

**STATE OF THE WORLD'S
NEWBORNS:
NEPAL**

**SAVING NEWBORN LIVES
SAVE THE CHILDREN**

July 2002

This report was prepared in collaboration with His Majesty's Government of Nepal and Save the Children US.

Save the Children is a leading nonprofit child-assistance organization working in more than 45 countries worldwide, including the United States. Our mission is to make lasting, positive change in the lives of children in need. Save the Children is also a member of the Save the Children Alliance, a worldwide network of 30 independent Save the Children organizations working in more than 100 countries to ensure the well-being of children everywhere.

Saving Newborn Lives (SNL) initiative, led by Save the Children US, is funded through a generous grant from the Bill & Melinda Gates Foundation. SNL promotes affordable and sustainable solutions to maternal and neonatal health problems in communities and countries where neonatal death rates are highest and people have limited access to known, life-saving interventions.

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List of Abbreviations

ADB	Asian Development Bank	MD/ob gyn	Doctor of Medicine/Obstetrics and Gynecology
AHW	Auxiliary health worker	MIRA	Maternal and Infant Research Activities
AIDS	Acquired immunodeficiency syndrome	MMMS	Maternal mortality and morbidity study
ANC	Antenatal care	MMR	Maternal mortality ratio
ANM	Assistant nurse midwife	MNH	Maternal and neonatal health program
BCC	Behavior change communication	MoH	Ministry of Health
B/EmOC	Basic/emergency obstetric care	MoPE	Ministry of Population and Environment
BMI	Body mass index	NA	Not applicable
BPH	Bachelor in Public Health	NALS	Neonatal advanced life support
BPKIHS	B.P Koirala Institute of Health Sciences	NEPAS	Nepal Pediatric Society
CARE	Co-operatives of American Relief Everywhere	NFCC	Nepal fertility care center
CBR	Crude birth rate	NFHS	Nepal Family Health Survey
CBS	Central Bureau of Statistics	NGO	Nongovernmental organization
C/EmOC	Comprehensive/emergency obstetric care	NHEICC	National Health Education Information and Communication Center
CEDPA	Center for Development and Population Activities	NHRC	Nepal Health Research Council
CHD	Child health division	NHTC	National Health Training Center
CHDK	Clean home delivery kits	NID	National immunization day
CPR	Contraceptive prevalence rate	NMCG	National Maternity Care Guidelines
CRC	Convention on Rights of the Child	NMR	Neonatal mortality rate
CTEVT	Council for Technical Education and Vocational Training	NNIPS	Nepal Nutrition Intervention Project Sarlahi
DFID	Department for International Development	NPC	National Planning Commission
DHO	District health office/officer	NSMP	Nepal Safer Motherhood Project
DHS	Demographic and Health Survey	PCLN	Proficiency Certificate Level in Nursing
DoHS	Department of Health Services	PESON	Perinatal Society of Nepal
DPHO	District Public Health Office/officer	PHC/C	Primary health care/center
EMNC	Essential maternal and neonatal care	PNC	Postnatal care
EmOC	Emergency obstetric care	PNMR	Perinatal mortality rate
ENC	Essential newborn care	PRA	Participatory rapid appraisal
END	Early neonatal death	RDS	Respiratory distress syndrome
EOC	Essential obstetric care	RHCC	Reproductive Health Coordination Committee
EPI	Extended program for immunization	Rs.	Rupees
FCHV	Female community health volunteer	RTI	Reproductive tract infections
FHD	Family health division	SCA	Save the Children Alliance
GTZ	German Technical Co-operation	SCBU	Special care baby unit
HA	Health assistant	SCF	Save the Children Federation
Hb	Hemoglobin	SC/US	Save the Children/United States
HIV	Human immunodeficiency virus	SHP	Sub health post
HMG/N	His Majesty's Government/Nepal	S/LTHP	Second/long term health plan
HP	Health post	SMN	Safe motherhood network
ICH/L	Institute of Child Health/London	SMSC	Safe motherhood subcommittee
ICPD	International Conference on Population and Development	SNL	Saving Newborn Lives
IMCI	Integrated management of childhood illness	Sr.AHW	Senior auxiliary health worker
IMR	Infant mortality rate	STD	Sexually transmitted diseases
I/NGO	International nongovernmental organization	TBA	Traditional birth attendant
IoM	Institute of Medicine	TFR	Total fertility rate
JHPIEGO	Johns Hopkins University International Education and Training in Reproductive Health	TT	Tetanus toxoid
JHU	Johns Hopkins University	TOR	Terms of reference
JICA	Japanese International Cooperation Agency	TU	Tribhuvan University
JSI	John Snow Incorporated	TUTH	Tribhuvan University Teaching Hospital
KU	Kathmandu University	UNICEF	United Nations Children's Fund
LBW	Low birth weight	UNFPA	United Nations Population Fund
LTHP	Long term health plan	USAID	United States Agency for International Development
MASS	Management support services	VDC	Village development committee
MCH	Maternal and child health	VHW	Village health worker
MCHW	Maternal and child health worker	WB	World Bank
MDGP	Doctor of Medicine General Practice	WHO	World Health Organization

INTRODUCTION

Save the Children/US has launched the Saving Newborn Lives initiative through a grant from the Bill & Melinda Gates Foundation. The overall goal of the initiative is to improve the health and survival of newborns in countries where the magnitude and severity of the need are greatest. In June of 2000 a workshop was held in Virginia (USA) to identify target countries, and Nepal was chosen as one of six.

Nepal is a landlocked country in the foothills of the Himalayas, sharing its northern border with the People's Republic of China and its southern, eastern, and western borders with the Republic of India. It is divided into three distinct geographic regions: the high mountains in the north, the hills in the middle part of the country, and the plains (called the Terai) in the south. The country is approximately 130 kilometers from north to south and 880 kilometers from east to west, with a total land area of 147,181 square kilometers and a population of 23.4 million (according to the 2001 census). Nepal is predominantly rural, with only 10 percent of the population living in urban areas. The majority of the population resides in the Terai (49 percent) and the hills (45 percent) and the remaining (6 percent) in the mountains. Transportation is limited in the mountains and hills because of the steep terrain but is generally more developed in the plains of the Terai.

For developmental purposes, Nepal has been divided into 5 administrative regions—Eastern, Central, Western, mid-Western, and far-Western—14 zones, and 75 districts. The districts are further divided into village development committees (VDCs) and urban municipalities. Combinations of the 3 geographic regions and the 5 administrative regions create a grid of 15 eco-developmental areas with various multiethnic and multilingual variations.

Nepal remained isolated until 1950, when exposure to the outside world demonstrated to its people that their country lagged behind in development and created a sense of urgency, especially in the health sector.

EXECUTIVE SUMMARY

Some Improvements—and Room for More

Ninety percent of the population of Nepal resides in rural areas, 50 percent in the lowland Terai areas and 45 percent in the mid-hills. Poverty, the lack of education, and poorly developed transportation and communication systems impede access to health facilities and medical expertise. While Nepal has made progress in a number of health indicators in recent years, including some with a direct bearing on neonatal health, newborns are still an at-risk and largely neglected population. On the positive side, the age at first marriage in Nepal has slowly risen and perinatal and neonatal mortality have declined by 17 percent and 15 percent respectively; numerous safe motherhood initiatives are being implemented; and family planning efforts have contributed to reducing the rate of both maternal and neonatal mortality.

If Nepal has made advances in an absolute sense, the state of the newborn still compares poorly to that in almost all other developing countries. Nepal's neonatal mortality rate is the third highest in the world, as is its percentage of low birth weight babies, and it has the fourth lowest percentage in the world of births attended by skilled personnel. Neonatal mortality has continued to increase as a percentage of overall infant mortality—and now accounts for more than 60 percent of all deaths in infancy. Any further reduction in infant mortality in Nepal is thus dependent to a great extent on saving more newborn lives, yet by and large national policies and development plans overlook the newborn, addressing their issues—when they address them at all—within the context of safe motherhood programs.

Why Newborns Die

In many ways, the story of newborn health in Nepal is dominated by a single statistic: more than 90 percent of all births take place at home in the absence of a skilled health provider. While there are other important dimensions to this story—most notably the status of maternal health and antenatal care—sooner or later the neonatal health conversation always comes back to this fundamental fact. It is the source of many of the risks to newborn health and survival and is, or at least should be, the starting point for policy discussions and intervention strategies.

