A Synthesis of Recent Studies on Maternal and Newborn Survival Interventions in Nepal

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Government of Nepal
Ministry of Health and Population
Department of Health Services
Child Health Division

Government of Nepal
Ministry of Health and Population
Department of Health Services
Family Health Division

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PREFACE

There has been significant improvement in the health status of women and children in Nepal since 1991.The Government of Nepal has established itself as a global leader in developing and implementing low cost and high impact community based interventions on maternal, newborn and child health (MNCH) programs. Many of the program interventions were piloted and then scaled up during varying time frame. As a part of monitoring and evaluation of these interventions, studies and surveys were done, and the results were disseminated. However, fewer attempts have been made to bring the results of standalone studies into single concise form and analyze their implications from a broader perspective for program planning and implementation.

"A Synthesis of Recent Studies on Maternal and Newborn Survival Interventions in Nepal" has synthesized the studies conducted during 2011-2014 on Maternal and Newborn Health (MNH) survival. It summarizes the findings of these studies and brings them all together which is expected to be helpful for institutionalization of effective interventions and strengthening of the less effective ones in order to maximize the impact on maternal and newborn health. Recommendations from the aforementioned synthesis will be useful for strengthening the existing programs as well as for advocating/leveraging resources for effective maternal and newborn strategies in future.

I would like to thank the colleagues of Child Health Division, representatives of supporting partners, professionals and academicians who provided their inputs to this procedure. Child Health Division also acknowledges Save the Children, Saving Newborn lives program and all the personnel involved in it for providing the technical support and funding. Similarly, I appreciate the work of reviewers for providing feedback on the document and the role of Newborn Care Secretariat in coordinating the review.

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PREFACE

There is no doubt that we have made significant progress in maternal and child health in the last decade. A high burden of neonatal and maternal mortality still is a major problem of Nepal. There is an unacceptable proportion of newborns losing their lives within the first month of birth. We remain committed to continue our efforts to make Nepal a country suitable to live and suitable to be born. A number of interventions are ongoing; and Family Health Division has taken lead in respective roles to save mother and newborn.

"A Synthesis of Recent Studies on Maternal and Newborn Survival Interventions in Nepal" has focussed on providing overall picture of standalone studies of maternal and neonatal health from different interventions currently implemented in Nepal. This review was conducted by Saving Newborn Lives, Save the Children under aegis of Family Health Division and Child Health Division.

This review utilises a number of assessment reports and surveys conducted as part of maternal and newborn survival interventions, monitoring reports, and the findings from national surveys. I believe this report will be useful for policy makers, health program managers and relevant stakeholders in maternal and newborn health in Nepal. This review will be helpful to guide future maternal and newborn survival interventions in Nepal.

I would like to acknowledge the intellectual inputs and resources provided by different stakeholders to finalise this report. I am thankful to all the stakeholders who agreed to provide their studies to include in this review. In addition, efforts from reviewer and the team of Saving Newborn Lives, Save the Children, Kathamandu have been tremendous to make this review possible. Finalising this review would not be possible unless a number of reviewers have provided their significant intellectual input. I appreciate the role of Newborn Care Secretariat in coordinating for this review.

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SUMMARY

Introduction

Nepal has been one of the exemplary countries in maternal and newborn health to generate evidence and scale up evidence based practices to increase maternal and newborn survival. The lessons from community based interventions and studies conducted in Nepal during the past several years have fed policy makers and programmers with information on which interventions are likely to work and which are not. Synthesis of evidence generated from already implemented innovative programs is useful to provide an overview of the direction of maternal and newborn health (MNH) in Nepal. The aim of this report is to: (1) synthesize the findings from selected maternal and newborn related studies in Nepal conducted during 2011-2014, (2) identify areas of improvement in existing interventions, and (3) recommend possible strategies to fulfill such gaps.

Methodology

Thirteen studies were selected purposively to reflect findings on recent studies on maternal and newborn health programs. The findings of the studies were summarized in tables and narratives. Further analyses of some of the studies were also included to add more information. To organize findings, the continuum of care framework was adapted which included antepartum care, care during labour and delivery, immediate newborn care, postnatal care for newborn and mothers, and postpartum care for mothers as major areas.

Findings

Findings of this review are presented below according to different stages mentioned in the methodology section.

Antepartum care

At the national level, first antenatal care (ANC) visit was attended by >80% of the mothers, whereas, only 50% attended the recommended four ANC visits [1]. Antenatal care services includes a number of components such as weighing pregnant mothers, measuring blood pressure, blood and urine test, tetanus toxoid immunization, iron-folic acid supplementation, and counseling on danger signs. Only a quarter (24.3%) of mothers reported receiving all of these components of care [1]. Half of the mothers received counseling on danger signs during pregnancy. Counseling on postpartum haemorrhage (PPH) was higher in the districts where the community-based PPH prevention program was implemented [2]. Findings from birthing centres [3] reflects that a vast majority were being provided with iron-folic acid supplementation and counseling, however, only one in five received counseling on the side effects of the medications. The proportion of mothers receiving full duration of iron-folic acid supplementation remains unanswered.

The Birth Preparedness Package (BPP) was less attention; both in practice and counseling. Findings from the studies that include the entire country reflect that more than half of the mothers were being advised on deciding the place of delivery, and setting money aside; however, such advice were not translated into practice [3, 4]. On a positive note, the promotion of Essential Newborn Care messages during the antenatal period has increased significantly where the Community Based Newborn Care Package (CB-NCP) was implemented [5].

Care during labour and delivery

Health facility delivery has increased significantly since 2011. Recent studies (2013-2014) such as the Mid-term Assessment on Use of Chlorhexidine for Better Cord Care [6] and Evaluation of Postpartum Haemorrhage Prevention Program in Nepal [2] reported 49.5% and 54% rates of facility delivery, respectively. At the national level, encouragingly, nine in every ten mothers received transportation cost, and knew about free delivery services [7]. However, 12% of mothers still had to pay for maternity services for different reasons such as medicine, registration fee, and payment to cleaners.

In the areas where the Community based chlorhexidine program was implemented, the majority (77%) of home births reported safe cord-cutting practice [6]. In these districts, chlorhexidine was applied by almost two thirds of mothers to their newborns [6]. However, a significant proportion (almost one in every five) of mothers reported using materials other than chlorhexidine.

Newborn care

Infection (neonatal sepsis), birth asphyxia, pre-term birth and low birth weight are the major causes of neonatal death, respectively by their magnitude in the CB-NCP districts [8]. Only half of the health workers were equipped with management skills for birth asphyxia. The CB-NCP Program reported 4 % prevalence of Low Birth Weight (LBW) babies among those reached by FCHVs (against 15% expected). FCVHs were able to correctly identify only 29% of LBW cases among all LBW babies.

Postnatal care of newborn has increased from 36% (baseline) to 78% (endline) in the CB-NCP districts. However, provision of such care is much lower in home births (24%) compared to those born in health facilities (97%) [5]. Early newborn care such as breastfeeding and cleanliness has improved; however, thermal care practice still needs significant improvement. CB-NCP has shown significant impact on increasing early initiation of breastfeeding with three quarters of mothers initiating breastfeeding within one hour of childbirth [5]. However, introduction of pre-lacteal feeds has remained a major challenge to exclusive breastfeeding. While the Nepal Demographic and Health Survey (NDHS) 2011 reported poor adherence to thermal care practices, CB-NCP implemented areas have shown significant improvements in recommended thermal care practices [5, 9].

Post partum care of mothers

The NDHS reported that less than half (43.2%) of postpartum mothers received postnatal care within 42 days and 40% received such care within two days [4]. Evaluation of Postpartum Haemorrhage Prevention Program in Nepal reported that a quarter of mothers experienced prolonged bleeding [2]. Mothers' knowledge on PPH remains low. Small proportion (15%) of mothers received misoprostol or locally known as Matri Suraksha Chakki (MSC), indicating a major problem in coverage of the community based MSC distribution. However, 88 % of those who received MSC reported consuming it, indicating good compliance.[2]. Six in every ten FCHVs did not have stock of MSC tablets which could be one of the reasons for low coverage.

Infection prevention

Infection prevention is the most neglected issue noted in this review. Hand-washing and the use of personal protective equipment, the basics of infection prevention, was practiced by only about half of the health workers.

Existing gaps in current progress of MNH in Nepal

This review identified a number of gaps despite encouraging improvements in MNH in recent years. These include:

- Quality of antenatal care [1, 3] and recommended four antenatal care visits (47%) [10] is low.
- Counselling during pregnancy (birth preparedness, nutrition education, and essential newborn care message) is a neglected issue.
- Only half of mothers reported delivering in health facilities despite significant investment in birthing centres and skilled birth attendants [2].
- High proportion of fresh stillbirths indicates that there is poor quality of care during labour and delivery.
- The coverage of community based MSC distribution for PPH prevention is low despite significant effort through the community based PPH prevention program and the high compliance among those who received the MSC. This infers a need for rapid and effective solution to increase coverage.
- Despite a high rate of application of chlorhexidine, there was low compliance to the recommended method (applying the entire tube, hand washing before application) of application in the program districts.
- The challenges to managing the major causes of neonatal deaths such as infections, birth asphyxia, pre-term and LBW were low coverage, sub-optimal skill and inadequate interventions (for pre-term births).
- Care of newborns and mothers during the postnatal period is low.
- Counseling of mothers such as communicating danger signs, recognition of signs of PPH generally remains poor.

Conclusion

There has been encouraging improvements in major areas such as antenatal care, health facility delivery, newborn care practices, and postpartum haemorrhage prevention through community based MSC distribution, and safe cord care practices. However there remain areas for improvement which this review has further identified. These areas mostly demand more focus on increasing coverage and compliance to existing interventions and guidelines, increased focus on quality, and focus on counseling and education. The current interventions do not have much focus on preventing still births, pre-term birth, and LBW; and managing pre-term newborns.

ABBREVIATIONS

ANC	Antenatal Care
ANM	Auxiliary Nurse Midwife
BCC	Behavior Change Communication
BPP	Birth Preparedness Package
CB-IMCI	Community Based Integrated Management of Childhood Illness
CB-NCP	Community Based Newborn Care Package
CEOC	Comprehensive Emergency Obstetric Care
CEONC	Comprehensive Emergency Obstetric and Neonatal Care
CHD	Child Health Division
CHW	Community Health Workers
DDC	District Development Committee
DHO	District Health Office
DPHO	District Public Health Office
ENAP	Every Newborn Action Plan
FCHV	Female Community Health Volunteers
FHD	Family Health Division
HP	Health Post
KMC	Kangaroo Mother Care
LBW	Low Birth Weight
MCHW	Maternal and Child Health Worker
MDG	Millennium Development Goal
MINI	Morang Innovative Neonatal Intervention
MNH	Maternal and Newborn Health
MSC	Matri Suraksha Chakki (Misoprostol)
NDHS	Nepal Demographic and Health Survey
NHTC	Nepal Health Training Centre
NNIPS	Nepal Nutrition Intervention Project, Sarlahi
PHCC	Primary Health Care Centres
PPH	Post-partum Haemorrhage
SBA	Skilled Birth Attendant
SHP	Sub Health Post
VDC	Village Development Committee
VHW	Village Health Workers
WHO	World Health Organization

CONTENTS

Figures

Tables

CHAPTER 1: INTRODUCTION

1.1 Introduction

Nepal is an exemplary country in reducing maternal and child mortality since the adoption of Millennium Development Goals (MDG). The effort to improve newborn health got momentum around 2001 when Ministry of Health and Population (MoHP) initiated to formulate the National Neonatal Health Strategy (NNHS) with technical assistance from Saving Newborn Lives (SNL) [11]. The NNHS became a formal document of the MoHP in 2004. Since then, the country's leadership has taken major steps to piloting, evaluating and recognizing new initiatives as an effort to increase child survival. Such initiatives, not only has paved the foundation of an effective delivery of care within the existing health system of the country but also has served as an example for other developing countries. A number of programs were initiated as pilot program and are part of government's regular programs [12]. A good example is Community Based Integrated Management of Childhood Illness (CB-IMCI), the bi-annual supplementation of high dose Vitamin A to children aged 6-60 months. Other examples of promising pilot studies are treatment of newborn illness at the community level Morang Innovative Neonatal Intervention (MINI), prevention of umbilical cord infection (Chlorhexidine application), establishing birthing centres, initiating Comprehensive Emergency Obstetric and Neonatal Care (CEONC) services based on public private partnership models [13]. Respective divisions such as Child Health Division (CHD) and Family Health Division (FHD) have been providing leadership for piloting, and scaling-up these initiatives [12, 13]. Each of these pilot studies is evaluated before scaling-up with the view that a well-designed pilot study may not work in the real setting. However, such evaluation was not conducted for CB-NCP before scaling-up. Therefore, in an effort to scale up the proven interventions based on assessments, respective program divisions and partners conduct assessments repeatedly to report evidence on epidemiology, effectiveness of interventions, and efficiency of service delivery mechanisms. However, due to the different focus on each of the assessments, a clear picture of the evidence generated from them is sometimes lacking or inadequate. This report therefore presents a review of selected studies on maternal and newborn interventions in Nepal.

1.2 Current Maternal and Newborn Health Program and approaches in Nepal

Aama Program

Nepal has made significant progress in reducing maternal mortality between 1990 and 2006 (reducing maternal death total from 539 to 281 per 100,000 live births) [4]; however, the burden of maternal mortality still remains high. To increase the demand of facility delivery and reduce maternal mortality, the Government of Nepal initiated the maternity incentive scheme in 2005 which provided a cash incentive for mothers delivering at a health facility and was known as Safe Delivery Incentive Program (SDIP). The aim was to cover the transportation cost of reaching health facilities. With the initial positive response, the effort was further scaled

up in 2009 removing user fees for childbirth from all public health facilities and selected private health facilities. A further development of this program was the introduction of incentives for mothers who attend four timely ANC visits. Combined with former two schemes and the latter 4 ANC incentive, the program is now popularly known as "Aama Program". To monitor the effectiveness of the Aama program, the FHD conducts surveys to report on a number of core and supplementary indicators [10].

