on the interval for cord separation. Moreover, previous studies have concluded that the multiple dosage of 4% CHX gel (seven times in the first ten days postpartum) is associated with prolonged cord detachment as compared to dry cord care in Nepal (dry cord care mean 4.24 (\pm 1.6) days; CHX application 5.32 (\pm 2.4) days), and Zambia (dry cord care mean 4.65 (\pm 2.25) days; CHX application 7.33 (\pm 3.84) days) (J. Herlihy, Semrau, Mazimba, Yeboah-Antwi, & Grogan, 2012; Mullany, Darmstadt, Khatry, LeClerq, et al., 2006). However, the impact of single dosage of CHX gel on the interval for cord separation has not been investigated, thus future study could compare single dosage and multiple dosage in terms of interval for separation and anti-infection effect.

The present study also suggests a future clinical trial regarding CHX powder formulation. Kapellen et al. (2009) compared CHX powder formulation (0.1%) with dry cord care, by conducting an RCT study, and found that cord separation was 7.0 (\pm 2.5) days in CHX powder group and 7.8 (\pm 2.9) days in dry cord care group. The present study findings suggest that future study could compare dry cord care with CHX gel and powder formulation in terms of interval for cord separation and anti-infection effect.

Possible future research could also include repeating this study with random sampled subjects resulting in a less biased population, and replicating these findings among other ethnic groups in western Terai region.

4.3 Study Strengths and Limitations

The present study provided more data in Bardiya, Nepal and was conducted in the most scientifically sound manner possible. While many of the previous studies investigated traditional, cultural or religious beliefs and practices regarding child care and cord care in Nepal, little has been done with a focus on the interaction between traditional cord care practices and modern cord care practices. There is a need to understand such interactions to guarantee the efficacy of modern cord care practices and how they interact with traditional practices. The present study also constructed a cross-sectional study with one case group and two control groups, in order to elicit a comprehensive understanding of local cord care practices and adoption of modern cord care practices in the Tharu community and the non-Tharu community in Bardiya.

A number of important methodological constraints should be considered when interpreting and generalizing the results of this study. It is important to highlight that all the findings were based on RDW and health workers reports and may be subject to various forms of recall and response bias. It is plausible that some RDW reported what they perceived to be expected to practice in comparison to what they actually do, thereby introducing social desirability bias. Possible recall bias was mitigated by

triangulating interview and survey, and interviewing respondents individually.

Moreover, there was also a possible bias during the translation process. To control for this bias, a senior Nepali public health researchers went through translation, however, it is possible that a bias was still present.

An additional methodological constraint is that the results of this study were based on a relatively small and selective sample size in a western rural Terai region, with a sampling frame obtained from health facility records and birth registry. The study population totaled 59 which gave a sample of the community which appeared similar in many ways to the demographic seen in the latest census and survey data. However, it is possible that the study population had a self-selecting bias based on the fact of their presence in the health record and birth registry suggesting that they have accepted modern health care services.

5. Conclusion

Topical application of CHX was recommended by WHO in settings where the neonatal mortality rate is high. Many ethnic groups worldwide have their own traditional cultural or religious beliefs and practices regarding neonates' umbilical cord care and accepting the newborn to the community. Modern cord care practices do not replace but integrate into the existing traditional practices. Thus, it is important to understand the context, existing beliefs, practices in terms of cord care, and particularly the interaction between traditional practices and modern intervention. The current study suggests that CHX is incorporated with traditional cord care substances (e.g. mustard oil, ginger powder) which may delay cord separation. Cord separation has a high social valence (e.g. naming ceremony) to welcome the newborn into the society and label temporally to cord separation. Future studies should investigate the effect of CHX gel and powder formulation on the interval for cord separation, and detect if cord separation delay can be reduced or eliminated while maintaining the anti-infection effect of CHX in single or multiple dosage application.