While the available data on newborn health is inadequate, it is possible to piece together a general picture by extrapolating from a handful of national and district-level surveys, but even then—and this is symptomatic—there is much more data on maternal health than on newborn health. At 4.1, the fertility rate in Nepal is high. Perinatal mortality has declined in the last 15 years, from 63 to 52 per 1000 total births, and neonatal mortality has declined from 45.2 to 38.6 per 1000 live births.

According to four hospital-based studies, a leading cause of perinatal mortality is intrapartum asphyxia. In these studies, asphyxia contributed to 35 percent of neonatal deaths in one hospital in the capital city and 45 percent in another, and to 45 and 48 percent of deaths among newborns in the two rural districts of Jumla and Lalitpur respectively. More recent studies, however, seem to suggest that the rate of death from asphyxia may be declining, at least in urban areas.

Neonatal tetanus has long been another leading cause of newborn mortality in Nepal. A recent national study (1999/2000) revealed that mothers received the recommended dosage of the tetanus toxoid vaccine in only one third of all births, received only one dose in 13 percent of births, and received no doses at all in more than half of all births. UNICEF and the Ministry of Health are now immunizing women of childbearing age in selected districts with a high risk for neonatal tetanus. They have successfully increased the rate of coverage in these districts and are continuing to expand these efforts.

Other infections (such as those which cause sepsis and pneumonia) are also important causes of neonatal death. A recent hospital study in the Kathmandu valley found that more than half (52 percent) of infection-related deaths among newborns were caused by organisms other than tetanus.

Low birth weight infants are particularly at risk for infections and hypothermia. Twenty-seven percent of babies are born with a birth weight of less than 2.5 kilograms every year, the third highest percentage in the world (behind India and Bangladesh). A Maternal and Infant Research Activities (MIRA) study in four regional hospitals found that the prevalence of low birth weight newborns ranged from 20.4 percent to 34.7 percent. The majority of these babies were born at term, indicating that intrauterine growth restriction was a major cause of low birth weight. The MIRA study found that the top five factors associated with low birth weight were low maternal weight, height, and body mass index (BMI); previous history of a pre-term delivery; and a birth interval of less than two years.

Contributing Factors

Key contributing factors in newborn mortality include the lack of skilled attendance at delivery, poor breastfeeding and other newborn care practices, and staff shortages in rural health facilities. As noted earlier, 90 percent of all births in Nepal occur in the home without skilled help, with the use of a clean delivery kit being reported in only 2 percent of all home deliveries. While women who have health problems during pregnancy are more likely to deliver in a health facility than those with no problems, the majority still deliver at home and are thus vulnerable in case of an obstetric emergency. It should be noted, moreover, that even in those rare cases where the delivery is attended by a skilled caregiver, the well-being of the newborn is often not a priority.

Breastfeeding in Nepal is almost universal, with 98 percent of women reporting breastfeeding some time after birth. But there are problem areas: colostrum is routinely discarded; only 18 percent of newborns are breastfed within an hour of birth; 40 percent of newborns are still not breastfeeding after the first 24 hours; and exclusive breastfeeding is often not continued for the recommended first 6 months of life. In addition, there is disturbing evidence that breastfeeding may actually be less common among women who deliver with the assistance of trained personnel than among those who deliver alone or without skilled help.

Certain other newborn care practices may also contribute to illness and death: newborns are not routinely kept warm, for example; the cord may be cut by an unclean razor blade, a sickle, or a piece of wood; and unhygienic substances such as cow dung or ashes may be applied after the cord is cut.

Another contributing factor to poor neonatal outcomes is the lack of staff in many of the country's health facilities, especially at the level of primary health care centers where there are chronic shortages of doctors and staff nurses. While attempts have been made to increase the number of health facilities in Nepal in recent years, the simple truth is that a facility without staff is a facility that cannot provide health care.

Mother and Child

The survival of newborns is closely linked to maternal health and the care given to mothers during pregnancy, delivery, and the neonatal period. Important indicators of maternal health include the age at first pregnancy and childbirth, the number of pregnancies, the interval between pregnancies, and the nutritional status of the mother. In Nepal, the median age at first marriage is 17, and the median age at first birth is 20. This high rate of adolescent fertility is troublesome, as teenage mothers are more likely to suffer complications during pregnancy and childbirth, with potential risks for the health and survival of both the mother and child. The average number of pregnancies is 4.1 and the average birth interval is 32 months (but only 26 months for adolescent mothers). Short birth intervals (of less than 24 months) are still common in some areas of Nepal and have been associated with increased risk of death for the mother and the newborn.

Maternal nutrition, including micronutrient levels, is another key indicator of a mother's health. The cut-off point for chronic energy malnutrition is a BMI of 18.5. While the mean BMI in Nepal is 19.8, one quarter of all Nepalese women fall below the recommended minimum, indicating widespread malnutrition. The incidence of anemia among pregnant women is a risk factor for iron deficiency in newborns and is widespread in Nepal, with 75 percent of all pregnant mothers suffering from anemia. Malnourished, anemic mothers are at a substantially increased risk of having low birth weight babies.

On the care side of the equation, good antenatal care is an important factor both in maternal health and in a positive neonatal outcome. The Nepal Family Health Survey (NFHS 2001) showed that during the previous five years more than half (55.7 percent) of all pregnant mothers received no antenatal visits and only 9 percent received the recommended four visits, a significant finding given that the probability of a woman's delivering in a health facility increases with the number of antenatal care visits and that tetanus toxoid immunization likewise tracks closely with antenatal care. The most common reasons given for the lack of antenatal care were no perceived need, the related fact that such care was not part of local tradition, and women not knowing the service was available.

As noted earlier, skilled care at delivery is the rule in only 10 percent of all births, and the use of clean delivery kits is extremely rare. Nearly three-quarters of women with post-delivery problems seek assistance, most in a district hospital or a private clinic, but one quarter do not. A routine postpartum check-up (within 24 hours of delivery) was not reported by a majority of Nepali women.

Saving Newborn Lives

Nepal faces a number of challenges to improving the health and survival of its newborns, but they are challenges that are being successfully addressed elsewhere in the developing world and which do not, by and large, require either high-tech or high-cost interventions. With the help of targeted assistance, aimed mainly at the home and the rural community and at the critical link between healthy mothers and their babies, Nepal can expect a brighter future for its newborns. The Saving Newborn Lives initiative (SNL) of Save the Children US, a worldwide effort of the Bill & Melinda Gates Foundation, can make an important contribution to this cause in four key areas.

Essential newborn care in the community. SNL will focus on improving newborn care within the context of existing maternal and reproductive health programs, beginning with programs in the Kailali District of the western Terai and expanding into Siraha in the Eastern Terai. Working with key partners, SNL will prepare training curricula and materials and develop and implement behavior change strategies to improve the quality of newborn care services and increase the demand for antenatal, delivery, and postpartum services at the household and community level. Efforts will target mothers, family members, and community-based health care providers such as traditional birth attendants and village health workers. Special emphasis will be placed on such priority activities as: increasing and testing birth preparedness packages for families (in collaboration with the Center for Development and Population Activities and the Save the Children/Nepal Field Office); supporting newborn parenting programs and maternal tetanus toxoid immunization (with UNICEF, WHO, and the Ministry of Health); and improving the monitoring and evaluation of health interventions. The Ministry of Health has also requested assistance from SNL in developing a national neonatal health strategy. In addition, SNL will advocate for increasing the knowledge of newborn health issues on the part of policymakers, program managers, health professionals, and service providers, and for allocating more financial and human resources at all levels to improve newborn care.

Training. Many of SNL's planned interventions will have to be supported by increased training and skills development for a variety of health providers, including maternal/child health workers, village health workers, and traditional birth attendants, as well as the staff in various health facilities. The SNL initiative will review and update the curricula of training programs, develop new materials, and support or carry out training in the following areas: the essential newborn care package for delivery and postnatal home care, counseling and facilitation skills (to support behavior change and as part of efforts to increase the demand for skilled care at delivery), and developing and field-testing job aids and other materials for service providers.