Birthing centres to provide twenty-four-hour delivery services

Birthing centres provide 24-hour services for labour and delivery in selected public health facilities of districts, which is one of the three major strategies of the national Safe Motherhood Program of Nepal. This is a major development in the Safe Motherhood Program since its inception in 1996. Appropriate guidelines and policies have been developed which has also facilitated allocation of funds for the establishment of such facilities. Auxiliary Nurse Midwife (ANM) and Nurses are the delivery service providers in the facilities. The service providers receive Skilled Birth Attendant (SBA) training as per the National Policy on Skilled Birth Attendants [14]. When there are inadequate permanent staff (ANM/Nurses), funds are released to District Health Office (DHO)/District Public Health Office (DPHO) to locally hire personnel to run such birthing centres. In some districts, local bodies such as the District Development Committee (DDC) and Village Development Committee (VDC) also provide financial support for hiring ANMs and nurses to run birthing centers. The National Planning Commission also deploys volunteer nurses and ANMS to provide services in rural places.

A recent study from Kaski district highlighted that women by pass birthing centres to go to higher level hospitals [15]. The main reasons for by passing were availability of operating facilities, adequate medical supplies and equipment and competent health staff in higher level hospitals. To increase the use of birthing centres and avoid over-crowding in referral hospitals, FHD has recently started providing a set of warm clothes for newborns whose birth takes place in birthing centres which is known as the "Nyano Jhola" initiative [16]. The impact of "Nyano Jhola" initiative is yet to be evaluated.

Prevention of postpartum haemorrhage

Postpartum haemorrhage (PPH) remains a major direct cause of maternal death. According to the Maternal Mortality and Morbidity Survey, Nepal (2009) [17], PPH accounted for 24% of maternal cause of mortality. While this statistic is slightly lower than the status in 1998 (28%), the problem still demands much focus. There are two major interventions for prevention of PPH in Nepal - the use of Oxytocin and Misoprostol [2]. Oxytocin is an injectable uterotonic which needs to be administered by a skilled person in health facilities, whereas, Misoprostol is provided as a tablet, and can be taken during home births. In community setting FCHVs are trained to distribute Misoprostol for the mothers who are in their last trimester. Three tablets (200 micrograms/tablet) are provided to each mother, who are advised to take it immediately after childbirth and before the placenta is delivered. The pilot program was initiated in Banke district in 2005 which was approved by the Government of Nepal for further scale up nationwide in 2010. As of 2013, the program has reached 36 districts (of 75) districts. Compliance and coverage surveys were conducted to measure success, feasibility and challenges of the program. Results recent surveys are presented in this review.

In health facility-based deliveries, active management of third stage labour along with the use of Oxytocin has remained the major strategy to reduce PPH. The use of Oxytocin has been promoted in all birthing centres, strictly to be provided by skilled birth attendants in facility based settings. In facility settings, management and Supply chain issues usually limit the capacity of health workers to deliver the intended level of services, including administration of Oxytocin immediately after childbirth [16].

Community Based Newborn Care Program

Despite significant reduction witnessed in infant and under-5 mortality, the neonatal mortality has remained stagnant in Nepal. Surveys have shown that neonatal mortality has not reduced since 2006 (33 per thousand live births during 2006-2011) [4]. With this background, the Community Based Newborn Care Program (CB-NCP) was developed, and gained much attention and hope for its potential contribution to reducing high burden of newborn deaths [13].

CB-NCP was built on an initially successful community based pilot program- the Morang Innovative Neonatal Intervention (MINI) which was implemented in 2005 in Morang district [18]. Lessons learned from the community-based trial in Gadchiroli (India) were also helpful to initiate CB-NCP in Nepal [19]. With MINI's successful results to deliver a community based newborn service-which was lacking in the existing Community Based Integrated Management of Childhood Illness (CB-IMCI), the government of Nepal decided to pilot CB-NCP in ten districts. The program received attention from the Ministry of Health and Population due to its potential to deliver service at the community level that could fill the gap of service for newborns. The CB-NCP program recommends promotion and adoption of five key newborn care practices:- (1) wiping newborns with a soft, dry cloth immediately after birth, (2) putting newborn on the mother's chest and initiating skin-to-skin contacts immediately after birth, (3) initiating breastfeeding within one hour of birth, (4) not applying anything on the cord stump (currently amended as application of chlorhexidine), (5) delayed bathing of the newborn only after 24 hours of birth. Along with these, the program intends to deliver services for immediate causes of neonatal mortality: birth asphyxia, low birth weight, and neonatal sepsis. Under CB-NCP, the Female Community Health Volunteers (FCHVs), Community Health Workers (CHWs), which includes Village Health Workers (VHWs) and Maternal Child Health Workers (MCHWs) and health workers in the facilities are trained to provide essential services (cleanliness, cord care, thermal care, breastfeeding), manage birth asphyxia, identify and manage low birth weight, perform postnatal care, and detect and treat neonatal infections and detect danger signs and refer case to health facilities. CHWs are also trained to inject Gentamicin in sick neonates with danger signs with mothers consent. Alternately, CHWs also provide home-based management after consent, if referral is not accepted.

All the health facility level, health workers are trained to provide treatment and management for ill and very ill neonates using injectable antibiotic (Gentamicin) which is an added component and skill to the existing sets of skills.

An assessment was carried out in 2012 to evaluate the impact of CB-NCP in 10 program districts [5]. The findings suggested that the program was successful in many components such as reaching mothers with messages related to essential newborn care and also contributed to

an increase in recommended practices significantly. CB-NCP aimed at reducing the mortalities due to birth asphyxia and low birth weight, but was not as successfull as anticipated. FCHVs were not able to capture low birth weight and birth asphyxia at the intended rate. With the current trend of lower presence of FHCVs during home births, increased case load, and decreased efficiency, significant positive impact in reducing neonatal mortality is unlikely to be achieved.

Chlorhexidine (4%) application on umbilical stumps of newborn

This intervention was based on local evidence of Sarlahi district from Nepal [20]. A community based cluster randomized trial was implemented in 2002-2005 as Nepal Nutrition Intervention Project, Sarlahi (NNIPS), which included 413 communities with 4,934 infants assigned to 4.0% Chlorhexidine, with two other control groups (cord cleansing with soap water and dry cord care). The result reported that there was marked reduction (75%) in severe umbilical cord infection (Omphalitis) and a reduction in neonatal mortality by one fourth (25%) in the Chlorhexidine application group [Further details are published elsewhere [20]]. Based on this success, the program was further scaled up in Banke, Jumla and Bajhang with 4.0% Chlorhexidine (lotion or liquid preparation) preparation named "Kawach" [21, 22]. With endorsement by MoHP to scale-up the program nationwide in 2011 [22], a decision was made to include Chlorhexidine as part of CB-NCP in 2012. As of 2013, the program has been scaled up to 41 districts.

Verbal autopsy on the causes of neonatal death

The vital registration system of Nepal is almost non-functional and underutilized for program planning, especially for health programs [8]. Ministry of Local Development is responsible for implementation of the vital registration system. To plan and implement neonatal survival program, ascertaining the causes of deaths is essential so that resources and skills are directed toward the most important cause of death. For this reason, Nepal has to depend on primary data collected through various surveys using the verbal autopsy method. With this necessity of data, a verbal autopsy study (2013) was recently carried out to ascertain the causes of neonatal death [8].

Nepal Demographic and Health Survey 2011

The Nepal Demographic and Health Survey serves as a major source of data for national planning and monitoring of nutrition and health related indicators. This survey is conducted every five years covering the entire country and is part of the global DHS project of USAID. In Nepal, the most recent survey was conducted in 2011 and the report was made publicly available in 2012. A number of studies were published based on further analyses. Some of those are relevant to maternal and neonatal health [1, 9, 23-25].

Every Newborn Action Plan (ENAP) Report on National Consultative Workshop-Nepal ENAP workshop was organized by the Ministry of Health and Population with objectives of analyzing the existing challenges, inequities and policies in newborn survival programs in Nepal [16]. Key outcomes of the workshop include a clear roadmap on the way forward in newborn survival by identifying key bottlenecks, and solutions. The ENAP workshop was based on seven health

system building blocks and nine tracer interventions (critical newborn interventions). Health system building blocks includes: leadership and governance, health financing, health workforce, essential medical products and technologies, health services, health information system, and community ownership and partnership. The nine critical newborn interventions includes: management of pre-term birth, skilled care at birth, basic emergency obstetric care, comprehensive emergency obstetric care, basic newborn care, neonatal resuscitation, kangaroo mother care, treatment of severe infections, and in patient supportive care for sick and small newborns.

1.3 Rationale of current review

To design, implement, evaluate and scale up interventions, it is crucial that local evidence is generated to inform decisions. The Government of Nepal and partners in maternal and neonatal health programs have been conducting different studies based on their requirements in specific programs. Synthesis of standalone findings from those studies is necessary to provide a more comprehensive view on maternal and newborn health for further implementation of maternal and newborn survival interventions. This review will be useful for program managers to make evidence based decisions. In addition, MNH is major area of the Nepal Health Sector Program Implementation Plan-2 (NHSP) (2010-2015) [26].

1.4 Objectives of study

The specific objectives of this review are:

1. Briefly summarize the findings from purposively selected studies on the effectiveness of maternal and newborn survival interventions conducted in Nepal (during 2011-2014);
2. To identify inequalities and challenges in existing programs;
3. Provide recommendations for further maternal and newborn survival interventions based on the findings of the selected studies.

1.5 Limitation of review

A major limitation of this review is its scope being limited to few studies which have included only selected variables of interest. While the framework of analyses adapted the continuum of care model, many studies did not report on the wide range of variables as presented in the conceptual framework. Therefore, certain information may be missing from the review which might come as a question to the readers; however such limitation is inevitable due to the inherent nature of the difference in the focus of these studies. Different methods used by the studies have made comparison of indicators difficult. For example data on Results from Assessing Birthing Centers in Nepal [3] are mostly from observation in contrast to other majority of studies where interviews were the major method to obtain data [5, 6, 13]. Some of the studies also do not cover the entire country, and have small sample sizes which limits generalizability of findings. Furthermore, this review does not quantify the strengths of effect sizes such as in meta-analysis or systematic reviews. It should also be noted that it does not include all published and unpublished studies during 2011-14 as the studies were selected purposively. Nevertheless, an effort has been made to present findings more relevant to programs implemented in Nepal

1.6 Organization of findings

This report is organized in five major chapters. Chapter one has provided an overview of the programs to understand the context of the review. Following this, the methodology chapter reports on how the synthesis was carried out in order to make it reader-friendly and program-oriented. Chapter three presents the results from various studies according to different themes in the conceptual framework. This part also presents inequalities and challenges accordingly. Chapter four presents the key issues and recommendations for further program implementation. Finally, the conclusion section highlights the major areas and gaps in existing studies. The findings in this review are drawn from many studies; many of which are not representative of the entire country.

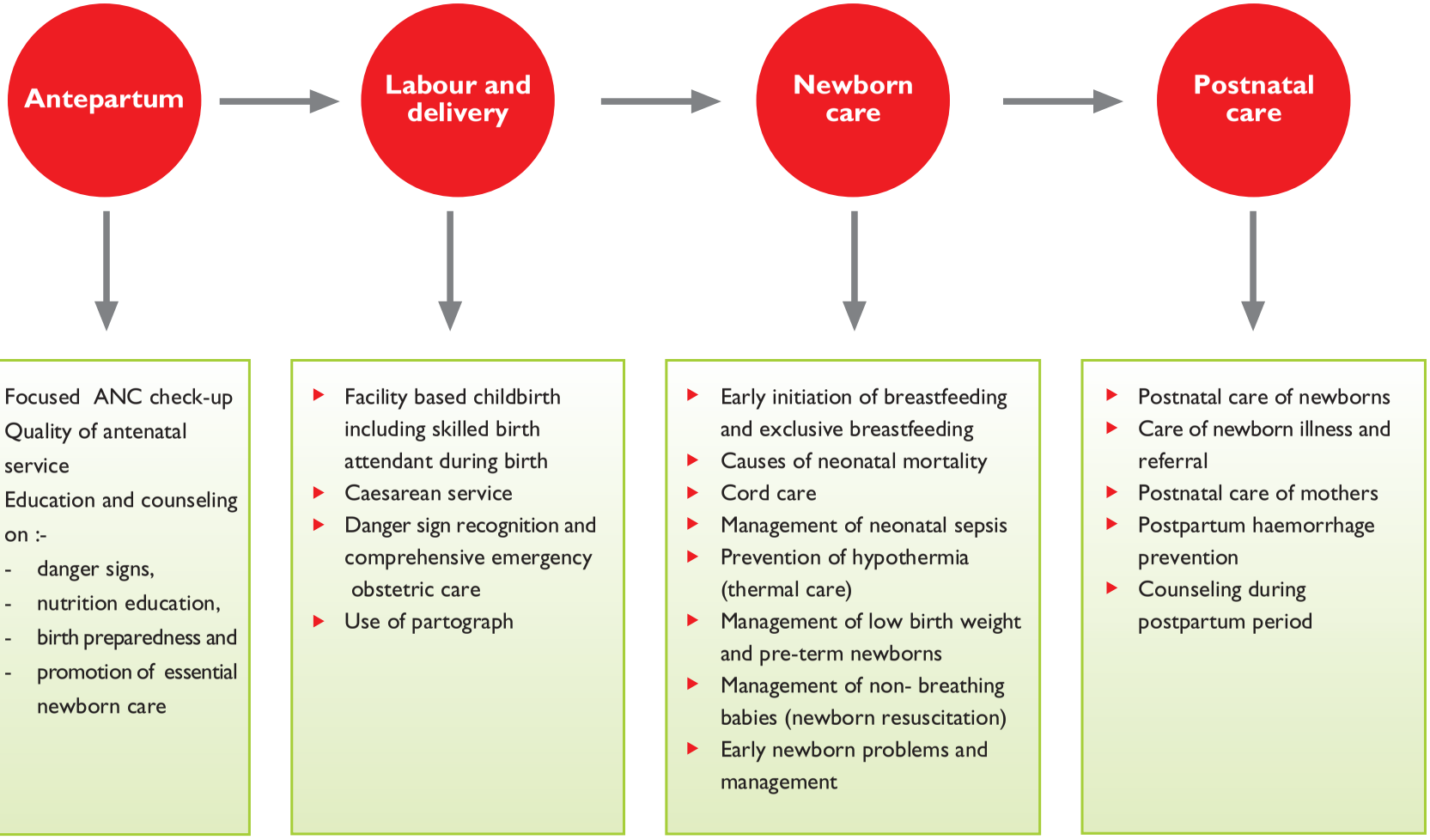
CHAPTER 2: METHODOLOGY

2.1 Conceptual framework of review

This synthesis has adopted the continuum of care framework to present the summary of findings (Figure 1). It should be noted that certain information presented in this model might be different from those presented elsewhere. The conceptual framework was adapted in a way so as to include the information presented in various studies selected for the review.