Table 3: Pregnancy Related Questions (TUIP & NTUIP)

	TUIP (N=19)	NTUIP (N=21)	Odds Ratio (95% CI)	P-Value (Fisher's exact test)
Contacted FCHV During Pregnancy	18	20	0.9	1.000
Antenatal Check (At least 4 times)	17	18	0.9	1.000
Heard Mother Group	11	11	1.25 (0.37, 4.27)	0.761
Attend Mother Group	10	8	-	-
Heard CHX	12	16	0.54 (0.14, 2.03)	0.525
Received CHX during Pregnancy	7	4	2.48 (0.62, 9.82)	0.293
Know Usage of CHX	8	12	0.55 (0.16, 1.88)	0.341

Table 4: Pregnancy Related Questions (TUIP & TUIN)

	TUIP (N=19)	TUIN (N=19)	Odds Ratio (95% CI)	P-Value (Conditional logistic regression)
Contacted FCHV During Pregnancy	18	19	-	-

Antenatal Check (At least 4 times)	17	19	-	-
Heard Mother Group	11	12	0.80 (0.22, 2.88)	1.000
Attend Mother Group	10	8	1.53 (0.43, 5.38)	0.746
Heard CHX	12	15	0.46 (0.11, 1.85)	0.476
Received CHX during Pregnancy	7	9	0.65 (0.18, 2.31)	0.655
Know Usage of CHX	8	12	0.43 (0.12, 1.53)	0.339

Table 5: Reason of Delivery Location Choice

	TUIP (N=19)	NTUIP (N=21)	TUIN (N=19)	Total (N=59)
Home Born	(n = 2)	(n = 2)	(n = 0)	(n=4)
Did not have time to go to health facility	2	2	0	4
Facility Born	(n = 17)	(n = 19)	(n = 19)	(n=55)
Health Facility in VDC	(n=14)	(n=15)	(n=15)	(n=44)
Close to the house	8	10	9	27
Good Facility	6	7	8	21
Safer	0	0	1	1

Cheap	1	0	0	1
Hospital in Municipality	(n=3)	(n=4)	(n=4)	(n=11)
Good Facility	3	3	3	9
Close to the house	0	1	0	1
Emergency	0	0	1	1

Table 6: Transportation to Delivery if Facility Born

	TUIP (N=17)	NTUIP (N=19)	TUIN (N=19)	Total (N=55)
Bullock Cart	7	4	9	20
Ambulance	3	5	3	11
Bus	1	1	4	6
Car	2	2	1	5
Motorcycle (Bike)	0	3	2	5
Bicycle	1	3	0	4
Walk	3	1	0	4

Table 7: Distance to Health Facility

	TUIP (N=17)	NTUIP (N=19)	TUIN (N=19)	Total (N=55)
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If Nearby Health	15	15	13	43
Facility				
<= 30 Minutes	9	12	8	29
30 – 60	2	3	3	8
Minutes				
1 – 2 Hours	3	0	2	5
> 2 Hours	1	0	1	2
If Hospital in	3	4	5	12
Municipality				
<= 1 Hour	1	3	2	6
> 1 Hour	2	1	3	6

Table 8: Duration in Health Facility

	TUIP (N=17)	NTUIP (N=19)	TUIN (N=19)	Total (N=55)
<= One Day	11	12	10	33
Two Days	3	2	4	9
More than two days	2	2	2	6
Cannot Remember	1	3	3	7

Table 9: Delivery Related Questions

	TUIP (N=19)	NTUIP (N=21)	TUIN (N=19)	Total (N=59)
Breastfeed within 1 hour	18	20	18	56
Skin to Skin contact	18	21	18	57
Baby Received CHX				
Yes	9	15	12	36
Cannot Remember	10	6	7	23
The Person who applied CHX told RDW about application of CHX				
Yes	8	9	9	26
No	7	5	6	19
Cannot Remember	4	7	4	15