Behavior Change Communications (BCC). This component of the SNL initiative will emphasize changing the behavior of three key target groups: 1) family members and community health workers; 2) health providers; and 3) national, regional, and local leaders and decision-makers (to encourage their support of newborn care in their policies, programs, and investment strategies). In conformity with SNL’s global strategy, activities in Nepal will be carried out in two main areas: behavior change as part of field interventions and in the context of advocacy for policy change. The following practices will be the primary targets of BCC efforts: essential newborn care (clean delivery, warming, drying, immediate and exclusive breastfeeding), birth preparedness, and postpartum home visits (increasing the demand for such visits within the first three days of life).

Research. Before the health problems of Nepal’s newborns can be addressed, they must first be identified, documented, and publicized. Research, which will be driven by and coordinated with the other activities mentioned above, will focus on three areas: 1) the knowledge, attitudes, and practices of local communities vis-à-vis newborn care, and the social, cultural, and economic factors which influence them; 2) the attitudes and practices of health providers; and 3) the health-seeking behaviors of family members (especially with regard to the role played by traditional healers). Specific research topics will include such issues as family decision-making patterns and community-based management of newborn illness. SNL will support research on developing indicators to measure program achievements and the impact of new policies.

Nepal’s newborns face serious challenges to their survival and well-being, but low-cost, low-tech solutions are within reach. There is no reason the interventions that have worked elsewhere to bring down newborn mortality will not work in Nepal. If the call goes out—if the players in Nepal’s neonatal health drama will but take up the cause—help is at hand.

1 Newborn Health

Introduction

It is difficult to obtain a clear picture of the status of neonatal health in Nepal; for one thing, the great majority of women in Nepal give birth at home, making data collection difficult, and for another, very few of the health facilities in Nepal record or maintain data on neonates as this is not a population they serve directly.

This report has been prepared using information from a variety of sources: national health surveys, district level studies, operational research reports, hospital statistics, articles in the health literature, reports of field trips, and discussion with a number of stakeholders. Because of the lack of proper follow-up on newborns after they are discharged from the hospital, any data on the early neonatal period is necessarily incomplete. Moreover, the data that does exist is not always of the highest quality, nor in most cases, the product of rigorous research. Even so, the information contained in this analysis is believed to be sufficiently adequate to present a general picture of the status of newborns in Nepal and to suggest future directions and priorities for work in this important area.

In the absence of other indicators, neonatal mortality is a useful measure of newborn health in Nepal. A high total fertility rate (4.1 births per woman in the reproductive age group) ensures that a large number of children are born in Nepal every year (858,145 by one estimate). Of every 1,000 newborns, 39 die within the first month of life (NFHS 2001) from such causes as birth asphyxia, sepsis, prematurity, and neonatal tetanus. Though the neonatal mortality rate (NMR) has stabilized somewhat during the past 14 years, ranging from 50 to 39 per thousand live births, the overall infant mortality rate (IMR) has declined during the same period.

Table 1.1: Trend of NMR and IMR

Year	IMR	NMR	Percent of IMR
1987 ⁽¹⁾	113	45.2	40%
1992 ⁽²⁾	107	52.4	49%
1996 ⁽³⁾	79	50.0	63%
2001 ⁽¹⁸⁾	64.2	38.6	60%

The most likely causes of the decline in the IMR are improvements in the management of diarrhea (particularly in the prevention of deaths due to dehydration), improved immunization, vitamin A supplementation, and the improved management of acute respiratory infections, especially pneumonia. The decline in the infant mortality rate has served to highlight the greater contribution of neonatal mortality to total infant mortality, with NMR currently accounting for more than 60 percent of all deaths in infancy. Further reduction in IMR is thus increasingly dependent on saving more newborn lives.

Perinatal Mortality

In point of fact the neonatal mortality statistics from the Nepal Family Health Survey (NFHS 1996) more accurately describe perinatal mortality. This information was collected by asking women about all the pregnancies they have had in their lifetime, and the information on perinatal mortality was obtained from reports from these women on pregnancy losses, pregnancy duration, stillborn children, and live-born children dying within the first week of life. While these events are highly susceptible to misreporting, this approach provides information that is more representative of the general population than hospital-based studies.

According to NFHS 1996⁽³⁾, perinatal mortality in Nepal has declined by 17 percent over the last 15 years. The rate went from 63/1000 total births (stillbirths and live births) 10-14 years before the survey to 52/1000 in the period 0-4 years before the survey. Factors which correlated with a higher incidence of perinatal mortality were first birth or sixth birth or higher and residence in rural areas and in the Terai, eastern, and mid-western regions of Nepal. Surprisingly, the educational level of the mother did not account for significant differences in the rates of perinatal mortality.

Table 1.2: Perinatal mortality rates by background characteristics of the mother, 1986-1995⁽³⁾

Background characteristics of mothers	Perinatal mortality/1000 total births
Age group:	
<20 years	60.9
20-29 years	56.2
30-39 years	51.5
40-49 years	76.5
No. of pregnancies at event:	
1	70.7
2-3	47.4
4-5	49.7
6 and above	68.1
Residence:	
Urban	47.1
Rural	57.6
Previous pregnancy interval:	
<2 years	77.2
2-3 years	52.6
4 years and more	31.3
Total:	56.9

Causes of perinatal mortality

A survey (Geetha, et. al.)⁽⁴⁾ was carried out in four sites, two Kathmandu hospitals and two rural districts, to establish urban and rural perinatal mortality rates (PNMR) and to determine the causes of perinatal mortality for these four centers. The sites chosen for the community-based studies were the Lalitpur district in the Kathmandu valley and Jumla in the remote northwest of Nepal. All perinatal deaths over a one-year period in the four sites were counted (during which time there was a total of 14,967 births). The cause of death was established either by a review of hospital case records or, in the rural areas, by a structured questionnaire (verbal autopsy). The PNMR in the two hospitals was 48.0 and 23.7 per 1,000 total births, while that in the rural settings was 96.2 and 42.5 per 1,000 births. Birth asphyxia, low birth weight, and infection were the most common causes, but many of the deaths were unexplained. These high mortality rates were felt to reflect the difficult circumstances of childbirth in Nepal.

In another study, the perinatal mortality rates and prevalence of LBW for the year 2000-01 in the three leading hospitals in Kathmandu valley were as follows:⁽⁵⁾

Table 1.3: Perinatal mortality rates and prevalence of LBW in the three leading hospitals in the Kathmandu Valley, 2000-01

Hospital	Total live births	Stillbirths	Early neonatal deaths	Low birth weight	Perinatal mortality rate/1000
Maternity Hospital	15,980	359	207	28%	35.4
Patan Hospital	5,790	79	44	17.3%	21.2
TU Teaching Hospital	2,695	34	31	14.2%	24.4

Neonatal Mortality

The Nepal Nutrition Intervention Project, Sarlahi (NNIPS) II study⁽⁶⁾ provides the most accurate population-based data on neonatal mortality for Nepal. NNIPS II enrolled 43,559 women in a study to measure the impact of vitamin A or β -carotene supplementation on infant health, including neonatal health. A total of 15,832 pregnant women were monitored during their pregnancy and for six months after delivery. From these pregnancies, there were 15,868 live births, 1,478 miscarriages or stillbirths, 27 maternal-fetal deaths, and 119 sets of live born twins—resulting in a total of 15,987 live-born infants eligible to be monitored from birth through 24 weeks. Of these 15,987 live-born infants, 15,115 were followed through their first 28 days, during which time there were 50 neonatal deaths for every 1,000 births.

Causes of neonatal deaths

The most common causes of neonatal illness and early neonatal deaths (within the first seven days of life) are shown below in statistics from three hospitals in the Kathmandu valley.⁽⁷⁾

Table 1.4: Patterns of neonatal illness in the three leading hospitals in Kathmandu, 2000-2001

Maternity Hospital	Patan Hospital	TU Teaching Hospital
<ul style="list-style-type: none"> a. Birth asphyxia: 31% b. Extreme prematurity: 15% c. Respiratory distress syndrome: 12% d. Congenital anomalies: 11% e. Septicemia: 11% f. Meconium aspiration: 6% g. Others: 14% <p>There were 207 neonatal deaths, of which 155 were in neonates with LBW (or 75%).</p>	<ul style="list-style-type: none"> a. Respiratory distress syndrome: 32% b. Pneumonia: 16% c. Sepsis: 11% d. Congenital anomalies: 11% e. Birth asphyxia: 7% f. Meconium aspiration: 5% g. Prematurity: 5% h. Necrotizing enterocolitis, severe hypothermia, shock, hemolytic anemia, intracranial bleeding and unknown cause: 2% each. <p>There were 44 early neonatal deaths, of which 29 were in neonates with LBW (or 66%).</p>	<ul style="list-style-type: none"> a. Sepsis: 52% b. Respiratory distress syndrome: 23% c. Congenital anomalies: 23% d. Necrotising enterocolitis: 16% e. Birth asphyxia: 13% f. Extreme prematurity: 3% g. Others: hemolytic anemia: 3% <p>There were 31 neonatal deaths, of which 26 were in neonates with LBW (or 84%).</p> <p>In some of the neonates, more than one cause of death was assigned.</p>

Causes of neonatal morbidity

There are no population-based studies available in Nepal (which might list the causes of neonatal morbidity). The statistics which follow are from hospital-based studies.