The findings are summarized and interpreted with focus on three major areas: Antepartum care, Care during labour and delivery, Newborn care, and Postpartum care (Figure 1) [27]. It should be noted that the postnatal period mainly focuses on 0-28 days as the major focus of the study is newborn survival; however, some information on the postpartum period (0-42 days) are also presented in respective sub-headings to provide detailed information.

Figure 1 Conceptual framework of review



2.2 Methods

This review consists of two major approaches in summarizing the findings: narrative review and further analyses of data from the studies. This review includes purposively selected 13 studies from different programs as outlined in the introduction section; and from the NDHS 2011. These studies were conducted during 2011- 2014. A brief overview of these studies is presented in Table 1.

A narrative review was conducted based on an agreed format by Child Health Division (CHD), and Family Health Division (FHD) and other partners working in newborn health. The maternal and newborn (MNH) related findings were summarized according to the respective stage as outlined in Figure 1. Further, the major findings were summarized in tables or figures where two or more studies reported the same outcome variable. The majority of the findings from further analyses of the NDHS 2011 were summarized from the published peer reviewed articles.

Table 1 Overview of studies

Studies	Year	Objective	Study type	Sample size	Study area	Limitations
1. A Report on Verbal Autopsy to Ascertain the Causes of Neonatal Deaths in Nepal 2014. (CHD, IRHDTC funded by USAID)	2014	To ascertain the causes of neonatal deaths	Cross sectional study. Interviews.	551 total perinatal and neonatal deaths (including 209 still births, 342 live births)	Six CB-NCP implemented districts: Dolpa, Jumla, Palpa, Salyan, Chitwan, Morang.	Restricted to CB-NCP implemented districts. Misclassification of causes of deaths are possible.
2. Evaluation of Postpartum Haemorrhage Prevention Program in Nepal (FHD, Gynuity, New ERA)	2014	To report coverage and compliance of community based MSC	Cross sectional study. Interviews	2,070 recently delivered mothers	Nine districts from three ecological zones. Bajura, Darchula, Mugu, Ramechap, Udaypur, Doti, Banke, Kailali, Dang.	Recall bias, use of MSC based on self report.
3. Results from Assessing Birthing Centers in Nepal (FHD, New ERA, ICF International Inc., funded by USAID)	2014	To assess the quality of birthing centres	Cross sectional survey. Observation on ANC and labor/delivery cases, interviews and inventory checks.	131 birthing centres, 306 ANC clients,	Entire country: 131 health facilities (PHCC: 26, HP 29, SHP 44, Private 12).	Only included the birthing centers that are located in the rural area.
4. Mid-term Assessment on Use of Chlorhexidine for Better Cord Care (Cholrhexidine Navi Care Program, JSI Research and Training Institute Inc., New ERA)	2013	To report coverage and compliance of community based Chlorhexidine gel.	Mix method study: Quantitative findings used in this report.	100 for quantitative information	Six districts: Sankhuwasabha, Dailekh, Kapilvastu, Mahottari, Doti, Baitadi,	Small sample size to represent in percentage in some findings.
5. Every Newborn Action Plan-Report on National Consultative Workshop - Nepal	2013	To identify ways to scale up evidence based	Workshop report.	N/A	Entire country	Workshop report. Strengths of evidence cannot be judged.

Studies	Year	Objective	Study type	Sample size	Study area	Limitations
(MoHP, UNICEF, Save the Children, WHO, USAID)		interventions addressing preventable newborn deaths				
6. Rapid Assessment of the Demand Side Financing Schemes: Aama and 4 ANC Programmes (The Seventh Rapid Assessment) (MoHP, NHSSP, HERD)	2013	To monitor the implementation of Aama program.	Cross sectional study. Interview and observation.	44 health facilities	Entire country: health facility based survey including 2 zonal hospitals, 4 private hospitals, 4 district hospitals, 11 primary health care centres, 15 health posts and 8 sub-health posts	Only represents service provider's perspective.
7. Readiness of Comprehensive Emergency Obstetric and Neonatal Care in Nepal (MoHP, NHSSP)	2011	To assess readiness for CEONC service in Nepal	Mix method study. Interview and observation.	18 hospitals	Entire country: 18 districts	
8. Service Tracking Survey 2012 (MoHP, NHSSP, SAIPAL, UKAID)	2012	To monitor the service indicator of various services provided including NHSP-2 indicators	Cross sectional study. Interview and observation.	HF:198, Exit interview: 787	Entire country	Service provider side of information; does not reflect household situation.
9. Assessment of the Community-Based Newborn Care Package (CHD, MoHP, MCHIP, Save the Children, UNICEF, NFHP, funded by USAID)	2012	To monitor the achievements of CB-NCP	Mix method study Quasi experimental design.	Multiple sources, NHIS data HMIS data NDHS data HHS data	Ten CB-NCP implemented districts	Only reflects the situation of CB-NCP intervention districts.
Further analysis of 2011 NDHS* data						

Studies	Year	Objective	Study type	Sample size	Study area	Limitations
10. Neonatal health in Nepal: analysis of absolute and relative inequalities and impact of current efforts to reduce neonatal mortality	2013	To assess absolute and relative inequalities in neonatal mortalities in Nepal	Cross sectional quantitative data NDHS further analysis (2001-2013).	All births occurring in five years succeeding the survey, vary by NDHS period	Entire country	Recall bias, measuring direct effect of interventions to reduce newborn mortality was not feasible.
11. Poor Thermal Care Practices among Home Births in Nepal: Further Analysis of Nepal Demographic and Health Survey 2011	2014	To report thermal care practices and the factors associated with optimum thermal care.	Cross sectional quantitative data NDHS further analysis (2011).	2464	Entire country Restricted to home birth	Focused only on home births, recall bias are highly likely, limited components of thermal care included.
12. Factors associated with the use and quality of antenatal care in Nepal: a population-based study using the demographic and health survey data	2014	To report factors associated with four ANC visits and the quality of ANC visits.	Cross sectional quantitative data NDHS further analysis (2011).	4079	Entire country	Recall bias, bias due to self report, no information on reason of why some received lesser components of care,
13. Factors associated with the introduction of pre-lacteal feeds in Nepal: findings from the Nepal Demographic and Health Survey 2011	2013	To identify factors associated with the introduction of pre-lacteal feeding	Cross sectional quantitative data NDHS further analysis (2011).	3948	Entire country	Recall bias, cluster effect is likely as the study was not restricted to last born children

*NDHS: Nepal Demographic and Health Survey; N/A: not applicable due to nature of study; HF: Health Facility.

CHAPTER 3: FINDINGS

This section summarizes the findings from different studies included in this review. A brief detail of the studies included in this review is presented in Table 1. The results start from the antenatal period and continue through the postnatal period. The findings are organized according to different themes that are highlighted in national programs. Some services during intra-partum and postnatal periods overlap such as immediate care of newborn, care of newborn with asphyxia, low birth weight, or hypothermia, etc. In this situation, the findings are presented according to the flow of information.

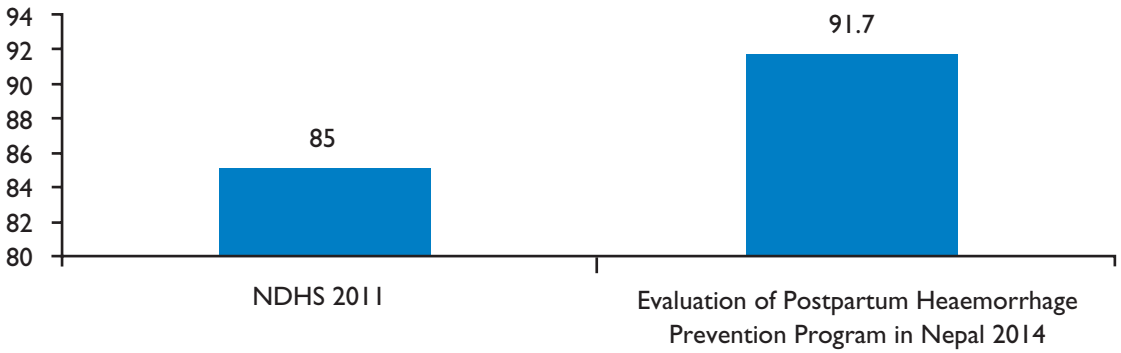
3.1 Antepartum care

3.1.1 ANC check-up and quality of antenatal service

The World Health Organization (WHO) recommends that the first antenatal visit should take place on the fourth month of pregnancy and the Ministry of Health and Population follows the same. Benefits of attending antenatal care has been documented well with its contribution towards health promotion during pregnancy, nutrition counseling, tetanus toxoid immunization, health condition monitoring, birth preparedness, and increasing health facility delivery and skilled attendance during childbirth. Similarly, attending four antenatal visits and consuming iron-folic acid during pregnancy has been reported to reduce the likelihood of having a low birth weight baby [25, 28]. The FHD, Ministry of Health and Population, Nepal recommends that all pregnant women should attend ANC visits during the 4th, 6th, 8th and 9th months of pregnancy [3].

Figure 2 presents findings on the attendance of ANC first visit from different surveys over a three -year period (2011-2014). Evaluation of the Postpartum Haemorrhage Prevention Program in Nepal survey reported that 91.7 % (N=2,079) of recently delivered mothers attended at least one antenatal care visit [9]. A further analysis of NDHS 2011 also reported that a majority (85%) of mothers were attending at least one antenatal care visit [1]. This indicates that the access antenatal care has reached to a majority of the population.

Figure 2 Proportion of mothers attending at least one ANC visit



Four antenatal care visits is still being attended by only half (50.0%) of the mothers [1]. Findings from the Aama rapid survey VII suggested that the four antenatal visits were attended only by less than half (47%) of the mothers [10].

Table 2 Inequalities in the number and quality of ANC visits

Factors	% receiving four antenatal visits (N=4079)	% receiving good quality of antenatal care# (N=4079)
Ecological Regions	ns	*
Mountain	42.7	17.3
Hill	50.3	19.7
Terai	50.9	28.2
Place of residence	*	*
Urban	71.8	33.7
Rural	47.7	23.1
Education	*	*
No education	28.7	13.1
Primary	51.6	19.3
Secondary	71.7	35.4
Higher	92.6	46.2
Wealth status	*	*
Poorest	28.3	8.3
Poor	39.1	13.3
Middle	48.0	21.3
Rich	65.1	36.6
Richest	83.7	43.3

*Statistically significant difference ($p<0.05$); ns: not significant; Presented as proportion (%). # good quality of antenatal care reported as receiving all of the following care: counseling, iron tablet/syrup, intestinal parasite drugs, two or more tetanus injections, blood pressure measured, blood sample taken, urine sample taken; Source: NDHS 2011 further analysis [1].

Table 2 shows that the use of four ANC visits is unequal across different groups: by wealth (poorest: 28.3%, richest: 83.7%); by education (no education: 28.7%, tertiary education: 92.6%) [1]. There was no significant difference in antenatal care attendance based on ecological region-Terai (50.9%), Hill (50.3%), and Mountain (42.7%) [1]. Results from Assessing Birthing Centers in Nepal [3] showed that first ANC visits are initiated late. Summing up these findings, while at least one ANC visit is high, timely first ANC visit and four ANC visits remain low.

Table 3 Proportion (%) of mothers receiving different components of care during ANC visits

Components of ANC	NDHS 2011 (N=4079)	Results from Assessing Birthing Centers in Nepal 2014 (N=306)
Counseling	81.6	-
Provided/received iron tablet/syrup	91.3	-
Intestinal parasite drugs	63.9	-
Two or more tetanus injections	86.2	-
Blood pressure measured	86.4	98.7
Blood sample taken	45.3	29.4
Urine sample taken	55.9	30.1
Weight taken	-	89.2
Checking signs of edema	-	68.3
Checking signs of anemia	-	72.5
Abdomen palpated for uterine height	-	95.5
Foetal heart beat examined	-	88.2

- : not reported, figure presented as a percentage.
Source: Joshi et al. (2014, NDHS 2011 further analysis), Results from Assessing Birthing Centers in Nepal (2014).

The quality of ANC - represented by the components of care, varies despite a higher proportion of mothers attending first ANC visit (Table 3). The NDHS 2011 reported on seven components of care during antenatal care as the indicators of quality i.e. counseling (81.6%), iron tablet/syrup (91.3%), intestinal parasite drugs (63.9%), two or more tetanus injections (86.2%), blood pressure measured (86.4%), blood sample taken (45.3%), urine sample taken (55.9%); however, only a quarter (24.3%) reported receiving all of these components of care [1]. The Results from Assessing Birthing Centers in Nepal [3] also reported on components of ANC, however; the variables included were different from that of the NDHS 201. It reported that the proportion of mother receiving four key services vary significantly: taking blood pressure (98.7%), taking

weight (89.2%), checking signs of edema (68.3%), and checking signs of anemia (72.5%). While these services are feasible to provide in all settings - health facility and community only slightly more than half (51.3%) of the mothers were receiving all of these examinations. It should be noted that the Results from Assessing Birthing Centers in Nepal study is based on observation whereas NDHS is based on interviews.