Table 10: Summary of Substances Applied in Community

	TUIP (N=19)	NTUIP (N=21)	TUIN (N=19)	Total (N=59)
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If Substance Applied				
Mustard Oil	10	13	8	31
Ginger Powder	4	4	0	8
Ashes	2	1	1	4
Lotion	0	2	0	2
Burned Cow Dung	1	1	0	2
Not Anything Applied	6	5	11	22

Table 11: After Infection First Person to Contact

	TUIP (N=19)	NTUIP (N=21)	TUIN (N=19)	Total (N=40)
Health Facility	10	14	-	24
First FCHV then Health Facility	5	5	-	10
Family or Relatives then Health Facility	4	0	-	4
First Neighbors then Health Facility	0	2	-	2

Table 12: After Infection Home Treatment

	TUIP (N=19)	NTUIP (N=21)	Total (N=40)
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	N=4	N=5	N=9
If home treatment is conducted, the frequency of			
Mustard oil	3	4	7
Ginger Powder	2	3	5
Cow Dung	1	0	1
Did not conduct any home treatment	15	16	31

Table 13: Key Person in Decision of Choosing Delivery Location

	TUIP (n=17)	NTUIP (n=19)	TUIN (n=19)	Total (N=55)
RDW	4	6	2	12
Mother-in-law	5	6	4	15
Husband	5	3	5	12
Family members together	1	3	3	7
Father-in-law	4	1	1	6
FCHV	1	2	3	6
Sister-in-law	1	2	2	4

Friends	0	1	0	1
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Table 14: Decision about Household Purchasing

	TUIP (n=19)	NTUIP (n=21)	TUIN (n=19)	Total (N=59)
RDW	0	2	2	4
Husband	5	6	6	17
RDW and Husband	2	9	7	18
Together				
Mother-in-law	6	9	3	18
Sister-in-law	2	0	0	2
Father-in-law	8	10	6	24

Table 15: Decision about visiting maid home or relative

	TUIP (N=19)	NTUIP (N=21)	TUIN (N=19)	Total (N=59)
RDW	1	2	1	4
Husband	8	12	13	33
RDW and	6	10	7	23
Husband Together				
Mother-in-law	9	12	7	28
Sister-in-law	0	0	0	0

Father-in-law	9	11	9	29
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Table 16: Decision about Healthcare Access

Identified Barriers to Healthcare Access	TUIP (N=19)	NTUIP (N=21)	TUIN (N=19)	Total (N=59)
Permission from family members to see doctor	17	16	16	49
Getting money needed for healthcare services	15	16	16	47
Distance to health facility	15	16	18	49
Going alone to health facility	16	14	18	48
Seeking service from male health worker	11	10	15	36

Appendix A

Recently Delivered Women Interview Guideline

100. Identification			
01	Form Number:	02. Date of visit:/...../.....(dd/mm/yyyy)in A.D	
03	VDC /Municipality name.....	04. VDC/Municipality code: <input type="text"/> <input type="text"/> <input type="text"/>	
05	Ward no: <input type="text"/> <input type="text"/>		
06	Is birthing center available in this VDC/municipality?	Yes.....1 No.....0	
200. Demographic information			
	Description	Responses	Go to
01	Caste of respondent:		
02	How old are you? (record completed age)	<input type="text"/> <input type="text"/> years	
03	How old is your youngest child?	<input type="text"/> <input type="text"/> Months	
04	Are you able to read and write in any language?	Yes.....1 No.....0	→ 207
05	What is highest grade you passed?	<input type="text"/> <input type="text"/> grade Informal education.....66	

06	Will you be able to read this (handover the Chlorhexidine job aid in Nepali language to RDW)? (ask this question to the women if she has not completed grade six education) (If the women tells that women can read other than Nepali language, identify the language and give reading materials of her language)	Unable to read single word1 Able to read few words2 Able to read the whole sentence3	
07	What is your main occupation?	
08	Does your family have following communication tools?	Yes	No
08A	Radio	1	0
08B	Television	1	0
08C	Mobile phone (Your own)	1	0
08D	Mobile phone (own by any member of your family)	1	0
Now I would like to see and record the materials used in your home.			
09A	Main Material of the floor observed	A) Natural Floor (earth/sand/dung)1 b) Rudimentary (wood planks/palm/bamboo2 C) Finished Floor (parquet polished wood/vinyl asphalt/strips/ceramic tiles/cement/carpet.....3 D) Other (Specify)_____.....4	