Maternity Hospital. An analysis of 1,063 consecutive admissions to the special care baby unit (SCBU) of the maternity hospital in Kathmandu in 1996⁽⁸⁾ revealed that the main causes of admission were low and very low birth weight, birth asphyxia, neonatal jaundice, feeding problems, congenital anomalies, and hypothermia. Of the 1,063 cases admitted to SCBU, 50 percent were low birth weight, of which 6 percent weighed less than 1,500 grams. Of the LBW babies, 32 percent were of a gestational age of less than 37 weeks.

A more recent analysis of admissions to the same SCBU (for the year 2000-01) showed a similar trend: out of 2,898 admissions, 38 percent of neonates were low birth weight, and birth asphyxia was once again one of the leading causes of admission. Other causes for admission were: meconium aspiration, respiratory distress syndrome, preterm/LBW, maternal problems (admitted for routine care), jaundice, congenital anomalies, cyanosis, rhesus negative mothers, and fever.

The disease patterns of the admitted neonates were as follows: birth asphyxia, meconium aspiration, neonatal jaundice, congenital anomalies, respiratory distress syndrome, sepsis, hypothermia, hypoglycemia, intra-ventricular or pulmonary hemorrhage, and trauma.

Tribhuvan University Teaching Hospital.⁽⁷⁾ Of the total 2,695 births at TUTH for the year 2000-2001, there were 750 admissions into the special care nursery. The disease patterns of the sick neonates were as follows: neonatal sepsis (39.2 percent), neonatal jaundice (29.3 percent), pneumonia (17 percent), birth asphyxia (4.4 percent), prematurity (4 percent), meningitis (2.1 percent), and others (1.2 percent). This was a particularly bad year for infections at TUTH due to an outbreak of sepsis in the nursery.

Determinants of neonatal mortality

Low birth weight. The data available from the Kathmandu valley hospitals show a disproportionately high number of neonatal deaths among low birth weight babies. The data from Patan Hospital⁽⁷⁾ for the year 2000-01, for example, reveal an early neonatal mortality rate for infants weighing 1,000 grams or less of 416/1,000, which gradually decreases to 254.5/1,000 for infants in the weight category of 1,001-1,500 grams, a rate of 50/1,000 for infants between 1,501-2,000 grams, and only 4/1,000 for infants between 2,001-2,500 grams. The early neonatal death rate among infants weighing 2,500 grams and above is only 2.16/1,000, which compares very favorably with rates from developed countries.

Tribhuvan University Teaching Hospital statistics⁽⁷⁾ for the same year (2000-01) revealed that of the 31 early neonatal deaths, 26 (83 percent) occurred among infants born with a weight of less than 2.5 kg. Of the 31 neonates dying within one week of birth, 23 (74 percent) were born preterm (before completing 37 weeks of gestation). The data from Maternity Hospital⁽⁸⁾ reported in 1997 also showed a similar pattern: of the neonatal deaths, more than 75 percent occurred among infants with a birth weight less than 2,500 grams.

Mother and Infant Research Activities (MIRA) conducted a study⁽⁹⁾ in 1998 to assess the prevalence of and factors associated with low birth weight in various regions of Nepal. The study was conducted in four hospitals in Nepal, one each in the eastern (Biratnagar), central (Kathmandu), western (Pokhara), and mid-western (Nepalgunj) parts of the country. The study found that the prevalence of LBW ranged from 20.4 percent at the Maternity Hospital in Kathmandu to 34.7 percent at Koshi Zonal Hospital in Biratnagar, with a weighted mean of 27.2 percent for all four sites. The prevalence at Western Regional Hospital, Pokhara, and Bheri Zonal Hospital, Nepalgunj was 22.3 percent and 26.0 percent respectively.

The majority of LBW infants were born at term, indicating that intrauterine growth retardation makes a major contribution. The ratio of preterm to term LBW ranged from 18:82 at the Maternity Hospital, Kathmandu to 39:61 at the Koshi Zonal Hospital in Biratnagar, with a weighted mean of 31:69 for all four sites.

A bivariate analysis to identify the factors associated with the LBW babies revealed the top five to be: low maternal weight, height and BMI, birth of a previous preterm infant, and a birth interval of less than two years. In addition, primiparity, adolescent motherhood, maternal illiteracy, rural residence, and minimal antenatal care were also implicated. In multivariate analysis, the effects of factors such as adolescent pregnancy and maternal illiteracy were substantially reduced. Overall, the strongest effects of LBW were seen from maternal weight, previous preterm delivery, short birth interval, and paternal employment in agriculture.

Birth asphyxia and birth injuries. Statistics from many developing countries stress the role of birth asphyxia in neonatal death. In one study in Pakistan, Bhutta⁽¹⁰⁾ reported birth asphyxia as the cause of neonatal death in 75 percent of the cases. From Nepal, Manandhar has reported birth asphyxia as the most important cause of death among neonates admitted to the special care baby unit at Maternity Hospital,⁽⁸⁾ and in their paper Geetha et. al.⁽⁴⁾ identified intrapartum asphyxia as the most important cause of neonatal death. In Patan Hospital, for example, it contributed to 35 percent of such deaths, and 45 percent in Maternity Hospital. And the figures were higher in rural settings—45 percent in Jumla and 48 percent in Lalitpur—though the number of deliveries in these areas was much smaller. In yet another hospital-based study, Ellis M. et. al.⁽¹¹⁾ suggested that 24 percent of all perinatal deaths occurring before discharge were due to birth asphyxia.

More recent data, however, from TUTH and Patan Hospital (personal communication) show a gradual decline in the role of birth asphyxia in early neonatal death and PMR over the last five years. For the year 95-96, birth asphyxia accounted for 21 percent of the early neonatal deaths at Patan Hospital; whereas it accounted for only 6.8 percent for the year 2000-2001. Data from TUTH for the year 2000-01 were almost the same; birth asphyxia was a factor in 6.15 percent of perinatal deaths and 12.9 percent of early neonatal deaths. These percentages appear to suggest an improvement in the obstetric care available in these hospitals.

Little data is available on the role played by birth injuries in the neonatal period, except for occasional mention in hospital statistics of intra-ventricular or pulmonary hemorrhage as a cause of death or of admission into the special care baby unit.

Infections and neonatal deaths. Among infectious illnesses, neonatal tetanus used to be a leading cause of neonatal deaths, but other infections are gradually becoming more prominent in the main hospitals in the Kathmandu valley. According to TUTH statistics for the year 2000-01, 56 percent of admissions into the neonatal ward were due to other neonatal infections, and these infections accounted for 52 percent of deaths in the first seven days of life. The data from Patan Hospital revealed a similar trend; for the year 2000-01, 27.3 percent of early neonatal deaths were caused by neonatal sepsis. In 1997, Maternity Hospital reported neonatal sepsis, including meningitis and pneumonia, as the cause of 13 percent of neonatal deaths.⁽⁷⁾

The data would seem to suggest that with a gradual decline in deaths due to birth asphyxia, there is a steady increase in deaths due to infections. A high prevalence of LBW and unhygienic interventions during delivery are the high risk factors associated with sepsis in the newborn. There is no community-based data to round out this picture.

Neonatal tetanus.⁽¹²⁾ According to WHO estimates, tetanus kills about 450,000 infants and 40,000 women worldwide each year. While the exact number of newborns dying of neonatal tetanus in Nepal is not known, the percent of women who receive tetanus toxoid and/or have access to safe delivery practices—two key risk factors in neonatal tetanus—is very low. In 1999/2000, only 40 percent of pregnant women were immunized with two doses of tetanus toxoid and only 25 percent of women had access to a safe delivery.