The quality of such care varied by different factors such as ecological regions, wealth status, education, and the place of residence. The NDHS 2011 further analysis [1] indicated that there was marked difference in the quality of ANC by: wealth status (poorest: 8.3%, richest: 43.3%), education (no education: 13.1%, tertiary education: 46.2%), ecological regions (Terai: 28.2%, Hill 19.7%, Mountain 17.3%), residence (rural: 23.1%, urban: 33.7%) (Table 2). The Results from Assessing Birthing Centers in Nepal [3] also reported that the proportion of mothers receiving services during ANC visits was much lower in the Terai (40.0%), and the Mountain (49.3%) compared to those in the Hill regions (63.1%). The study further highlighted that when disaggregated by health facility type, the service was poor in private health facilities compared to public facilities. Taking examples of four basic components i.e. checking blood pressure, measuring weight gain, looking at signs of edema and checking anemia; checking blood pressure was done by all health facilities. Proportion of pregnant women who were weighed was high (90%) in all health facilities and ecological zones. However, checking the signs of edema was lower (68.3%) with lowest in the Terai (54.8%) and in private health facilities (45.2%). About three quarters (72.5%) of ANC clients were checked for signs of anemia with the lowest in private health facilities (64.3%) and the Hill regions (68.0%). Findings from the NDHS 2011 further analysis and the Results from Assessing Birthing Centers in Nepal show much more effort is needed to improve the quality of ANC in Nepal.

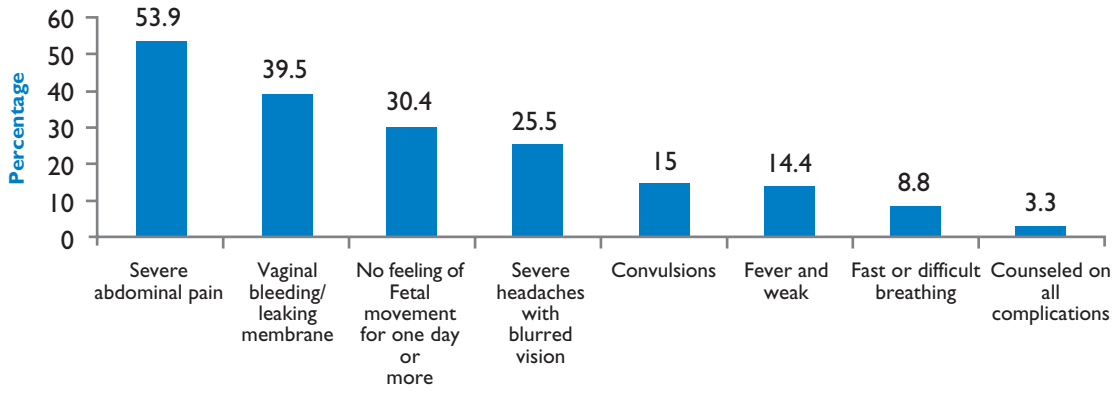
3.1.2 Counseling mothers on nutrition, birth preparedness, essential newborn care and danger signs

Counseling on danger signs of pregnancy

Antenatal counseling focuses on pregnancy complications, place to go if any complications occur, and advice on availing services from skilled birth attendants at the health facility. In Nepal's setting, health workers and FCHVs are two main service providers for counseling during pregnancy.

The further analysis of NDHS 2011 reported that a majority (81.6%) of mothers reported receiving such counseling [1]. The Results from Assessing Birthing Centers in Nepal (2014) also reported that a vast majority (85.6%) of mothers received counseling from health workers [3]. However, inequality exists across ecological zones with the Terai (73.0%) having lower proportion of health workers counseling mothers compared to Mountain (95. 7%), and Hill regions (91.8%). While the overall status on counseling gives an encouraging picture, content of counseling especially on danger signs during pregnancy remains sub-standard [3]. Figure 3 presents findings on danger signs mentioned to mothers. Unfortunately, lower proportions of mothers were informed of on all danger signs.

Figure 3 Percentage of ANC clients who receive counseling on danger signs of pregnancy



Source: Results from Assessing Birthing Centers in Nepal (2014)

In the community settings, FCHVs are the providers for counseling. The Evaluation of Postpartum Haemorrhage Prevention Program in Nepal survey reported a higher proportion of mothers were being counseled by FCHVs [2]. For instance, 96.2% received counseling on taking MSC, 63.6% on how to recognize signs of excessive bleeding, 79.7% on what to do in case of excessive bleeding, 89.4% on where to seek help in case of excessive bleeding. While later findings are mostly related to postpartum haemorrhage, these reflect that FCHVs are effective for counseling mothers in community settings. It should be noted that the current high level of counseling in communities is reported from pilot districts where intensive training and monitoring activities were carried out as part of the PPH prevention program. This does not necessarily reflect the situation in other districts where regular programs are being implemented with suboptimal monitoring and weak support system to FCHVs.

Putting together the findings from health facility and community level, the counseling in health facilities and community level is inadequate and needs significant improvement.

Nutrition education, Iron-folic acid supplementation and de-worming during pregnancy

Nutrition education and iron-folic acid supplementation are the major components of antenatal care. The recent Results from Assessing Birthing Centers in Nepal (2014) observed that a majority (82.0%) of health workers counseled mothers on taking nutritious food during pregnancy; with a higher proportion in the Hills (95.9%) than in the Terai (73.9%) and the Mountain regions (71.0 %) [3].

The MoHP recommends that a woman should take 180 tablets during her pregnancy. A vast majority (91.3%) of mothers reported receiving iron-folic acid supplementation at least once

in the NDHS 2011 survey [1]. A recent study (2014) reported that 78% of mothers were provided iron-folic acid supplementation during ANC visits [3]. Similar to counseling, the Terai area (60.9%) was under-performing compared to the Hill (91.8%), and the Mountain (81.2%) [3]. Informing mothers about the importance of continuous intake and the side effects of iron-folic acid is essential to achieve a high compliance to iron-folic acid supplementation. However, less than one thirds (30.7%) of the mothers were informed about the reason for taking iron-folic acid supplementation; and only one fifth (20.2%) were explained about the side effects, reflecting poor counseling during pregnancy.

The MoHP recommends that a pregnant woman receive de-worming medicine in her second trimester to reduce parasitic infestation. However, findings from the NDHS 2011 (63.9%) [4] and Results from Assessing Birthing Centers in Nepal 2014 (65.7%) [3] reported that only two thirds of mothers receive such medicine. It should be noted that iron-folic acid tablets are provided by FCHVs in their communities; however, de-worming medicine is provided only in health facilities. The existing data do not allow us to conclude if such higher initiation of consumption of iron-folic acid compared to de-worming medicine is due to community based iron supplementation. With the studies included in this review, it is not possible to report the total number of days a pregnant woman took iron-folic acid supplementations.

Birth preparedness Package counseling and practices

The MoHP of Nepal has been focussing on the birth preparedness package and is one of the major interventions during pregnancy. The BPP promotes active participation of mothers and her families in decision making for childbirth and postpartum periods [29]. The components of such preparedness plan includes- saving money, arranging transportation, identifying person who can donate blood if required, identifying and contacting health facility and health worker for childbirth, and having a clean delivery kit. Such components are delivered to mothers through interpersonal communication between health workers/ FCHVs, pregnant woman and families. To facilitate such communication, pictorial booklets (initially key chains) are provided to each mother and flip chart provided to FCHVs [30].

Table 4 reflects the status of the birth preparedness plan and the proportion of health workers who counseled on such preparation. The NDHS 2011 [4] reported that 35.8% of mothers saved money, 3.4% arranged for transport, 0.4% identified blood donor, 1.7% contacted health person, 4.5% bought a delivery kit, 55.7% arranged for food and clothing, 2.2 % did other preparations, and 35.4% did no preparation. The Evaluation of Postpartum Haemorrhage Prevention Program in Nepal also reported that slightly more than half of the mothers (58.3%) had reported to have planned to deliver in a health facility [2].

Counseling on birth preparedness is one of the proven measures to increase such preparations [30]. The Results from Assessing Birthing Centers in Nepal study reported that slightly more than two thirds (69.2%) of health workers counseled on deciding the place to deliver, setting aside money and arranging transport [3] (Table 4). Only 17.9% of health workers provided counseling on all components. These findings reflect that the aforementioned lower level of preparedness may be due to sub-optimal level of counseling on birth preparedness.

Table 4 Birth Preparedness Plan (BPP) in Nepal: Practices and counseling provided

BPP components	% of mothers reporting BPP practice NDHS 2011(N=4,148)	% of mothers provided with BPP counseling Birthing Center*study 2014 (N=306)
Deciding place to deliver	-	69.2
Set aside money	35.8	69.2
Arrange transport	3.4	69.2
Preparation of new blades in case of emergency home delivery	-	24.3
Identified blood donor	0.4	-
Contacted health person	1.7	-
Bought a delivery kit	4.5	-
Arranged for food and clothing	55.7	-

- : not reported. Source: NDHS 2011, * Results from Assessing Birthing Centers in Nepal (2014).

Promotion of essential newborn care messages

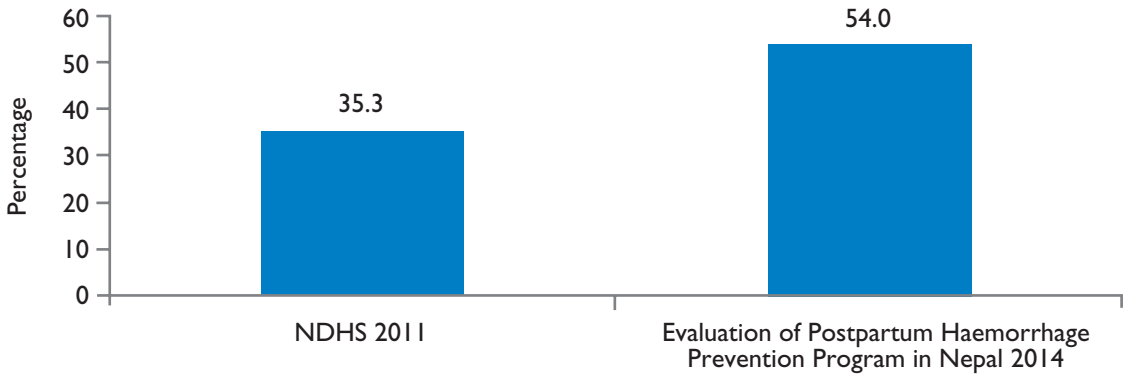
The Five key newborn care messages includes immediate drying, maintaining skin-to-skin contact, cord care (application of Chlorhexidine), immediate breastfeeding, and delaying bathing. These messages are the major focus of CB-NCP program. The CB-NCP assessment reported that mothers were reached by FCHVs in most of the cases, and the information provided by FCHVs were mostly correct. Qualitative information revealed that mothers were exposed to messages regarding birth preparedness, neonatal care, hospital delivery, and maternal and newborn danger signs [5]. A vast majority of mothers from Bardia reported receiving messages on delayed bathing by FCHVs (39% in baseline compared to 86% in endline) and by health workers (34% in baseline compared to 79% endline) after implementation of CB-NCP [5]. Information related to practices on immediate drying, skin to skin contact, delayed bathing, and breastfeeding is presented in section 3.3.2.

3.2 Care during labour and delivery

3.2.1 Facility based deliveries

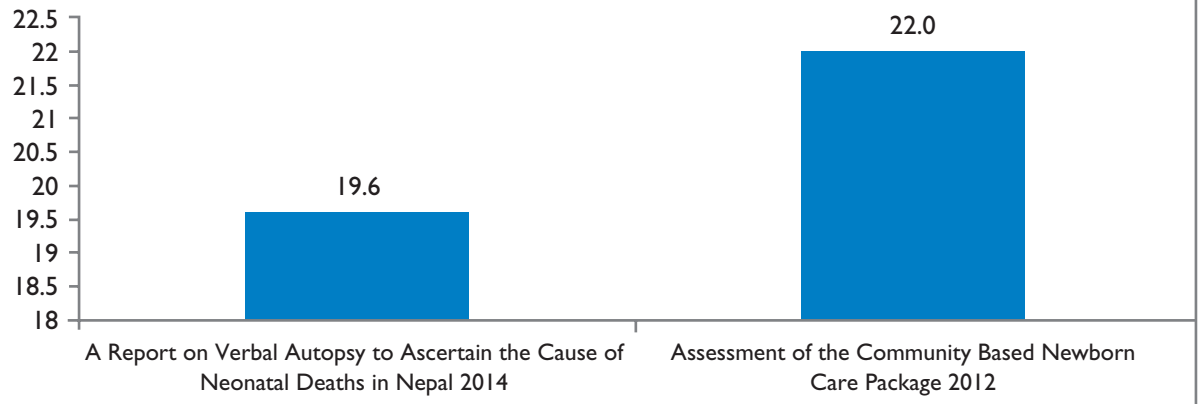
The NDHS 2011 reported that about one third of mothers delivered in a health facility (35.3%) [4]. More recently (2014), Evaluation of Postpartum Haemorrhage Prevention Program in Nepal also noted that 54% of mothers reported delivering in a health facility [2] (Figure 4). The findings of NDHS 2011 and the subsequent survey are not directly comparable due to methodological differences. Nevertheless, the recent findings show that more than half of mothers had delivered in health facilities.