09B	Main Material of the roof observed	A) Natural roofing (no roof/thatch/palm leaf)1 b) Rudimentary (rustic mat/palm bamboo/wood planks/cardboard.....2 C) Finished roofing (galvanized sheet/wood/calamine/cement fiber/ceramic tiles/cement/roofing shingles3 D) Other (Specify).....4	
09C	Main material of the exterior walls observed	A) Natural walls (no walls/cane/palm/trunks/mud/sand)1 b) Rudimentary (bamboo with mud/stone with mud/plywood/cardboard/reused wood2 C) Finished walls (cement/stone with lime/bricks/cement blocks/wood planks/shingles3 D) Other (Specify).....4	
10	Does any member of this household own any agricultural land?	Yes.....1 No.....0	> 214
11	How many bigha of agricultural land do members of this household owns If 95 or more, circle "995" If less than 1 record "00"	BIGHA.....1 95 or more bigha/.....995 Don't know.....998	
12	Does this household own any livestock, herd, other farm animals or poultry?	Yes.....1 No.....0	

13	<p>How many of the following animals do this household own? If none, enter "00" If 95 or more, enter "95" If unknown, enter "98"</p> <p>Buffalo? Milk cows or bulls? Horses, donkeys, or mules? Goats? Sheep? Chickens? Ducks? Pigs?</p>	<p>Buffalo_____</p> <p>Milk cows or bulls_____</p> <p>Horses, donkeys, or mules_____</p> <p>Goats_____</p> <p>Sheep_____</p> <p>Chickens_____</p> <p>Ducks_____</p> <p>Pigs_____</p>
<p>Now I would like to ask you questions about some other important aspects of your marital status. I know that some of these questions are very personal. However, your answers are crucial for helping to understand the condition of women in Nepal. Let me assure you that your answers are completely confidential and will not be told to anyone and no one else will know that you were asked these questions.</p>		
14	<p>Are you currently married or living together with a man as if married?</p>	<p>Yes, currently married.....1 Yes, living with a man.....2 No, not in union.....3</p> <p>} → 219</p>
15	<p>Have you ever been married or lived together with a man as if married? If no, check for the presence of others in house.</p>	<p>Yes, formerly married.....1 Yes, lived with a man.....2 No3</p>
16	<p>What is your current marital status? Are you divorced, widow or separated?</p>	<p>Widow.....1 Divorced.....2 Separated.....3</p> <p>} 220</p>

17	Is your (husband/partner) living with you now or is he staying elsewhere?	Living with her.....1 Staying elsewhere.....2	
18	Have you been married or lived with a man only once or more than once?	Only once.....1 More than once.....2	

Now I would like to talk with you about pregnancy, delivery and postnatal care of your youngest child.

301. Where did you give birth of your last child? Exact location and name (probe: who's house, on the way, government hospital, primary health care center, health post, private hospital, clinic, nursing home) who made the decision of going to this location? What was the reason of choosing this location?

(IF Non Institutional go to # 302; If Institutional go to #303)

302. Non institutional Delivery

302.1 How did you prepare for birth?

Did you have a Clean Home Delivery Kit? If so, from where and when did you get it?

302.2 In your community, who normally accompany during home delivery?

302.3 Who supported you while giving birth of your last child? (Probe: Husband, Health worker, Traditional Birth Attendant, FCHV, Mother-in-law, Mother, Sister-in-law, Neighbor, Other relative, Other person)

302.4 Why you did not go for the institutional delivery?

GO TO QUESTION #304.