Hypothermia. Although hypothermia has not been identified as a primary or direct cause of neonatal death by any of the hospital or community-based studies, it has been shown to be an important cause of sickness in newborns in Maternity Hospital. Ellis M. et. al.⁽¹³⁾ studied the pattern of post-delivery hypothermia and cold stress among the normal neonatal population in Maternity Hospital (which has 15,000 deliveries annually). During the study, continuous ambulatory temperature monitoring was carried out on a series of 35 healthy term neonates kept in the general ward with their mothers. The study found that the ambient temperatures

were generally lower than the recommended level of 25 degrees Celsius, particularly in the winter months. During the winter months, most infants were moderately hypothermic by WHO criteria for much of the first eight hours of life. Postnatal hypothermia was prolonged, with axillary core temperatures only reaching 36 degrees C after a mean of 6.4 hours had elapsed. In another study, Johanson et. al. ¹⁴⁾ found that in the cold season 49 percent of babies were still moderately hypothermic 24 hours after birth. We do not know if this finding would be the same in the community.

Congenital anomalies.⁽⁷⁾ Congenital anomalies account for a number of neonatal admissions and deaths in Maternity and Patan Hospital, according to the statistics for 2000-2001, though it is difficult to be precise because of the lack of proper records. According to TUTH neonatal ward records for the year 2000-2001, 42 congenital anomalies were seen out of 2,935 births. The most common anomalies were neural tube defects (anencephaly in 3 and meningomyelocele in 4), cleft lip and palate, club foot, hypospadias, and Downs syndrome. The fact that neural tube defects accounted for about 15 percent of the congenital malformations may indicate the need for more active promotion of the use of folic acid in the periconceptional period.

Breastfeeding. According to the Nepal Family Health Survey of 1996⁽³⁾, breastfeeding is nearly universal in Nepal, with 98 percent of children breastfed some time after birth; only 18 percent are breastfed within an hour of birth, however, and 3 out of 5 babies are breastfed within 24 hours of life. Although exclusive breastfeeding is recommended for the first 5 months of life, 10 percent of babies less than 2 months old are already on food other than breast milk, and only 60 percent of children in the 4-5 month age range are on breast milk exclusively.

The survey reported a disturbing trend with regards to breastfeeding: there appears to be very little difference in the incidence of breastfeeding whether a delivery is assisted by medically trained personnel, by a traditional birth assistant, or by no one. While the overall percentage of infants started on breastfeeding within 24 hours was low, around 60 percent, it was one-third lower—about 40 percent—when a traditional birth attendant (TBA) conducted the delivery. In a related finding, the percentage of breastfeeding is higher among infants delivered at home than among those delivered in health facilities.

The majority of the mothers in Nepal have been breastfeeding their infants, but there are a number of problem areas, such as late initiation, discarding the colostrum, lack of exclusive breastfeeding, and too-early or too-late introduction of weaning food. In order to promote and protect breastfeeding, a national committee was formed in 1992 under the chairmanship of the Secretary of the Ministry of Health. Two of the principal activities of the committee were to support the training of health professionals in proper breastfeeding and to identify "baby friendly" hospitals, those where ten steps to promote breastfeeding have been put into practice. Seven hospitals have achieved baby-friendly status to date, and there are programs in place to make all hospitals in the country baby-friendly in the near future. Every year activities to promote breastfeeding are carried out around the country during the first week of August.

Traditional and cultural beliefs and practices affecting the health of newborns

All communities have their own health-seeking practices and behaviors consistent with their concepts of health, which are in turn based on the traditional values and beliefs of their culture. Many of these cultural practices, which vary from region to region and from one ethnolinguistic group to another—and sometimes even within the same ethnolinguistic group—inevitably affect maternal and newborn care.

This section on traditional practices is taken from the work of Mary Manandhar⁽¹⁵⁾, Munu Thapa⁽¹⁶⁾, Tariq Ihsan⁽¹⁷⁾, Hari Badan Pradhan⁽¹⁸⁾, N. S. Upreti⁽¹⁹⁾, David Marsh, and Bharat Pant⁽²⁰⁾. It also includes information from the field visits of the consultants and from personal communication with other community practitioners. The findings are presented in summary form to present a composite picture of traditional practices in Nepal.

Dietary practices. Nepali families have learned to live with what they have. The bulk of the Nepali diet consists primarily of one of the cereals (rice or maize or any other grain), supplemented by limited quantities of seasonal fruits and vegetables. The practice of restricting and prescribing certain food items during pregnancy and the postpartum period is common, based on the view that restricting food during pregnancy helps the mother avoid a difficult delivery caused by a large baby. Following delivery, women are given the local version of what is considered nourishing food three to four times a day (including snacks) for up to six months because of the belief that new mothers are always hungry. This belief in the need for additional food is reflected in the cultural tradition whereby the parents of the mother, along with relatives and neighbors, always send food to a new mother. Needless to say, food scarcity plays a key role in dietary practices in Nepal.

Hygienic practices, ritual pollution, and ritual segregation. Birthing is considered a ritual pollution process and often takes place in an animal shed, which is prepared for the delivery by having the floor plastered with a paste made of cow dung and locally available soil. The surface used for delivery is either not covered or only scantily covered with straw, an old bed sheet, old sacks, or a polyvinyl sheet. Traditional faith healers, when called to attend a difficult birth, do not go closer to the mother than the doorway of the shed. Women are considered semi-untouchable when they are giving birth and must stay in a place apart from the rest of the family for 11-28 days after the baby is born.

Birthing practices. Traditional birthing practices include massaging the laboring woman, chanting mantras, performing rituals, and giving the mother special food and drink (which varies depending on the region).

Warming and bathing practices. Keeping newborns warm is not the traditional practice. The tradition in Nepal, rather, is to find clothes after the baby is born, with the result that most families do not usually have warm, comfortable clothes ready at the time of delivery. Accordingly, the newborn is kept naked or covered by a thin piece of cloth until the placenta is delivered and the umbilical cord cut off. Following this, newborns are clothed in old and unstitched clothes until the sixth day of life, after which time babies are usually wrapped in soft clothes. Bathing the newborn is a common practice, though there is a definite time lapse between birth and bathing. In the colder hill regions, the newborn is bathed in lukewarm water, while cold well water is used in the warmer southern plain. Thorough drying of the baby before wrapping is not practiced. The nursing room is usually kept warm by burning wood, cow dung cake, or charcoal and is usually not well ventilated.

Placenta and cord care practices. Once the baby is born, the placenta is allowed to come out on its own. If it does not come out by itself, abdominal massage is given. These practices are based on the widespread belief that the placenta is linked to the baby even after separation and that the manner in which the placenta is disposed of affects the life of the newborn.

Some people still believe that all life from the placenta must be transferred to the newborn, or the baby may die. Therefore, the cord is usually cut only after cord pulsation stops upon the delivery of the placenta. In some areas, the cord is milked, especially if the baby is not breathing, in order to bring the baby's soul back from the mother. The cord is cut anywhere from minutes to hours after delivery, with a variety of instruments being reported, including a new or used razor blade, a sickle, or even a piece of wood.

After the cord is cut, mustard oil, ash, turmeric, or spider web are applied. The most common reason given for applying these substances to the cord are to prevent bleeding from the stump and to prevent early separation of the stump. Thapa's report mentions that the Tamang people in Dhading keep the umbilical stump open, whereas others tie it with a thread. There is a custom of using homemade cord ties of raw cotton in accordance with the saying, "A new thread for the new baby." The use of unclean clothes for wrapping the newborn and covering the cord is also reported.

Resuscitation. Crying is widely regarded as the indicator of respiration. Newborns who fail to cry are encouraged by sprinkling water on the body, pouring water on the face, and fanning the face. Other techniques to make the newborn cry are making a noise, milking the umbilical cord, massaging the soles of the newborn, and holding the newborn upside down and patting its back. To date, clearing the airway has not been reported as a traditional practice in Nepal.

Prelacteal feeds and early breastfeeding. The general impression is that the colostrum is discarded and mothers start regular breastfeeding only after three days. During this three-day interval, other lactating women breastfeed the newborn, or the baby is given goat's milk. Honey, sugar or ghee are common first foods for newborns.