Figure 4 Rates of facility deliveries reported by different surveys



Presence of FCHVs in home deliveries to provide immediate newborn care is a major part of CB-NCP. Attendance of FCHVs during home deliveries remains low in CB-NCP districts. The Verbal Autopsy to Ascertain the Causes of Neonatal Deaths in Nepal (2014) reported that FCHVs were present only in one in five (19.6%) home births [8]. The CB-NCP assessment report also noted that the FCHVs were present only in one in five (22%) home deliveries (Figure 5).

Figure 5 Attendance of home deliveries by FCHVs



3.2.2 Operational aspects of Aama Program

To promote institutional delivery, the Aama program provides incentives for mothers, health workers and institutions. The Aama Rapid Assessment Survey VII (2013) [8] reported that about three quarters (76%) of mothers received travel incentives, despite the fact that Service Tracking Survey (2012) reported higher knowledge on travel incentive (90.9%) [7]. Only a small proportion of women had received 4 ANC incentives, and 57% had paid some cash to the

health facility during their childbirth, mainly for medicine, registration fee, and payment to cleaners. Informal payment to providers was minimal with only 3.8% of mothers having normal delivery reporting such payments. Cross verification reported that a vast majority (95%) of health facility records matched with women's report on the receipt of transport incentives and similar matching was found for 4 ANC incentives (94%) [10]. Such a high proportion of matching reflects a lesser likelihood of mishandling of cash incentives.

The Service Tracking Survey 2012 reported that only 67% of the public facilities were implementing the Aama Program. Such a lower proportion was due to inability of sub health posts and health posts to provide services as birthing centres [7]. On the other side, the 2013 Aama Rapid Assessment VII [10] reported that slightly less than half (43.5% of 796) mothers reported receiving free delivery care. Such proportion of mothers receiving free delivery was much lower in Terai districts (15%- 35%) compared to Hill (69.1%-74.2%) and Mountain districts (86.0-100%).

3.2.3 Comprehensive emergency obstetric and neonatal care

Facility delivery is a high priority intervention to reduce maternal mortality and morbidity. To ensure survival of mothers such services are need to be linked with adequate caesarean services to provide services in case of emergency. However, such surgical facility is limited in Nepal, especially in Hill and Mountain areas. Since fiscal year 2008/09, the MoHP has started allocating a special fund called Comprehensive Emergency Obstetric and Neonatal Care (CEONC) fund to support this high cost, and higher skilled service.

The Service Tracking Survey 2012 reported that 62 % of districts had at least one centre to provide Comprehensive Emergency Obstetric Care (CEOC) service (providing blood transfusion and caesarean section 24/7) [7]. A CEONC readiness survey was conducted in 2011 to assess whether such provision has made any improvement in service, and to identify if the districts are ready to provide such services [31]. The survey reported that only 0.4% of expected births were by caesarean section (against national target 5% to represent adequate access) [31]. In 2010/11, only six (of 18) districts provided the services more than nine months a year, and eight districts (about 44%) provided services less than three months a year. Few districts such as Achham, Makawanpur and Syangja played exemplary roles to establish and facilitate regular services through CEONC sites. Along with positive experience, some managerial issues were noted in the study- especially lack of skills to manage the fund, poor leadership, and friction between private providers and government staff. On the technical part, even when almost 80% of such funds were used for health workforce, there was lack of skill transfer from the contracted team to existing regular staff of the MoHP. Importantly, the contracted team could not play the role in strengthening hospital services. The anaesthesia assistants who were trained by the government, and are the part of regular staff were found not being involved with the contracted team.

3.3 Newborn care

3.3.1 Causes of newborn mortality and their management

A Report on Verbal Autopsy to Ascertain the Causes of Neonatal Deaths in Nepal is the most recent study ascertaining causes of neonatal death [8]. The major causes of deaths identified in the report were: neonatal sepsis (48%), birth asphyxia (16%), prematurity (13%) and low birth weight (5%) [8]. The study also reported that a majority of deaths occurred in health facilities (51.1%), followed by home births (46.4%). Neonatal sepsis was the major cause of death among newborn deaths occurring either at home (49.1%) or health facilities (46.9%). The first seven days of birth were very crucial as 26.9% of deaths occurred on the same day of birth and 42.6% deaths occurred between 1-7 days of birth. These figures imply that provision of intensive support to improve the quality of care during the first week of life has a potential for a two-third reduction in neonatal mortality.

Severe inequality in neonatal mortality can be witnessed in Nepal. A further analysis of the NDHS reported high disparity in neonatal mortality by wealth status, maternal education and geographical differences [32]. Focusing on the NDHS 2011, the difference in neonatal mortality rates in the Mountain and Terai regions was 12.7 (Mountain 45.6, and Terai 35.1 per 1000 live births); in eastern and far western regions 11.6 (eastern 29.3, far western 40.9 per 1000 live births), and in the mothers with no education group and mothers with secondary and higher education was 14.1 (no education 40.3, secondary and higher education 26.2 per 1000 live births). A much higher difference was observed among the poor and the richest group: 21.4 (poor 40.0; richest 18.6 per 1000 live births). Similarly, the recent Verbal Autopsy to Ascertain the Causes of Neonatal Deaths in Nepal (2014) noted that the disadvantaged Janjati groups shared an unequal burden of neonatal mortality with 38.8% neonatal deaths occurring in this group as compared to 3.8% among advantaged Janjati and 4.3% in the upper caste group [8].

Stillbirth has remained an under-studied area in current studies. The Verbal Autopsy to Ascertain the Causes of Neonatal Deaths study [8] included 551 deceased newborns, of which, 209 (37.9%) were stillbirths. Among these stillbirths, majority were fresh still births (72.7%), followed by macerated stillbirths (17.2%) and unknown type (10.0%). Factors associated with stillbirths are not reported in the studies included in this review.

3.3.2 Neonatal sepsis

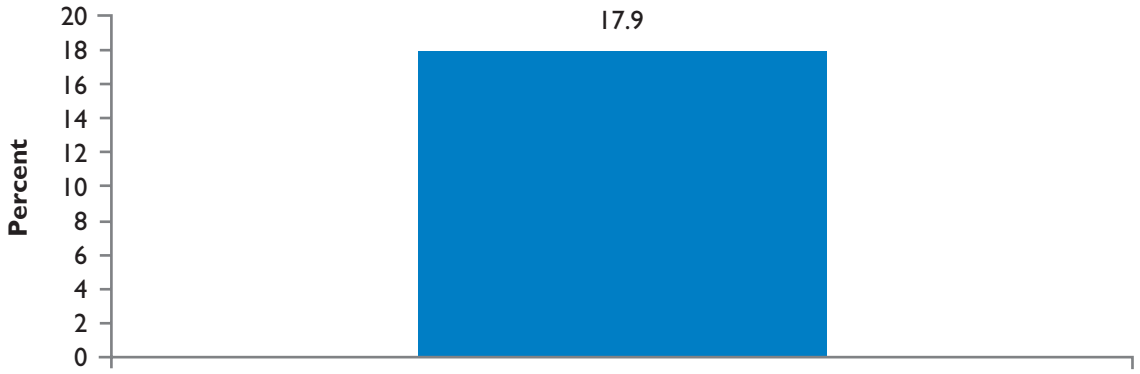
Infection/ sepsis still remains the leading cause of neonatal death in Nepal [8]. Neonatal sepsis (infection) was higher in the Hill (52.5%) compared to Mountain (44.9%) and Terai regions (45.8%) among the 163 neonatal deaths reported due to infection [8]. The household survey findings in the CB-NCP assessment (2012) noted that 22% of newborns experienced one or more danger signs [5]. This assessment further reported that 86% of newborn infection were identified by an appropriate provider (Health Workers, CHWs and FCHVs) with 11% being identified by FCHVs [5]. The former two findings from CB-NCP reflect that there is still a major challenge to track and identify infections in community settings. Further detail on the management of sick newborns, including those with the signs of severe infections is provided in section 3.3.8.

The ENAP workshop report [16] highlighted that the care for newborns with severe infection is costly and there are limited places to obtain services. While community-based guidelines on infection treatment is already in place, there is still lack of standard national treatment protocol for newborn care which can standardize the practices in districts and other referral hospitals.

3.3.3 Cord care

Safe cord cutting practices is one of the major strategies to avoid newborn infection. The MoHP has been promoting the use of safe and sterile cord cutting materials, especially clean home delivery kits or new boiled blades. Figure 6 presents that almost one in five mothers were still using unsafe cord cutting materials (NDHS 2011).

Figure 6 Practice of unsafe cord cutting practices among home deliveries in Nepal



The NDHS 2011 reported that safer cord cutting materials accounted a larger portion: instrument from safe delivery kit (14.1%), and new/boiled blade (68.0%) in home deliveries (N=1,143) [4]. However, a significant proportion of mothers reported using unsafe cord cutting materials (17.9%): used blades (3.6%), knives (0.4%), sickles (10.8%), *khukuri* (0.4%), scissors (0.9%), others (1.4%) and unknown (0.4%). Less is known on the general hygienic practices during the time of cutting cords such as hand-washing with soap and cleanliness of the surface where cord was placed.

Application of Chlorhexidine on umbilical stumps has been recently recommended for further expansion at the national level (Details presented in earlier section) [20]. According to the Mid-term Assessment on Use of Chlorhexidine for Better Cord Care, around two thirds (62.1%) of home deliveries (N=41) used Chlorhexidine on the umbilical stump [6].

Irregular logistic supply leading to stock-out is a major issue for many community based programs. Results from Assessing Birthing Centers in Nepal [3] reported that 50% of the birthing centers (in 33 districts where Chlorhexidine program is scaled up) had stock of Chlorhexidine tube with lowest in the Mountain regions (26.4%), compared to the Hill (40.0%) and Terai (77.5%).

At the community level, as part of the community-based Chlorhexidine program, FCHVs are supposed to reach and provide Chlorhexidine to all mothers during the last trimester and educate mothers on how to apply it on umbilical stumps. The Mid-term Assessment on Use of Chlorhexidine for Better Cord Care noted that FCHV knowledge was good on various aspects of Chlorhexidine application [6]. For instance, 83.3% knew Chlorhexidine is for prevention of umbilical infection, 72.2% knew it should be distributed on the 8th month of pregnancy with proper counseling, 90.7% reported it should be applied immediately after cord cutting, 88.9% reported need to wash hands before application, 90.7% reported it should be applied on the stump and surrounding, and 87% knew nothing should be applied on the stump other than Chlorhexidine.

At the household level, compliance to recommended way of application is a major issue. The mothers who applied the entire tube of Chlorhexidine within two hours of birth remained low (40%) [6]. Hand washing remained an issue among those who had applied Chlorhexidine. Only 52% of the mothers who applied Chlorhexidine had washed their hands before doing so [6]. A significant portion (12.5%) of those mothers who applied Chlorhexidine also used other materials as well; and such practice was higher in the Terai region than in the Hill/Mountains [8]. These findings indicate that there is room for improvement especially with regards to hygienic and appropriate application of Chlorhexidine and increasing compliance, especially in Terai region.

3.3.4 Thermal care

The existing newborn survival programs in Nepal recommend appropriate thermal care for all neonates, and skin-to-skin contact for low birth weight newborn. Table 5 presents findings from different surveys.

Table 5 Thermal care practices in Nepal

Thermal care practices	NDHS 2011	CB-NCP Baseline #	CB-NCP Endline (2011)
Dried before placenta was delivered	57.6	59	82
Wrapped in cloth before placenta was delivered	60.3	-	-
Newborns were bathed after 24-hours of birth	24.5	43	72
Initiated breastfeeding within the first hour	63.9	44	75
Skin to skin contact	-	-	56

- Not reported. # date of baseline varied by implementing organisation (2008-2009). Figures expressed as percentage.
- Source: NDHS 2011 further analysis; CB-NCP assessment 2012.

Among the 2,464 last born home deliveries reported in the NDHS 2011, only 57.6% newborn were dried before placenta was delivered, 60.3% were wrapped in cloth before placenta was delivered, 24.5% newborns were bathed after 24-hour of birth, and 63.9% were breastfed within the first hour of life [9]. It further reported that only one in ten such newborns were reported receiving the abovementioned four thermal care practices [9]. Observation during Results from Assessing Birthing Centers in Nepal revealed that 7.4% of health workers still practice bathing newborns within 24-hours of birth [3]. On a positive note, Table 5 also reports that thermal care practices has improved significantly where the CB-NCP program has been implemented [5]. Such changes in newborn care practices show promising improvements for newborn survival in Nepal.

3.3.5 Pre-term and low birth weight

Prematurity and low birth weight were also found to be contributing significantly to newborn mortality in Nepal [8]. A pooled analysis of NDHS 2006 and 2011 reported a 12.1% incidence rate of low birth weight among those infants whose birth weight was reported [25]. Identification of newborns with low birth weight is a major challenge to providing care in home deliveries. There was a significant increase in the proportion of newborns that were weighed (from 42% to76%; calculated among live births during household surveys) in the five CB-NCP implemented districts where household survey data was available [5]. When this finding was restricted to home births, 43% of newborns were weighed within three days of birth. The household surveys during CB-NCP assessment found that the FCHVs were able to capture only 15% of LBW. Among those weighed by FCHVs, the proportion of newborns with V/LBW were reported to be 4 % (994/23040) reflecting a lower incidence of low birth weight (against expected 15%). Two major reasons could be attributed to a lower reported incidence of LBW. First, only 52% of all home births were being weighted by FCHVs. Second, FCHVs did show a limited capacity to correctly diagnose LBW as only 29% of LBW newborns were correctly diagnosed as LBW by the FCHVs [5].

Pre-term birth remains one of the major challenges to reducing neonatal mortality. A Report on Verbal Autopsy to Ascertain the Causes of Neonatal Deaths in Nepal noted that pre-term birth (13.2%) was one of the major causes of neonatal mortality [8]. The burden of pre-term was even higher (24.9%) when calculated among still births and neonatal deaths combined [8]. (The ENAP workshop report also identified pre-term birth as one of major issues related to the newborn problem and noted that antenatal corticosteroids, which is one of the proven intervention to save lives of preterm babies, has not been used as a public health initiative [16]. It further pointed that skilled birth attendants currently do not have the authority to administer antenatal corticosteroids). The studies included in this review do not report on: (1) the incidence of pre-term birth, and (2) the proportion of pre-term newborns among LBW in Nepal.