303. Institutional Delivery

303.1 How did you get to facility? How long did it take to get there?

303.2 Who accompanied to you while giving birth of your last child? (probe: Husband, Traditional Birth Attendant, FCHV, Mother-in-law, Mother, Sister-in-law, Neighbor, Other relative, Other person)

Was any person other than health worker allowed to get inside the delivery room? (probe: Traditional Birth Attendant, FCHV, Mother-in-law, Mother, Sister-in-law, Neighbor, Other relative, Other person)

Did your family request to be inside the delivery room? If, so was that usual in your community/neighbor? Why did your family request? Was that the same case with your previous delivery?

303.3 How long did you stay in the health facility? How long did your baby stay in the health facility?

304. Pregnancy Related Question

304.1 Have you contacted FCHV in your last pregnancy?

304.2 Did you go for health facility for the antenatal care check, if so, how many times have you visited in total? When was each visit? which facility did you go each time. How far from your house? How did you get there?

304.3 Have you ever heard about Health Mother Group? If so, have you ever participated in the health mother group meeting during your last pregnancy? If so, what did the group discussed? What did you learn from the group discussion?

304.4 What are the common practices for cord care in your communities? Please describe me the steps of this practice? What is the instrument used to tie the cord? What surface/base is used to cut the cord, what is the instrument to cut the cord? And what is the instrument to clean the cord?

What types of substances are applied to the cord in your communities? Why?
From whom did you learn?

304.5 Have you ever heard about CHX? Show them the gel tube. If so, when did you first heard CHX?

If so, from where did you heard about CHX? (Probe: FCHV, Health Worker, Friend, Relative, Pregnant women/mother's group, radio, television, other)

Have you heard CHX from FCHV? Have you heard CHX during antenatal care check? Can you recall did CHX ever mentioned in the health mother group you have attended?

304.6 Did you receive Chlorhexidine gel tube in your last pregnancy (probe: show the gel package brand name: Kawach) If so, when and where did you receive CHX? Have you and your family members receive information on how to use CHX, from whom you receive?

304.7 To whom do you use CHX? Which part of body? When should we use CHX? What is the purpose of CHX use?

305. Delivery and Neonates related Question (For question 305 only interview both RDW and the person who was inside the delivery room at health facility during last delivery or the person who supporting the RDW during last delivery at non-institutional place)

305.1 Can you recall what are the steps that the person did with the **body of the baby** and **Umbilical Cord** after the delivery? (Ask the details in each steps.)

Did the newborn baby get wiped or not? Was baby kept warm or not?

When did you start breastfeeding? How long after delivery? Did anyone tell you when to start breastfeeding? Did you feed anything to your baby before you start breastfeeding?

Did you keep the baby skin to skin contact?

When did the baby get bathed? How long after delivery?

(If non-institutional delivery, ask this question) Was the clean delivery kit used during the delivery?

305.2 Who tied the cord after cut? How was the cord tied? What was used to tie the cord? Where was this instrument brought from? (Probe: new thread, boiled thread, used thread without boil, cord clamp, other)

305.3 When was the cord cut (probe: timing)? What was used to cut the cord? Where was this instrument brought from? How long after tying the cord was the cord cut?

305.4 What was the base used to cut umbilical cord? Where was this instrument brought from?

305.5 Could you please explain what substance was applied to the cord after cutting?

Who suggested applying it? Who applied it?

How long after cutting the cord was the substance applied?

How often was that substance applied? (Probe: Once a day? Several times in a day? once a week?)

Why that substance was applied?

305.6 What factors do you think determine the substance was used? (Probe: Sex of the child, month/season of the delivery, economic status, presence of family members or other persons) why?

305.7 Did the baby receive CHX?

If so, can you recall and describe me the process CHX was applied to newborn baby?

Did the person who applied CHX to your baby told you about CHX used to baby?

Did the person washed his hand or wearing gloves before apply CHX to baby?
Was the CHX applied to cord stump only or surrounding area of cord stump? Was all

the gel of tube used at once or little was used? After application of CHX, did you cover cord stump by cloth without touching it?