Oil massaging and sunbathing. The practices of mustard oil massage and sunbathing for the mother and baby are prevalent. Oil massaging is done on the whole body two to three times a day for one month, either outside under the heat of the sun or inside near a fire. In the case of newborn massage, the baby's arms and legs are passively exercised and hot compression is used on the extremities, actions which are believed to prevent air from getting in, to protect the newborn from getting a chill, and to provide sensory stimulus to help normal growth and development. Extra oil is poured over the anterior fontanel and into all the orifices (ears, nose, eyes, naval, vagina etc).

Care providers. Typically, family members do not take the newborn child to a doctor for at least eleven days. If the newborn baby develops complications, family members typically seek help outside the home, usually by contacting traditional healers, FCHVs or TBAs, who advise mothers about breastfeeding and the importance of feeding colostrum. Some families also use home remedies, particularly for respiratory symptoms. (One mother mentioned using the herb "rudilo" for a child with difficulty in breathing.)

Recognition of danger signs in newborns. Difficulty in breathing, fever, infected umbilical cord, and the inability to suck breast milk were the danger signs most commonly mentioned by participants in the participatory rapid appraisal conducted by Ihsan in Nuwakot. Some participants also mentioned jaundice and infected wounds, and others mentioned skin rash, bleeding from the cord, dry lips and mouth, grunting, hypothermia, cough and cold, bluish discoloration, low birth weight, and birth defects.

Some beliefs. Some families consider excessive crying or the refusing of food to be normal. In some households, there is a belief that the baby is searching for its "friend" in the womb (the placenta), and this is the cause of excessive crying. Some families believe that the color of a newborn's skin changes seven times in a day, a factor that may explain delays in seeking treatment for jaundice and cyanosis.

Neonatal Services

Most at-home deliveries take place without any professional assistance, with 55 percent attended by relatives and friends (NFHS 2001).⁽³⁾ Older women, women living in rural areas, and illiterate women are more likely to deliver without any professional assistance. The use of a clean delivery kit was reported in only 2 percent of the deliveries conducted at home. Thus, the majority of newborns do not have access to any neonatal care other than what immediate family members can provide. The use of newborn services seems to be a function of the availability of such services, the place of residence, and the educational level of the mothers.

The nearest health worker to most newborns is a traditional birth attendant, a maternal and child health worker,⁽¹⁷⁾ and an auxiliary health worker. The nearest health facility is the sub health post or health post. In some cases, a hospital with neonatal services may be available, but the majority of newborns do not receive care at health facilities with trained manpower, equipment, and services. And even where such health facilities exist, the quality of care is often less than adequate.

Kanti Children's Hospital is the only central hospital with level III neonatal care facilities (with ventilators). Other hospitals in Kathmandu valley with level II care are TUTH, Patan Hospital, and Maternity Hospital. The newly opened private medical colleges are in the process of starting level II neonatal services. Outside

the Kathmandu valley, the medical college in Pokhara has started to provide some neonatal intensive care services, and the B. P. Koirala Institute of Health Services in Dharan provides intensive neonatal care approaching level III. The Nepalgunj and Biratnagar hospitals have level II neonatal services. The contribution of these tertiary care hospitals to reducing neonatal mortality must be considered indirect at best. Most of these centers lack adequately trained manpower, for example, and their equipment is often not working. Even in those cases where intensive care facilities are available, all the hospitals have a policy of charging for intensive care, and the cost is usually beyond the means of the average villager. These places *can* serve as neonatal care demonstration and training institutions, however, to prepare doctors, nurses, and paramedical staff for future employment at district hospitals or in primary health care centers.

Summary and Conclusion

A significant proportion of births in Nepal result in death within the first month of life. The direct causes of these deaths are birth asphyxia, infections, prematurity, low birth weight, hypothermia, and congenital anomalies. Contributing factors include inadequate or nonexistent medical facilities for antenatal and natal services and inappropriate newborn care practices in the family and in the community. Other contributing factors include the nutritional status of mothers and the educational and general status of women in the family.

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2 Maternal Health

The provision of care for women during pregnancy and childbirth is essential to ensure a healthy and successful outcome of pregnancy for the mother and her newborn infant. In Nepal, women generally do not have access to basic health care services during pregnancy and childbirth, with predictable results for mother and child. This chapter will examine the relationship between pregnancy and delivery and the health and well being of newborns.

Pregnancy, Birth, and Fertility

Out of a population of 23 million, 22 percent are women of reproductive age.⁽³⁾ During the Nepal Family Health Survey of 1996, about 7 percent of women reported themselves as pregnant. The total fertility rate (TFR) for women age 15-49 was 4.6 in 1996⁽⁴⁾ and 4.1 in 2001.⁽⁵⁾ TFR is a summary measure of fertility and refers to the number of children a woman would have in her lifetime if she were to experience prevailing age-specific fertility rates. In 1998 the Ministry of Population and Environment projected the crude birth rate—the total number of births in a given year per 1,000 people—at 34.1;⁽³⁾ in 2001 the rate was 33.5.⁽⁵⁾

Marriage, Childbearing, and Adolescent Fertility

Marriage is almost universal in Nepal. In 1996, 79 percent of women of reproductive age were married, according to the NFHS. The median age at first marriage has risen slowly over the last 25 years⁽⁴⁾ to the current figure of 17.1 years, which is one year less than the legally sanctioned age of marriage for a female without consent.⁽⁴⁾ Despite the increased age at marriage, childbearing begins early for Nepalese women, many of whom are undernourished as teenagers only to become married and pregnant before they complete their growth.

Early childbearing adversely affects the health of both mothers and newborns. One out of four women in Nepal age 15-19 is already a mother or pregnant with her first child, with teenage childbearing more common among rural women (24 percent) than urban women (20 percent).⁽⁴⁾ While NFHS data shows the median age for the first birth at around 20 years, 50 percent of all women have their first birth before the age 20.

Adolescent fertility, the proportion of women who become pregnant and give birth before age 20, is a major public health concern, since adolescent mothers are more likely to suffer from severe complications during pregnancy and childbirth, complications that can be detrimental to the health and survival of both mother and newborn. As noted above, the practice of early marriage—almost 44 percent of women age 15-19 are already married—is the major factor accounting for adolescent childbearing.⁽⁴⁾

Birth Intervals

Short birth intervals, defined as a succeeding birth less than 24 months after the preceding birth, are common in Nepal and have been associated with an increased risk of death for mother and newborn. Data from the NFHS 1996 shows that children born to adolescent mothers and those born with short birth intervals suffer higher rates of illness and death. The median birth interval in Nepal is 32 months and increases with the age of mother; it is 26 months for mothers age 15-19 and 41 months for mothers 40 and older.⁽⁴⁾

Maternal Nutrition

The basic indicators used to measure maternal nutrition in this report are the height and weight of women and the body mass index (BMI), a measure that combines height and weight data. Maternal height is associated with nutrition during childhood and adolescence. The NFHS 1996 reported 150 centimeters as the mean height of mothers, which is also the recommended cut-off point for classifying women as being at nutritional risk. Fifteen percent of Nepalese mothers are shorter than 145 centimeters. Along with maternal height, low pregnancy weight is also associated with an adverse pregnancy outcome. The BMI, a person's weight in kilograms divided by the square of their height in meters, provides a reliable measure of thinness. The mean BMI for women in Nepal is 19.8. One out of every four Nepalese women fall below the recommended cut-off point (of 18.5) for measuring chronic energy malnutrition among nonpregnant women in Nepal.

Micronutrients

Anemia is a severe public health problem in Nepal and in pregnant women is likely to result in a newborn with iron depletion.⁽⁵⁾ More than two-thirds (67 percent) of nonpregnant and 75 percent of pregnant women are anemic in Nepal,⁽⁶⁾ suggesting that women who enter pregnancy with poor iron stores become more anemic due to demands for iron posed by pregnancy. Eighteen percent of Nepalese mothers suffer from night blindness during pregnancy, a condition caused by a deficiency of vitamin A. The presence of night blindness in even one child in a community usually means that many more children and their mothers suffer from nonclinical vitamin A deficiency. Another nutritional problem, iodine deficiency, is also present in Nepal (and is addressed by iodized salt supplementation).

Tetanus Toxoid Immunization

Tetanus toxoid injections are given during pregnancy to prevent maternal and neonatal tetanus. Pregnant women should receive two doses of the toxoid. Table 2.1 shows information on tetanus toxoid coverage during pregnancy for all births in the three years preceding the survey. In more than half of all births (54 percent), mothers did not receive a single dose of tetanus toxoid; in an additional 13 percent of births, they received only one; and in one out of three births (33 percent), mothers received the recommended dosage of two or more.