3.3.6 Birth asphyxia

Birth asphyxia is one of the leading causes of neonatal deaths, however, identification of birth asphyxia remains a major challenge in community settings. Household data of CB-NCP assessment reported 4-6% prevalence of birth asphyxia. CB-NCP assumed that FCHVs will be able to identify and manage birth asphyxia in home deliveries. However, CB-NCP assessment report did not find encouraging results [5]. FCHVs were able to provide service to 10% of expected

birth asphyxia, who needed bag and mask, among home births. Similarly, at the population level, the service was only given to 5% of expected births who needed bag and mask resuscitation. The assessment also suggested that the case load for birth asphyxia is very low; with current case load, an FCHV will manage one newborn with stimulation in 18 years and use bag and mask in 107 years. A health worker's skill to manage birth asphyxia is very crucial especially in the current situation where facility delivery is increasing significantly. The CB-NCP follow-up after training reported that slightly more than half (53%) of health workers demonstrated adequate skills (on doll) [5]. However, the Results from Assessing Birthing Centers in Nepal noted that there was inadequate availability of working equipment for provision of resuscitation if needed [3].

Findings on the part of FCHVs and health workers identified three major issues; (1) community based component of birth asphyxia management (by FCHVs) is unlikely to bring a significant change in newborn survival; (2) there is further need to strengthen skills of health workers to manage birth asphyxia primarily focusing on those serving at birthing centres; and (3) supply of equipment in working condition is a major issue.

3.3.7 Initiation and exclusive breastfeeding

The WHO recommends early initiation of breastfeeding (within one hour of birth) and exclusive breastfeeding for six months with no other supplementary feeding other than medicine, syrup and oral rehydration solution. Of the 4,079 last born children, 66.4 % were breastfed within one hour of delivery in the NDHS 2011 survey. The CB-NCP assessment (2012) showed an increase in the early initiation of breastfeeding from 44% (baseline) to 75% (endline) after implementation of the program [5].

Exclusive breastfeeding is a major focus of infant feeding practices in Nepal. The NDHS 2011 [4] reported that a majority (87.7%) of the newborns (0-1 month) were breastfed exclusively. None of the studies included in this review noted any particular information on exclusive breastfeeding among newborn groups.

Various cultures in Nepal favour the introduction of pre-lacteal feeds i.e. any feeds provided prior to initiation of breastfeeding. A further analysis of NDHS 2011 [33] reported that a quarter of mothers (26.5%) introduced pre-lacteal feeds. The major pre-lacteal feeds were plain water, sugar glucose, gripe water, sugar/salt solution, fruit juice, infant formula, and other milk. Educated mothers had higher proportion of introduction of such foods compared to those with no education (31.1% in no education groups, 42.6% in higher education). Mothers residing in Terai region had much higher rates (35.0%) of introduction compared to those from Mountain (15.6%) and Hill regions (17.3%). In summary, such a high rate of introduction of pre-lacteal feeding by the mothers living in Terai, and with higher education, calls for further interventions to discourage the practice so that exclusive breastfeeding is promoted for six months.

बाँकी

3.3.8 Early newborn problems and management

The Mid-term Assessment on Use of Chlorhexidine for Better Cord Care reported that about a quarter (27%) of mothers reported health problems of their newborns within two days [6].

The reported problems were: unable to breastfeed, fever, grunting, severe chest in-drawing, ten or more than ten skin pustules or one abscess, umbilical discharge or redness in order of occurrence. The percentage distribution is not feasible due to small sample size (n=27). The findings of the CB-NCP evaluation have reported a number of issues on immediate newborn problems such as birth asphyxia, low birth weight and pre-term management. These problems have also been found to be the major causes of deaths in the Verbal Autopsy to Ascertain the Causes of Neonatal Deaths in Nepal report (2014). The findings from CB-NCP evaluation are presented in section 3.3.2.

3. 4 Postnatal care

3.4.1 Postnatal care of newborn

The NDHS 2011[4] reported that only 30.1% of the newborns received postnatal care within the first two days of birth. The CB-NCP assessment report found that the pre-discharge postnatal care for newborns was much higher for institutional deliveries (97%) compared to home deliveries (24%) [5]. The CB-NCP program also demonstrated that there was a significant increase in provision of postnatal care of newborns (baseline 36% to endline 78% [5]). Among these, FCHVs had provided care to 33% of newborns. While a total of 43% of mothers reporting receiving postnatal care after discharge from hospital/ childbirth, provision of such follow-up postnatal care by health workers (after initial care in the day of delivery) was very low with 18% of mothers being provided such care by health workers.

There was much difference in the use of such services by independent variables [4]. Higher proportion of newborns from rural areas (70.2%) did not receive postnatal care compared to their urban counterparts (47.4%). Similar difference in not receiving such care was observed in ecological regions (Mountain 75.1%, Hill 71.4% and Terai 64.5%), education of mothers (no education 79.3%, SLC and above 46.6%) and wealth quintile (lowest quintile 86.8%, highest quintile 42.7%).

3.4.2 Care of newborn during illness and referral

Seeking immediate care when a newborn gets sick is a key behaviour promoted by child health interventions in Nepal. The household data presented in the CB-NCP assessment noted that there was an increase in the practice of seeking care from appropriate care providers (Health workers or CHW) with an increase from base line status of 77 % to 86%) [5]. Among them, there was little change in the proportion of newborns seen by health workers (76% baseline to 75% endline), however, there was significant increase in the proportion of newborns seen by FCHVs (1 % baseline to 11% endline). The proportion of newborns with possible severe bacterial infection (PSBI) and local bacterial infections (LBI) identified by CHWs was 15.1% (against expected 25% of infection among neonatal population) where FCHVs were contributing to reach only 3.9% of infections. The assessment noted that the mothers take their sick newborns directly to health facilities if one or more dangers signs were seen.

It is expected that all newborns with danger signs receive Cotrimoxazole before referral for further treatment with Gentamycin. The household data from the CB-NCP assessment (2012) [5] noted that a quarter(24%) of newborns had danger signs. Among them, only 24% received Cotrimoxazole and 10% received Gentamycin.

The Verbal Autopsy to Ascertain the Causes of Neonatal Deaths in Nepal (2014) reported that about four in every ten (43.3%, N=321) mothers sought care for their sick newborns [8]. Among the newborn who were taken for care (N=139), hospitals (27.3%) and other health facilities (31.6%) were major places consulted. Similar to the CB-NCP assessment report, only a very small proportion of mothers took their sick newborn to FCHVs (3.6%).

Referral of sick newborns from community to community level health facility; and peripheral health facility to district hospital or above is one of the major strategies in newborn survival interventions. The CB-NCP assessment (2012) noted that the referral system from health facility to district and zonal hospitals is poor [5]. In the referral hospitals, there was inadequate skill of health workers, inadequate equipment, and half of the cases went to private facilities.

3.4.3 Postnatal Care Attendance

Postpartum care for newborn and mothers is one of the focuses of current maternal and newborn survival programs in Nepal. According to analysis of the NDHS 2011 [24], 43.2 % of mothers received postpartum care within 42 days of delivery. Mothers from Terai (49.8%) were more likely to receive postnatal care compared to their counterparts in the Mountain (26.7%) and Hill (37.6%) regions. Similarly, far higher proportion of mothers with higher degree education (85.5%) received postnatal care than their counter parts having no education (26.6%), primary education (39.8 %) and secondary education (61.0 %).

While Nepal's current guideline demands postpartum care within the first three days of delivery, the local cultures do not allow mothers to go outside their home for about 11 days, which is also highlighted in ENAP bottleneck analysis [16]. Such paradoxes in local cultures and facility-based care might be one of the major reasons for lower proportion of postnatal service use in Nepal.

3.4.4 Postpartum Haemorrhage and Counseling During Postpartum Period

Postpartum haemorrhage remains a major challenge in maternal survival [17]. The Evaluation of Postpartum Haemorrhage Prevention Program in Nepal [2] reported that about a quarter (24.9%, n=2070) of mothers reported suffering excessive bleeding/bleeding more than normal. Knowledge on the sign of postpartum haemorrhage still remains poor among mothers: 39.5% reported heavy bleeding, 49.1% reported prolonged bleeding, 18.5% reported completely wet cloth, and 19.8% reported appearance of blood clots as the signs of PPH (Table 6).

Table 6 Knowledge on the signs of postpartum haemorrhage among recently delivered mothers

Signs of excessive bleedin	Number (N=1,020)	Percent*
Heavy bleeding/bleeding from more than normal delivery	403	39.5
Prolonged bleeding	501	49.1
Completely wet cloth/pad within half an hour of delivery	189	18.5
Appearance of blood clots/excessive bleeding	202	19.8
Others	9	0.9
Do not know	206	20.2

Source: Evaluation of Postpartum Haemorrhage Prevention Program in Nepal (2014)

Only about half of the mothers (51.4% of recently delivered mothers and 46.0% of currently pregnant women) reported receiving information on excessive bleeding during childbirth as a sign of PPH [2]. In addition, such postpartum counseling includes key practices for newborn care that postpartum mothers should abide to:- cleanliness of baby, skin-to-skin contact, clean cord cave, immediate breastfeeding (within one hour of birth) and bathing only after 24 hours of birth [34]. However, specific information on whether mothers received counseling on all of these issues remain unexplained in the studies included in this review.

Use of Oxytocin injection is a major strategy to prevent PPH in health facility deliveries. Oxytocin has to be administered by skilled birth attendants. In home deliveries, administration of Oxytocin is not feasible. Therefore, the community-based distribution of Misoprostol has been recently implemented in 31 districts of Nepal to prevent PPH among home deliveries. Evaluation of Postpartum Haemorrhage Prevention Program (2014) reported on compliance and coverage of Misoprostol (MSC) distribution [2]. A total of 15 % of recently delivered mothers had received MSC tablets. Of these, 88% had had taken MSC during their recent child birth [2]. Only one in five (19. 5%) mothers were counseled by health workers on the use of MSC tablets [2]. Overall, the coverage of MSC has remained very low.

FCHVs are major players in the community setting to educate and create awareness among mothers on signs and symptoms of postpartum haemorrhage. The Evaluation of Postpartum Haemorrhage Prevention Program in Nepal reported high variation in the knowledge of FCHVs on signs of postpartum haemorrhage: 58.1% reporting excessive bleeding, 16.7% bleeding for longer period, 55.6% soaking of more than two pads/clothes within half an hour of childbirth, 43.3% appearance of clots, as signs of PPH [2]. This finding indicates a serious need to educate FCHVs to increase their ability to recognize postpartum haemorrhage so that immediate referrals can be made from the community-level and also to enable them to educate mothers regarding PPH which is still one of the major causes of maternal mortality in Nepal.

Knowledge of FCHVs on MSC is essential to increase coverage and compliance of MSC among home births. The Evaluation of Postpartum Haemorrhage Prevention Program in Nepal (2014) [2] reported good knowledge among FCHVs - 91.9% knew MSC tablets should be taken immediately after delivery of baby and before delivery of placenta, and 94.1% knew that three

of what

MSC tablets should be taken at the same time. About two thirds (64.7%) did not have any stock of MSC during the time of survey which is a very discouraging finding.

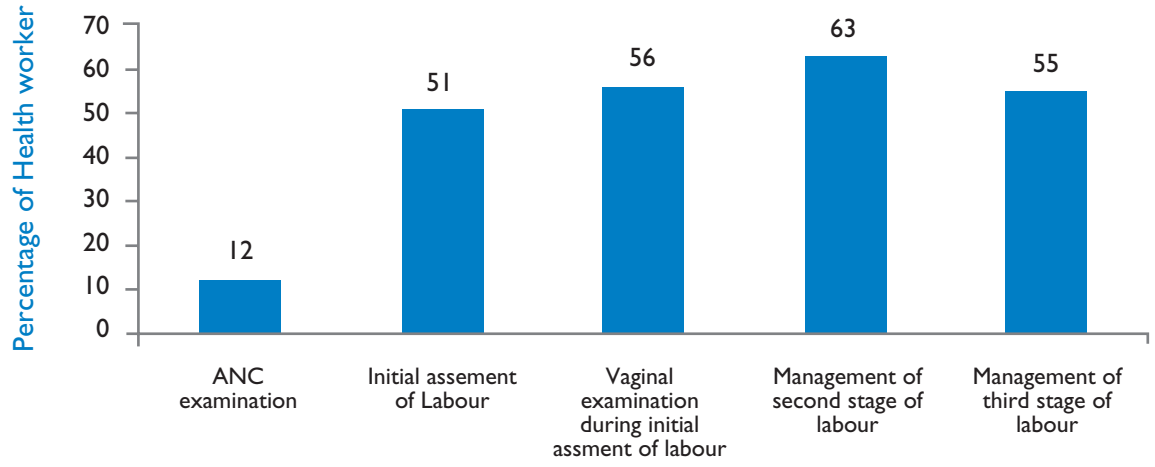
Three major things are notable from the aforementioned information. First, the knowledge on PPH remains very low among mothers. Second, the actual MSC tablet coverage is low. Finally, the supply system remains very poor. The factors make it difficult to attain a high coverage and prevent PPH in the community setting.

3.4 Infection Prevention: A Cross Cutting Area

Infection prevention is very important to protect both service providers and clients. Simple measures such as hand-washing, use of personal protective equipments and decontamination (using chlorine solution) has proven effective to reduce nosocomial infections. Realizing the need to focus on this under-noticed issue, this section presents the findings on infection prevention reported by various surveys.