If not, why did not the baby get CHX?

306. Umbilical Cord Infection

306.1 Did your youngest child have any problem within one month of birth?

If so, what type of problem was seen? (probe: not be able to breastfeed, fever, unconscious, fast breathing, wheezing, sever chest in drawing, unable to cry, 10 or more pus pack or large abscess, pus on cord or around cord, other)

If Healthy, go to **Question 307**.

306.2 Is your youngest child has any problem in umbilical cord or not? If is, what did you do with this problem in umbilical cord? (Probe: home treatment, applied CHX again)

Did you seek anyone else for help regarding the umbilical cord? If so, who do you seek help (probe: FCHV, health facility, pharmacy)? When did you visit this person after you have seen the problem? How many days after the problem?

306.3 What did the person you consult tell you about the baby's umbilical cord (probe: diagnosis)?

Please describe how did the person take care of the umbilical cord? How often was this care performed? (Probe: Once a day? Several times in a day? once a week?)

306.4 What did you do after seeking help from others?

(If substances applied from Q305.5 ask this question) did you continue to apply such substance even after you have seen the problem? Why did you continue or discontinue?

307. Umbilical Fell off

307.1 How did the baby's umbilical cord look like when it fell off?

307.2 How many days after delivery did the baby's umbilical cord fallen off? Was the duration the same with your previous baby's?

When your baby did have naming ceremony? Is naming ceremony associated with cord fell off or not? Do you think it's too long? Too short?

307.3 Did you and family member do anything to make the umbilical cord fell off faster? (Probe: pull the cord stump, scratch the cord stump, apply substance) If so, why?

308. Level of Autonomy of RDW

(Make sure there is no person other than recently delivered women while asking following questions) 400

Appendix B

Health Workers Interview Guideline

100. Identification			
01	Form number:	102. VDC/Municipality Name:	
03	VDC Code:	104. Date of visit:/...../.....(dd/mm/yyyy) in A.D	
200. Background Information			
	Questions	Responses	Go to
01	Health Facility's name:.....		
02	Designation of the staff met	Medical officer.....1 HA/Sr. AHW/AHW.....2 Staff nurse/Sr. ANM/ANM.....3 Others6	
03	Type of Health Facility	PHCC.....1 HP.....2 UHC/CHC.....3	
Logistics and Inventory 300			
Interview the Sister-in-charge or facility-in-charge following questions: I am going to ask you about management, supplies, equipment in delivery room and postnatal room. Please tell me the current situation and the situation during last 6 months.			

01	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?	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)..... Don't know	
02	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 methods used for metal equipment such as speculums or forceps.	Dry-heat sterilization.....1 Autoclaving.....2 Steam sterilization.....3 Boiling.....4 Chemical method.....5 Nothing is done.....6 Other (specify)..... Don't know	
03	In the last 12 months, was there ever Chlorhexidine stock out in this HF?	Yes.....1 No.....0	
04	From where the CHX is being supplied in this facility?	District store.....1 Nearby HF.....2 Others.....6	
The Interview is Ask the sister-in-charge or facility-in-charge to show the delivery room or adjacent room to make observation.			

05	Describe the setting of the delivery room?	Private room with visual and auditory privacy.....1 Non-private room with visual and auditory privacy.....2 Visual privacy only.....3 No privacy.....4	
06	Is there a toilet for client use near the delivery room	Yes.....1 No.....0	
07	Is the toilet functioning?	Yes.....1 No.....0	
08	Is there clean and sterile gloves in delivery room or adjacent room?	Observed.....1 Not available.....2 Don't know.....3	
09	Is there sharps container in delivery room or adjacent room?	Observed.....1 Not available.....2 Don't know.....3	
10	Is there alcohol and rub in delivery room or adjacent room?	Observed.....1 Not available.....2 Don't know.....3	
11	Is there soap for handwashing in delivery room or adjacent room?	Observed.....1 Not available.....2 Don't know.....3	
12	Is there syringes and needles in delivery room or adjacent room?	Observed.....1 Not available.....2 Don't know.....3	