Table 2.1: Percent of live births by number of tetanus toxoid injections received during pregnancy, 1993-1996⁽⁴⁾

Development region	Number of tetanus toxoid injections				Total
	None	One dose	Two doses or more	Don't know/missing	
Eastern	50.3	15.5	34.0	0.2	100.0
Central	45.0	14.6	40.0	0.4	100.0
Western	52.0	14.9	32.6	0.4	100.0
Mid-western	63.8	9.6	26.3	0.2	100.0
Far-western	76.0	8.1	15.7	0.1	100.0
Total	53.6	13.4	32.6	0.3	100.0

Abortion

In Nepal the intentional act of aborting under any circumstances is illegal and punishable except in cases prescribed by a medical board for saving the life of the mother. Consenting to, helping, or conducting an abortion are all unlawful and punishable. In spite of these restrictions and the availability of contraceptives, abortion is practiced widely—but not wisely. Abortions are either self-induced or conducted by unskilled

practitioners. While data on abortion is not available, studies in six major hospitals have shown that between 20 percent and 60 percent of all obstetric and gynecological admissions are abortion complication cases. (CREPHA 1998 and 1999)

Maternal Mortality

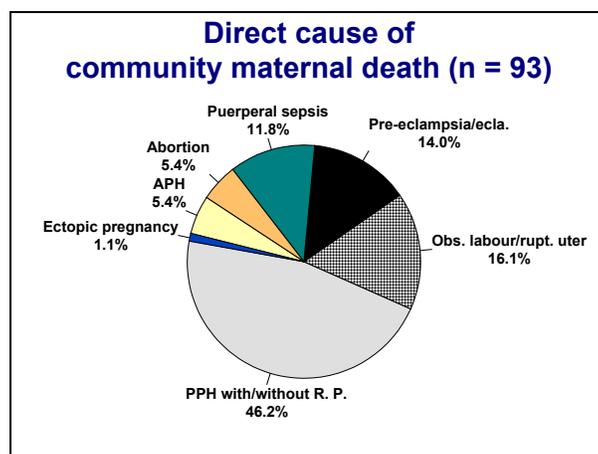
One of the most important indicators of maternal health is maternal mortality. Maternal deaths are defined as any death that occurs during pregnancy, childbirth, or within two months after the birth or termination of pregnancy. The leading causes of maternal mortality worldwide are postpartum hemorrhage, eclampsia, infections, obstructed labor, and complications of abortions. Deaths from these conditions can be prevented with adequate and appropriate health services during pregnancy, labor, delivery, and the postpartum period.

Maternal mortality in Nepal is high. As different estimates of MMR have come up with different figures, no single figure is acceptable to all stakeholders. The commonly accepted maternal mortality ratio is 539 deaths per 100,000 live births.⁽⁴⁾ The maternal mortality and morbidity study (MMMS) of 1998 helped establish the causes of maternal deaths at the community and hospital level. Out of the 132 deaths studied at the community level, there were 93 direct deaths, 23 indirect deaths, and 7 fortuitous deaths (with 9 deaths from unknown causes). Table 2.2 shows the direct causes of maternal deaths, which represented 70 percent (93/132) of the total number.

Table 2.2: Direct causes of maternal death (N=93)⁽⁷⁾

Cause of death	Number	Percent
PPH without retained placenta	22	23.7
PPH with retained placenta	21	22.6
Obstructed labor/ruptured uterus	15	16.1
Pre-eclampsia/eclampsia	13	14.0
Puerperal sepsis	11	11.8
Abortion	5	5.4
Antepartum hemorrhage	5	5.4
Ectopic pregnancy	1	1.1
Total	93	100.0%

Figure 2.1: Direct cause of community maternal death (N=93)



The MMMS reports that 90 percent of maternal deaths occurred in rural settings and almost two out of three (62 percent) took place after delivery. About one-fourth of mothers dying from postpartum hemorrhage died within 2 hours of delivery, and 30 percent died within 6 hours.

The same study also reported on hospital deaths. The leading cause of the 31 hospital deaths was eclampsia (10 cases), followed by prolonged/obstructed labor (4 cases) and postpartum hemorrhage (4 cases).

Antenatal Care

The National Maternity Care Guidelines (NMCG) recommend a minimum of four antenatal visits for each pregnancy, encouraging women to seek antenatal care from a skilled health service provider as soon as the pregnancy is anticipated. The timing of the subsequent antenatal visits depends on a woman's need and the clinical judgment of the health service provider within the broader framework outlined in the NMCG.⁽⁸⁾

Table 2.3 shows the percent of births over the five years preceding the survey by source of antenatal care: 17 percent of mothers received antenatal care from a doctor, 11 percent from a nurse or a auxiliary nurse midwife (ANM), 11 percent from a health assistant or auxiliary health worker (AHW), 6 percent from a village health worker (VHW), and 3 percent from a maternal and child health worker (MCHW). About half of mothers did not receive antenatal care from anyone at all.

Table 2.3: Antenatal care⁽⁵⁾

Percent distribution of women (who had a live birth in the five years preceding the survey) by type of antenatal care provider during pregnancy for the most recent birth, according to background characteristics, NFHS 2001.							
Characteristic	Doctor	Nurse/ANM	Health assistant/AHW	MCHW	VHW	TBA/otherⁱ	No one
Age at birth							
<20	22.1	13.5	13.4	4.5	6.3	0.4	39.8
20 – 34	17.0	11.8	10.9	3.1	6.6	0.6	49.9
35 - 49	6.3	5.4	8.5	2.5	4.7	0.6	72.0
Residence							
Urban	54.5	20.2	4.3	0.8	1.1	1.3	17.6
Rural	13.8	10.6	11.5	3.5	6.7	0.5	53.4
Total	16.6	11.3	11.0	3.3	6.3	0.5	50.9
Note: If more than one source of ANC was mentioned, only the provider with the highest qualifications is considered in this tabulation. ANM = auxiliary nurse midwife AHW = auxiliary health worker MCHW = maternal and child health worker VHW = village health worker TBA= traditional birth attendant ⁱ Includes women who do not know the type of provider.							

The frequency and timing of visits, as well as the quality of care, determine the effectiveness of antenatal care in avoiding adverse pregnancy outcomes. Information about the number and timing of antenatal visits made by pregnant women is presented in table 2.4. The median number of such visits among women who receive antenatal care is three. Among women who received care, the median duration of pregnancy at the time of the first visit was five months.

Table 2.4: Number of antenatal visits and stage of pregnancy⁽⁴⁾

Percent distribution of live births in the three years preceding the survey by number of antenatal care visits, and by the stage of pregnancy at the time of the first visit, NFHS 1996	
Number of visits	Percent
None	55.7
1	10.7
2	10.5
3	11.6
4+	8.8
Don't know/missing	2.8
Total	100.0
Median	3.0
Stage of pregnancy (# of months pregnant at time of first visit)	
<6 months	24.9
6-7 months	12.5
8+ months	4.0
Don't know/missing	3.0
Total	100.0
Median	5.4

Three quarters (76 percent) of Nepalese women giving birth within the last five years received no formal antenatal care visit, while 10 percent of women received the recommended four visits. Among those who had at least one visit, only 43 percent received their first antenatal visit within the first three months of pregnancy (compared to the 100 percent recommended by NMCG).⁽⁸⁾

The most common reasons for the absence of antenatal care visits are not perceiving a need for routine antenatal care and the fact that women are unaware of the service. Table 2.5 shows the reasons given by women in households for not having formal antenatal care visits.

Table 2.5: Reasons given by women who did not have any antenatal care visits during their last pregnancy⁽⁹⁾

Reason	Number of women	% women
No need perceived	4485	34
Not part of local tradition	4184	31
Not aware of service	3107	23
Too far to health facility	1642	11
No money to pay for visits	648	5
No time to go for visits	301	2
Poor quality service	157	1
Family doesn't allow the visit	136	1
Don't know\missing	300	2
Total	14780	More than 100

Note: Up to three reasons were allowed for each respondent.

Table 2.6 presents the sources of antenatal care. The majority of women (57 percent) who had any antenatal care visits went to a district hospital, 19 percent went to a health post, and 13 percent went to private clinics.