Only 52% of the mothers who applied Chlorhexidine had washed their hands before doing so [6]. The Results from Assessing Birthing Centers in Nepal also reported that hand-washing was a much neglected issue [3]. It reported that only 12% of health workers practiced proper hand washing or used alcohol hand rubs before touching patients during ANC examination. Similarly, only 51% washed their hands before physical examination and 56% did so before vaginal examination during initial assessment of labour. Furthermore, only 52% washed their hands with soap or used alcohol rub during management of first stage of labour. Such practice of handwashing increased slightly during second stage (63%) and third stage (55%) of labour management (Figure 7).

Figure 7 Proper hand washing (including alcohol handrub) among health workers



Source : Results from Assessing Birthing Centers in Nepal (2014).

Use of other protective equipment is important to prevent cross infections in health facilities. The Results from Assessing Birthing Centers in Nepal [3] reported that only half (55%) of the health workers wore clean protective equipment such as (goggles, gown and apron) and a higher proportion (95% against recommended 100%) wore sterile gloves before vaginal examination during initial assessment.

Clean practices following labour and delivery also remained an issue with varying degree of practices. Of the 68 observed cases of labour and delivery in Results from Assessing Birthing Centers in Nepal, 85.3% disposed all sharps in a puncture proof container after use; 83.8% disposed of all contaminated waste in leak-proof containers; 76.5% sterilized/used high-level disinfection for all reusable instruments; 64.7% decontaminated all reusable instruments in 0.5% chlorine solution; and 20.6% removed apron and wiped with chlorine solution [3]. Overall, these findings show that infection prevention remains a major issue. With neonatal sepsis still a leading cause of neonatal mortality, institutionalization of infection prevention practices is essential.

CHAPTER 4: KEY ISSUES AND RECOMMENDATIONS

5.1 Care During Pregnancy

Key issue 1: Recommended four ANC visits and the quality of ANC remains low.

Recommendation: The MoHP recommends that pregnant woman should receive four timely ANC visits in 4th, 6th, 8th and 9th months of gestation. More focus on educating mothers during pre-pregnancy and pregnancy to attend ANC visit in 4th, 6th, 8th and 9th months of gestation is needed. Such messages need to be emphasized clearly in all education and counseling materials designed for pre-pregnancy stage. Along with that, the value and benefits of early and timely four ANC visits need to be communicated to expecting mothers, FCHVs and mother's group for health (and similar groups).

There is an argument that 4 ANC visit alone is not sufficient to ensure the quality of ANC services as it relates to number of visit only. Therefore, there is a need to focus on the quality of such services. Urine and blood test may be difficult components to achieve especially in HPs and SHPs. The use of dipstick for urine test (to screen for pre-eclampsia and eclampsia) may be a further step to improve the quality of ANC. A way forward to monitoring quality of ANC could be the use of a composite indicator merging all of the following conditions (at least in national, regional, and district level) (proposed): first ANC visit on or before 4th month of gestation, blood pressure measurement, tetanus toxoid vaccination, counseling on pregnancy related danger signs, iron-folic acid supplementation, de-worming medication and contact with skilled care provider on the 8th - month of pregnancy [1, 35]. The Number and type of services to include in the composite indicators may be decided by FHD and experts in the field. Some of the components may vary based on the type of health facilities. Laboratory components may be added as part of indicators in the facilities where services are available. In addition, de-worming tablets reach iron-folic acid supplementation level if both are provided together for the first time during pregnancy.

Key issue 2: All components of birth preparedness are not enforced during counseling.

Recommendation: The MoHP has been continuing its focus on birth preparedness activities through birth preparedness education materials (Jeevan Suraksha Flip Chart, and Jeevan Surksha Card). BPP counseling needs to focus more on the danger signs during pregnancy and on complete components of preparedness. To increase such opportunity to educate mothers through FCHVs: (1) FCHV review meeting should also highlight birth preparedness, (2) FCHVs should be provided with adequate Behavior Change Communication (BCC) materials (for mothers and FCHVs themselves). Provision of community-based ANMs would be useful to promote such communication activities and also educate FCHVs on a timely basis (also refer to: 5.4, Key Issue 1).

Key issue 3: Mobilisation of community and families for essential newborn care message during pregnancy has not been part of routine practice.

Recommendation: Promotion of essential newborn care message during pregnancy can be delivered through a number of already proven approaches. Delivering messages through mother's /women's group, and through community health workers such as MCHWs, and FCHVs have shown positive effects in maternal and newborn health previously and should be continuously promoted. The influence of mothers-in-law on the use of maternal health service has also been documented previously [36]. It is now time to focus fathers/fathers to-be to take part in such care and help make decisions to use services that are recommended. This approach can be materialized in a number of ways: (1) involving senior women of mothers group to disseminate message along with FCHVs [37], (2) counseling mothers-in-law/husbands during prenatal period, (3) building skill of FCHVs in participatory discussion so that mothers, senior woman and fathers can be involved in decision-making, (4) providing them with BCC materials that includes text messages in simple formats where literacy level is high (with increasing literacy, it is now feasible in many areas of Nepal). Instead of using expensive, coated paper to deliver messages, simple paper can be used for this purpose which will reduce the cost of production and may be helpful the sustainable supply of these products.

5.2 Care during labour and delivery

Key issue 1: Only about half of mothers reported having facility delivery.

Recommendation: This reflects that there is need for more focus to increase the number of new birthing centres (with significant increase in investment) and also to ensure that existing birthing centres are providing round the clock service. Such new birthing centres should be selected, taking into account strategic locations for the population and potential client flow and intent to increase access as underutilization of birthing centers has been reported as an issue in the DoHS annual report 2012/13 [38]. There is also a need to increase the quality of existing birthing centers and competencies of existing SBAs which would increase client flow in already established sites [39]. For example, recent findings from Kaski district report that mothers perceived that rural birthing centres are underequipped, did not have adequate medical supplies, and are staffed by less competent health workers [40]. Such perceived low quality of birthing centres was also a major reason for bypassing rural birthing centres, and opting instead to go to higher level facilities for labour and delivery [15].

Increasing the capacity of SBA training centres so that a larger number of health workers are trained on SBA skills is essential to produce high quality SBAs. Assessing the quality of SBA training sites was not the part of this review. However, it is essential that there is regular monitoring and accreditation of training sites, so that the SBAs have adequate skills to save the lives of mothers and newborns.

Pre-service training should be a major focus of skilled health workforce production in Nepal. Recently skills endorsed by SBA training have been included into pre-service training (Curriculum) of Proficiency Certificate Level in nursing, BSc Nursing, MBBS, and MDGP. Evaluation of effectiveness of such changes in curriculum is essential to investigate if graduates were able to deliver quality of service as per the SBA guideline.

Key Issue 2: The coverage of Misoprostol is low and unlikely to have significant impact on PPH prevention with current coverage.

Recommendation: Ensuring high coverage and compliance is essential to achieving the benefits of Misoprostol supplementation in a level that prevents PPH at population level. Low MSC coverage among home deliveries has remained a major challenge. There are a numbers of issues which need to be taken care of to increase coverage and compliance: (1) ensuring year round availability of MSC with FCHVs, (2) ensuring that all mothers get three tablets of MSC in their last trimester (3) intensive integrated monitoring of the supply system, and (4) including MSC as part of regular during FCHV monthly meetings. In addition, community-based MSC distribution should focus on only those areas where home delivery is high.

Key Issue 3: A high proportion of still births exist. Fresh still birth accounted for two thirds of all still births.

Recommendation: Stillbirths were entirely missed and does not appear in the MNH framework as a priority. Fresh still birth suggests that the infant might be viable during labour and was dead before delivery due to poor quality of labour management such as lack of competent skilled birth attendants, inadequate intra-partum monitoring and inadequate care during childbirth [41-43]. Stillbirths also might reflect poor quality of resuscitation services as fresh stillbirths have a potential to survive if good resuscitation services are provided. Adequate screening and treatment of maternal infections (syphilis, malaria, and other infections) is likely to prevent still births [39, 43]. Expansion of comprehensive emergency obstetric care [44] and provision of quality labour and delivery is a major step towards increasing foetal survival from fresh still births [39].

5.3 Care of newborn

Key issue 1: A large portion of mothers still apply potentially harmful materials on cord stumps (NDHS 2011). In those districts where the Chlorhexidine program is implemented, there is need to improve compliance with the recommended way of applying Chlorhexidine [6].

Recommendations: Three major strategies may help to reach higher compliance of recommended cord care practices. First, regular supply and no problems in the supply system should be ensured. Second, intensive monitoring (along with other community-based components-vertical monitoring focused only on chlorhexidine must not be promoted). Third, integrating application of Chlorhexidine should be a part of monthly and quarterly FCHV meetings, and refresher training. The quality of services at health facilities continue to be poor, including infection prevention practices [3], therefore, chlorhexidine should be applied on the cord stump of newborns born in health facilities.

Two issues need further consideration. Paudel et. al [32] argue that chlorhexidine clearly fits into the platform of CB-NCP, therefore, the current ongoing integration of IMNCI should be taken as an opportunity to integrate Chlorhexidine application into a program. In addition, the application of chlorhexidine should also be integrated as a part of essential newborn care practices during BPP counseling. (also see section 5.5 for infection prevention)

Key issue 2: Neonatal sepsis remains major cause of neonatal death, despite the fact that cost effective methods are available within the country.

Recommendation: CB-NCP had raised much hope that the program can manage immediate causes of deaths in newborns born at home however, findings were not encouraging for the community-based components. Only small proportions of home births were being attended or reached by FCHVs. Further strengthening of postnatal visits can contribute to reduce number of deaths due to infection and improved care practices for sick and LBW infants (refer to section 5.4).

To reduce the cost of treatment of severe infection among newborns, the component can also be included as a part of service provided through birthing centres and free of cost [16]. In the meantime, it is necessary to standardize the treatment protocol based on level of service delivery, i.e. community to tertiary hospital level. Improving the quality of care in health facilities is a major step forward to reduce the burden of infection and saving newborn lives [39].

At the community level, families need to be made aware that infections can happen anytime including within the first few days (during isolation) and newborns should be taken to the appropriate service provider immediately. To raise awareness, it is essential to implement multiple activities (messages through television, radio, street dramas, and mothers groups) that supports and encourages seeking care from skilled providers when newborns are sick. The existing BPP includes recognition of maternal and newborn danger signs and BPP counseling should also explicitly mention infection prevention practices.

Key issue 3: Poor institutional readiness to provide service for birth asphyxia.

Recommendation: All first line health workers need to be trained on newborn resuscitation. Given that an increasing number of births are being attended by skilled birth attendants in health facilities, increasing the capacity of skilled birth attendants should be a major priority to improve management of birth asphyxia [45]. In addition to skills, it is important to ensure that all essential equipment are available and functioning in all facilities including birthing centres [16]. It is also essential to develop strategies to ensure retention of skills in health workers especially in the birthing centers where case load is low and a case requiring resuscitation may be a rare event.

Key issue 4: Appropriate care of low birth weight and pre-term newborns still remains a major challenge.

Recommendation: There is need to build and retain the skills to provide Kangaroo Mother Care (KMC) to low birth weight and premature newborn of health workers and CHWs. The ENAP workshop also highlighted the need of a standardized guideline for KMC which should be a major priority while aligning MNH services through FHD and CHD [16]. KMC is a tedious task and proper counseling needs to be provided so as to ensure that compliance to the

standards of KMC is met and also facilitate the process of family members taking turns to give rest to the mother. While LBW and pre-term births are receiving much attention as a main cause of neonatal death, there is still lack of focus on prevention part. There is need of preventive programs focusing on increased maternal nutrition, avoiding early marriage, nutrient supplementation during pregnancy to reduce the high prevalence of LBW and pre-term babies. Dietary calcium supplementation during pregnancy has been found to be effective in reducing pre-eclampsia [46] and reducing pre-term birth [39]. Feasibility of this intervention should be studied in Nepal.

Interventions which are directed towards survival of pre-term newborns should be prioritized. Antenatal corticosteroids have been recommended to reduce mortalities in these newborns. A Cochrane review including 21 studies has reported the positive effect of antenatal corticosteroid use in the reduction of neonatal deaths (relative risk (RR): 0.69; 95% CI : 0.58, 0.81) [47]. Antenatal corticosteroid therapy accelerates foetal lung maturity; and reduces respiratory distress, intra ventricular haemorrhage, and long term neurological consequences. There is little evidence on incidence of, and factors associated with pre-term births in Nepal. Further studies are required to fulfill this knowledge gap.

Key issue 5: Only small proportions of newborns are provided with recommended thermal care.

Recommendation: Health workers should be provided with skills on thermal protection of a newborn, immediately after birth and later hours. Practice of bathing within 24 hours should be discouraged strictly. As reported in the review, small proportion of babies were bathed even in the presence of health workers, This needs to be strongly discouraged.

Skin-to-skin contact/KMC is essential, especially in LBW newborns, to prevent hypothermia and to help in gaining weight [39]. Inclusion of other family members in providing KMC is essential to reap full benefits from the intervention.

Key issue 6: Newborn care practice is very poor, especially in rural areas, poor families and among mothers with no education.

Recommendation: All newborns born in health facilities and birthing centres must be checked before discharge and during the stay there. To facilitate newborn routine care at home, feasibility of home-based care needs to be studied. However, such home-based care must not compromise the standard of care due to its home-based nature. Newborn care should be an integral component of pre-service training of health workers. Strategies must be developed so as to facilitate the hard to reach populations in accessing health care.

Key Issue 7: Quality of care at birthing centres, health facilities and community remains poor which may have impact on current stagnant burden of neonatal mortality.

Recommendation: One of the major points identified in this review is that majority of successful and promising interventions are already in use, however, neonatal mortality rate has not reduced significantly [13]. For instance, a higher proportion of neonatal mortality is taking place in health facilities. Part of this could be attributed to lack of compliance to maintenance of quality services [39] which was also pointed out during ENAP workshop [16]. In addition newborn care should also be an integral part of maternal care provided in the birthing centres.