13	Is there sterile scissors or blade in delivery room or adjacent room?	Observed.....1 Not available.....2 Don't know.....3	
14	Is there sterile disposable cord ties or clamps in delivery room or adjacent room?	Observed.....1 Not available.....2 Don't know.....3	
15	Is there towel or blanket to wrap baby in delivery room or adjacent room	Observed.....1 Not available.....2 Don't know.....3	
16	What equipment is used for sterilization?	Electric autoclave (pressure and wet hear).....1 Non-electric autoclave (pressure and wet hear).....2 Electrict dry heat sterilier.....3 Electrict boiler or steamer.....4 Non-electric pot with cover (for steam/bil).....5 Heat source for non-electrict equipment.....6 Automatic timer.....7 Other (specify).....	
17	How is water being made available for use in the delivery service area today?	Piped.....1 Bucket with tap.....2 Bucket or basin.....3	

18	Count and record number of Chlorhexidine tubes available in the store of health facility.	<input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> tube	
19	What is the earliest expiry date of Chlorhexidine available at store?	.../.....(mm/yyyy) in A.D	
Knowledge of Newborn Care 400			
Interview the delivery service provider and postnatal service provider about the following questions			
01	What is your current professional qualification?		
02	What year did you graduate with this qualification		
03	In what year did you start working in health facility?		
04	In what year did you start working in your current position in this facility?		
05	How many years in total have you provided delivery service? Service may have been here or in another facility?		
06	Have you ever received essential newborn care training? If so, When	Yes.....1 No.....2	
07	What basic equipment and supplies must be available to ensure the baby receives appropriate immediate care after birth?	2 day warm towels or cloths.....1 sterile blade or scissors.....2	

		sterile or disposable cord ties/clamps.....3 cap for baby.....4 source of warmth: heating lamp or incubator.....5 self-inflating ventilation bag...6 newborn face mask.....7 mucus extractor/simple suction/bulb syringe.....8 flat surface.....9 clock or watch with seconds....10 other (specify).....	
08	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....1 Ensure baby was breathing/ crying.....2 Provide thermal protection (skin to skin).....3 Bathe newborn shortly after birth.....4 Suction newborn with bulb.....5 Ensure mother initiates breast feeding within 1 hour.....6 Assess/examine newborn within 1 hour.....7 Weigh newborn.....8	

		Provide eye prophylaxis /antibiotic ointment.....9 Give prelacteal feed/ water...10 Cut cord with sterile blade/scissors.....11 Apply Chlorhexidine to cord stump.....12 Other (specify).....	
09	Can you please tell me the signs and symptoms of severe infection in a newborn?	Poor/ no breastfeeding.....1 Restlessness/irritability.....2 Breathing difficulties.....3 Hypothermia.....4 Hyperthermia.....5 Breathing rating >60/minute....6 Convulsions.....7 Pus/ redness around umbilicus...8 Abscess on any part of body....9 Skin pustules.....10 Lethargy/ no movement (conscious).....11 Unconscious.....12 Other (specify)..... Don't know.....13	
10	Is chlorhexidine applied to the new born in this facility?	Yes.....1 No.....0 →	end

11	Do you provide information to the mother and families about the use of CHX to the babies?	Yes.....1 No.....0		
12	Can you describe me the process how to apply Chlorhexidine?	Before application, the health worker washed hands with soap and water/use gloves	Yes.....1 No.....0	
		Before application, the health worker washed hands with soap and water/use gloves	Yes.....1 No.....0	
		Applied CHX on the tip of the cord, stump, and surrounding area	Yes.....1 No.....0	
		Was the job aid (poster or action card) displayed in the delivery room or nursing station or any other visible place?	Yes.....1 No.....0	

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