5.4 Postnatal care of mothers

Key issue 1: Less than half of mothers received post natal care.

Recommendation: There is need to establish a norm that all mothers and newborns delivering in birthing centres and health facilities are checked regularly for any problems experienced by mothers and specially before discharge from the health facility [24]. Considering significant cultural and traditional barriers for mothers to seek care for herself or her baby during the initial days after delivery, home-based care programs should be seriously considered. Initiating pilot program on community-ANMs, who will remain in the community and provide community and home based care, would be a good approach to address the need at the community level to increase support on birth preparedness and increasing postnatal care of mothers and newborns [48]. This will also help to increase services on a number of components such as treatment of neonatal problems in the first week of birth, which account for almost two thirds of neonatal deaths.

5.5 Infection prevention

Key issue 1: Infection prevention remains a highly neglected issue throughout all services.

Recommendation: A previous study from Sarlahi reported that handwashing by birth attendants (relative risk (RR): 0.81; 95% CI : 0.66, 0.99) and mothers (RR 0.56; 95% CI 0.38, 0.82) significantly reduced neonatal mortality [49]. Adequate facilities for hand-washing need to be installed in all health facilities including physical facilities such as water source and hand washing set (bucket with tap, bowl, and soap). In addition, alcohol hand rubs can be used where feasible; however, it should not be promoted as a substitute for hand-washing.

Other infection prevention measures must be part of all training and procedures for health workers, which includes availability and use of protective clothing - (apron, goggles and gloves) in health facilities. Infection prevention must be part of all quality control measures and monitoring visits so that it gets proper attention and to ensure the health workers follow the recommended action to avoid cross infection.

5.6 Cross cutting recommendations

Apart from the previously mentioned technical interventions, there are a number of issues that need to be addressed if the intended impact is to be achieved. Further studies and expert opinion is essential on these areas as the current review mostly focuses on the technical part of MNH.

Low compliance to standard protocol: A number of issue were found which were related to noncompliance such as in the use of chlorhexidine, infection prevention measures and providing different components of services during ANC and postnatal care. Close monitoring and re-enforcement is essential to increase adherence to such services.

Weak Supply chain management: This problem had impact on community-based misoprostol distribution and birth asphyxia management as noted in this review. An efficient suply chain system is needed to ensure availability of all commodities.

Inadequate management capacity: The CEONC study [31] reported poor management capacity among district hospital management committees and health managers. Improving the management capacity of district health offices/district public health offices is essential.

Inadequate referral services: The review found that the referral part of the program on newborn and maternal health has not been given much priority. Future interventions should include improved referral facilities and linkages with community level facilities so that community services are provided with a confidence that there is a referral facility when needed [15, 29].

Detailed recommendations are provided in appendix-1 to show the demand and supply side of interventions.

CHAPTER 5: CONCLUSION

Review of scientific evidence is useful to build consensus among policy makers, experts, and program managers and this review is an attempt for the same [12]. The objectives of this review are to: (1) summarize findings, (2) identify existing challenges, and (3) recommend future strategies to meet challenges. The ultimate purpose of this review is to present consolidated findings that can assist in decision making for further interventions.

This review reported the findings from the NDHS 2011 (85%) [4] and Evaluation of Postpartum Haemorrhage Prevention Program in Nepal (91.7%) [2] which show that first ANC visit is attended by the vast majority of mothers. However, the NDHS 2011 noted that only 50% attended four ANC visits [1]; only 24.3% reported receiving all of the following components of care: iron supplementation, intestinal parasite drug, two or more tetanus injections, blood pressure measured, blood and urine sample taken. The Results from Assessing Birthing Centers in Nepal [3] also reported similar lower quality of ANC. Observation of counseling on birth preparedness showed that 69.2% health workers counseled mothers on at least one component of the BPP with only 17.9% of them counseling on all components [3].

Evaluation of Postpartum Haemorrhage Prevention Program in Nepal [2] reported that one in every two of the recently delivered mothers had a facility delivery. While CB-NCP assumed that FCHVs should be present during home deliveries to ensure immediate care of newborns, FCHVs were present in one in five (22%) home deliveries in the CB-NCP districts. The Aama program reported reaching a majority of mothers, with 76% clients being provided with transportation cost. The coverage of CEONC, represented by proportion of caesarean delivery, remains low with only 0.4% of births (against intended 5%). The finding is from the districts where the CEONC fund was allocated [31].

Application of chlorhexidine on umbilical stumps was recently recommended for further expansion at the national level [20]. According to the Mid-term Assessment on Use of Chlorhexidine for Better Cord Care, around two thirds (62.1%) of home deliveries (N=41) used chlorhexidine on the umbilical stump. A number of problems such as noncompliance to hand-washing before application, not applying the entire tube, and applying other materials, were noted.

CBNCP is the major community based program implemented in the study districts. Thermal care practices were reported to be poor during the NDHS 2011 [9]. The CB-NCP showed a positive impact in improving thermal care practices in the program implemented districts. Similarly, there was improvement in early initiation of breastfeeding in CB-NCP areas from 44% (baseline) to 75% (endline) after implementation of the program [5].

The major causes of deaths identified in Verbal Autopsy to Ascertain the Causes of Neonatal Deaths in Nepal were: neonatal sepsis (48%), birth asphyxia (16%), prematurity (13%) and low

birth weight (5%) [8]. The CB-NCP assessment (2012) noted that 22% newborns experienced one or more danger signs [5]. There was limited capacity of health workers and FCHVs to manage birth asphyxia [5]. FCHVs showed limited capacity to identify LBW babies correctly. The Verbal Autopsy study noted that a quarter (24.9%) of perinatal deaths were pre-term [8]. It should be noted that the interventions to save pre-term newborns are still inadequate.

Postnatal care of mothers and newborns is essential to increase maternal and newborn survival. The CB-NCP assessment report found that the postnatal visit within two days of birth was much higher for institutional deliveries (97%) compared to home deliveries (24%) [5]. The Evaluation of Postpartum Haemorrhage Prevention Program in Nepal [2] reported that about a quarter (24.9%) of mothers reported suffering excessive bleeding/bleeding more than normal (a sign of PPH). Only about half of mothers (51.4% of recently delivered mothers) reported receiving information on excessive bleeding during childbirth as a sign of PPH [2].

This review also recommended on improvements for the future. It should be noted that much is known on the effectiveness of the interventions. Most of the community-based programs have been implemented in Nepal [12, 27]. Therefore, the areas highlighted above mostly demand more focus on increasing coverage [13] and compliance, increased focus on meeting quality [27], and more focus on education and counseling. There is room for new initiatives such as prevention of low birth weight and pre-term babies, introducing lifesaving interventions for pre-term; and prevention of still births.

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Appendix

Appendix 1: Existing gaps and suggested interventions in MNH in Nepal

Gaps	Supply side interventions	Demand side interventions
Antepartum Care		
Recommended four ANC visits and the quality of ANC remains low.	BCC materials designed for pre-pregnancy stage should include message on quality and frequency of ANC.	Counseling of mothers on the benefits of early and timely four ANC visits.
	A job-aid that guides health workers (ANM/Nurses or other cadres of health workers) to provide all components of ANC may be helpful	Mobilisation of FCHVs and mother's group for health (similar groups) to disseminate message
	Cost effectiveness and feasibility of the use of dipstick for urine test (to screen for pre-eclampsia and eclampsia) at HP and SHP level	
	Use of a composite indicator to monitoring quality of ANC	
Counseling during pregnancy on nutrition intake (iron-folic acid and de-worming medicine) is inadequate.	Community based supplementation of de-worming medicine	Focus on counseling
	Pre-service training of health workers needs emphasis on the value of adequate counseling	Strengthening of BPP for these messages including side effects of these medication
All components of birth preparedness are not enforced during counseling.	FCHVs monthly and quarterly review meeting should highlight on birth preparedness,	Counseling of mothers needs to focus on the danger signs during pregnancy, all components of birth preparedness
	FCHVs should be provided with adequate education materials (for mothers and FCHVs themselves)	

Gaps	Supply side interventions	Demand side interventions
Mobilisation of community and families for essential newborn care message during pregnancy has not been part of routine practice.		Involving senior women of mothers group to disseminate message along with FCHVs
	Building skill of FCHVs in participatory discussion to facilitate families in decision making	
	Providing mothers with BCC materials that includes the messages on newborn care where literacy level is high	
Care during labour and delivery		
Only about half of mothers reported having facility delivery.	Increase the number of new birthing centres (with significant increase in investment) which are located based on accessible locations for clients.	Increasing access to ambulance for transportation in those districts where there is motorable road.
	Ensure that existing birthing centres are providing round the clock service.	Maternity waiting homes in geographically difficult areas.
	Increase the quality of existing birthing centers and competencies of existing SBAs.	
	Regular monitoring and accreditation of training sites so that the SBAs have adequate skills.	
	Proven initiatives including those skills envisioned by SBA training should be included into pre-service training (Curriculum) of PCL nursing, ANM, HA, CMA.	
The coverage of Misoprostol is low and unlikely to have significant impact on PPH prevention with current coverage.	Ensuring year round availability of MSC with FCHVs.	Counseling on the third trimester (as part of BPP).
	Ensuring that all mothers get three tablets of MSC in their last trimester	

Gaps	Supply side interventions	Demand side interventions
	Intensive integrated monitoring of supply system	
	Adequate supply of job-aids	
	Including MSC as part of regular FCHV monthly meeting agenda	
A high proportion of still births exist. Fresh still birth accounted for two thirds of all still births.	Adequate screening and treatment of maternal infections (syphilis, malaria, and other infections) is likely to prevent still births	Nutrition education of mothers
	Expansion of comprehensive emergency obstetric	Attendance of ANC screening during ANC period
Care of newborn		
A large portion of mothers still apply potentially harmful materials in cord stump (NDHS 2011). In those districts where Chlorhexidine program is implemented, there is need to improve compliance to the recommended way of application of Chlorhexidine	Ensuring that there is no problem in supply system	Essential newborn care practices during BPP counseling
	Intensive monitoring	Educating mothers on safe cord care practices
	Chlorhexidine application should be integrated as part of FCHV monthly and quarterly meetings	
	Chlorhexidine should be applied to newborns born in health facilities	
	Current ongoing integration of IMNCI should be taken as an opportunity to integrate Chlorhexidine	
Neonatal sepsis remains major causes of neonatal death, despite the fact that cost effective methods are available within country.	Further strengthening of postnatal visits would contribute to reduce deaths due to infection	Educating families on newborn infection and need of immediate care
	Treatment of severe infection among newborn can also be provided through birthing centres and at free of cost	Multiple activities (message through television, radio, street drams, mother's group) to increase care seeking for sick newborn

Gaps	Supply side interventions	Demand side interventions
	Standardize treatment protocol based on level of service delivery, i.e. community to tertiary hospital level	The existing BPP includes recognition of maternal and newborn danger signs
		BPP counseling should explicitly state about infection prevention practices
Poor institutional readiness to provide service for birth asphyxia.	All first line health workers need to be trained on newborn resuscitation	
	Birth asphyxia management skills should also be incorporated as "Basic Medical Skills" in the curriculum of PCL nursing, ANM, HA, CMA	
	Ensure that all essential equipments are available in all facilities including birthing centres	
	Develop strategies to ensure skill retention especially in the low volume facilities.	
Appropriate care of low birth weight and pre-term newborns still remains a major challenge.	Build and retain the skill of Kangaroo Mother Care (KMC) of low birth weight newborn to all health workers and CHWs	Health workers need to encourage mothers, fathers and care takers that KMC can be practiced in hot areas too
	Standardized guideline for KMC	Promotion of adequate nutrition and rest during pregnancy
	There is need of preventive programs to reduce the high prevalence of LBW and pre-term	
	Feasibility of antenatal corticosteroid should be assessed in Nepal through pilot projects.	

Gaps	Supply side interventions	Demand side interventions
	A cheap and proven intervention with potential to save numerous preterm babies, this intervention should be adopted and assessed for scale up in the country.	
	One of the bottlenecks identified in the ENAP workshops is that SBAs aren't authorised to use antenatal corticosteroids and should be addressed.	
Only small proportions of newborns are provided with recommended thermal care.	Bathing of newborn need to be strongly discouraged especially when health workers and CHW are present	
	Skin to skin contact for thermal protection of newborns should be promoted.	also It will be useful to start involving fathers and other family members in KMC
Exclusive breastfeeding is adversely affected by the introduction of pre-lacteal feeds, with a higher rate of pre-lacteal feeding in Terai region.	In HF and home delivery: support mothers to establish breastfeeding, especially the first time mothers who usually lack confidence and skill to breastfeed,	Discourage prelacteal feeding practices,
	Clear communication and skill demonstration for a mother who has just gone through caesarean section	
	Revitalizing the concept of Baby Friendly Hospital Initiative	
Routine newborn care practice is very poor, especially in rural areas, poor families and with mothers with no education.	Feasibility of home-based care need to be studied	

Gaps	Supply side interventions	Demand side interventions
	All newborn born in health facilities and birthing centres must be checked before discharge and in between the duration	
	Newborn care should be an integral component of pre-service training of health workers	
Quality of care at birthing centres, health facilities and community remains poor which may be impacting on current stagnant burden of neonatal mortality.	Focus on improving quality of services	
Postnatal care of mothers		
Less than half of mothers received post natal care	Establish a norm that all mothers and newborns delivering in birthing centres and health facilities are checked regularly for any problem experienced by mothers and specially before discharge from the health facility	
	Initiating pilot program on community-ANM, who will remain in community and provide community and home based care	
Infection Prevention		
: Infection prevention remains a highly neglected issue throughout all services.	Adequate facilities for hand washing need to be installed in all health facilities including physical facilities such as water source, hand washing set (bucket with tap, bowl, soap)	
	Other infection prevention measure must be part of all training and procedure for health workers which include availability and the use of protective clothing-apron, goggles and gloves in health facilities	

*interventions are based on the findings noted in this review.

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