Table 2.6: Source of antenatal care among women reporting at least one visit and who could report the source⁽⁹⁾

Source of antenatal care	No. Women	% women
District hospital	2286	57%
Health post	775	19%
Private clinic	517	13%
Sub health post	185	5%
Primary health care center	114	3%
Own home	61	2%
Nursing home	52	1%
FPA clinic	50	1%

The NMCG and Reproductive Health Clinical Protocol determine the national medical standards for antenatal care services. In NMIS 1997, the quality of antenatal care was analyzed by interviewing service providers, examining TT immunization status, assessing iron/folates distribution, and asking about the content of counseling given during antenatal visits. Out of those interviewees who had an antenatal care visit, only 10 percent received iron/folate supplements during pregnancy, and only 2 percent took them for more than three months. Only a quarter of those interviewed recalled a discussion about the place of delivery or reported being counseled on breastfeeding. Most interviewees (59 percent) reported being “somewhat satisfied” with the care they received.

Delivery Care

By tradition, the home is the most common place for delivery in Nepal. The challenge is not to change the culture of home delivery but to make it clean, safe, and within the limits of referral management to avoid the death or serious illness of the mother and/or the newborn. While the NMCG recognizes that the home will remain the preferred place of delivery for the foreseeable future, it recommends that women with health problems during pregnancy should deliver in a health facility.

Table 2.7 reports on the place of delivery, showing that at the national level, the health institutions’ share of deliveries is only 8 percent, and that an urban child is eight times more likely to have been delivered in a health facility than a rural child. The probability of a woman’s delivering in a health facility grows with the increase in the number of antenatal care visits.

Table 2.7: Place of delivery ⁽⁴⁾

Percent distribution of live births (in the three years preceding the survey) by place of delivery, according to background characteristics, NFHS 1996				
Characteristic	Health facility	At home	Don't know or missing	Total
Residence				
Urban	43.8	56.2	0.0	100.0
Rural	5.1	94.1	0.8	100.0
Development region				
Eastern	7.2	91.9	0.9	100.0
Central	11.3	88.0	0.7	100.0
Western	7.4	92.0	0.5	100.0
Mid-western	2.7	96.5	0.8	100.0
Far western	3.9	94.8	1.3	100.0
Antenatal care visits				
None	2.1	97.1	0.8	100.0
1-3 visits	8.0	91.3	0.7	100.0
4 or more visits	41.4	57.9	0.7	100.0
Don't know/missing	4.3	93.7	1.9	100.0
Total	7.6	91.7	0.8	100.0

Table 2.8 shows the relationship between health problems during pregnancy and place of delivery. Although women with health problems during pregnancy are 1.6 times more likely to deliver in health facilities, the majority of them still deliver at home.

Table 2.8: Health problems during pregnancy and place of delivery⁽⁹⁾

	Delivery in health facility	Delivery at home
With problem	219 (16%)	1126 (84%)
No problem	1714 (11%)	13897 (89%)
Odds Ratio = 1.58 (95% CI 1.35 – 1.85)		

Table 2.9 shows that doctors (7.8 percent) or nurses/ANM (3 percent) assisted in just over 10 percent of deliveries, with the remaining 90 percent of babies delivered without benefit of skilled care, usually at home. Traditional birth attendants assisted in less than one fourth of deliveries (23 percent), relatives or friends assisted in 55 percent of deliveries, and 9 percent of mothers delivered on their own without any assistance. A number of variables are associated with the place of delivery and skilled delivery care. Generally, home delivery is more likely to be unskilled, whereas a health facility delivery is more likely to be skilled. The NMCG recommends skilled delivery care.

Table 2.9 Assistance during delivery⁽⁵⁾

Percent distribution of live births in the five years preceding the survey by person providing assistance during delivery, according to background characteristics, NFHS 2001								
Characteristic	Doctor	Nurse/A NM	Health Assistant/AHW	MCHW	VHW	TBA	Relative/ friends	No one
Age at birth								
<20	10.7	4.5	1.8	0.5	0.0	25.2	53.0	4.1
20 – 34	7.6	2.9	1.2	0.4	0.2	23.4	55.3	8.8
35 - 49	3.1	0.5	1.1	0.4	0.3	20.1	56.8	16.9
Residence								
Urban	39.4	10.7	0.8	0.0	0.0	9.4	36.1	3.5
Rural	5.6	2.5	1.3	0.4	0.2	24.4	56.3	9.0
Total	7.8	3.0	1.3	0.4	0.2	23.4	55.0	8.7
ANM = auxiliary nurse midwife MCHW = maternal and child health worker TBA= traditional birth attendant Note: If the respondent mentioned more than one person assisting during delivery, only the most qualified person is considered in this tabulation.								

The NMIS 1997 reports that about half of all families (54 percent) had to pay for the woman's last delivery. These costs, shown in Table 2.10, were for a delivery kit, medicine, a fee for the attendant, and transportation.

Table 2.10: Delivery costs for families that had to pay for the last delivery⁽⁹⁾

Item	Median cost (Rs)	No. of families (% of total)
CHDK	20	233 (1%)
Attendant/ medicine	250	3705 (18%)
Transportation	1000	1278 (6%)
Other item	400	7993 (40%)
General delivery charge	400	10843 (54%)

Reproductive Health Program Operational Management Guidelines recommend the use of a clean home delivery kit (CHDK),ⁱ first marketed in 1994-95. NFHS 1996 reports the kit was used in 2 percent of home deliveries, and NMIS 1997 reports 3 percent of women used it in their last delivery. Even for deliveries in the last three years, the use is only 4 percent. Factors that increase the likelihood of kit use are:

- institutional delivery
- delivery by skilled attendants
- a record of antenatal care visits
- literacy level of the mother.

Table 2.11 shows that a trained traditional birth attendant (TBA) is 16 times more likely to use a kit than an untrained TBA. Eighty-five percent (148 out of 174) of TBAs reported that they washed their hands with water and soap before a delivery; 10 percent (18 out of 174) washed hands with water only; and 4 percent (7 out of 174) did not wash their hands before attending a delivery. There is no apparent difference between trained and untrained TBAs in the level of hand washing.

ⁱ This is a specially prepared kit, containing a razor blade, a plastic disk as a cutting surface, a plastic sheet, a bar of soap, string ties, and a pictorial instructional leaflet, assembled by Maternal Child Health Product Pvt. Ltd.

Table 2.11: Training of TBAs and use of CHDK⁽⁹⁾

Training of TBAs	Use of CHDK by TBA	
	Sometimes/always	Not used
Trained	61 (64 %)	34 (36%)
Untrained	8 (10%)	72 (90%)
Odds Ratio = 16.15 (95% CI 6.49 – 41.60)		

On cord care practices, NMIS 1997 reports that 59 percent of women used an instrument, either a new blade or a boiled old blade, in cutting the cord of their last baby. The likelihood of the cord being cut with a clean instrument, usually a new blade, is more if the delivery took place within the last five years, an encouraging trend that was noted in both urban and rural areas. The practice of cutting the cord with a clean and sharp cutting instrument is 100 percent in health institutions (as reported by staff). This practice needs to be examined and strengthened.

Table 2.12 shows the materials used by TBAs to treat the umbilical cord. More than half (57 percent) women reported that ash, cow dung or oil was applied to the umbilical stump, 6 percent used antiseptics, and 37 percent applied nothing. There is no apparent difference between trained and untrained TBAs in terms of the materials they used to treat the cord.

Table 2.12: Materials used by TBAs to treat the umbilical cord⁽⁹⁾

Cord treated with	No. of TBAs	Percent
Nothing	62	35.6
Antiseptic	88	50.6
Ash	24	13.8
Total	174	100

An evaluation report of the clean health delivery kit published in 2000⁽¹⁰⁾ reached the following conclusions:

1. In areas where unhygienic practices are widespread, CHDK can contribute to a reduction in infection, but not if used in isolation.
2. If clean cutting instruments are already used, the CHDK does not add much benefit.
3. Even after the cutting of the cord, what is put on the cord in terms of foreign substance or cloth dressings is equally important.
4. The kit can provide the necessary components to make compliance with hygiene messages easier, but its value can be reduced if it is not part of a comprehensive strategy to reduce obstetric and newborn complications.

Health Problems After Birth

In NMIS 1997, 10 percent of mothers reported health problems for themselves or for their babies after delivery. The most common health problems reported are shown in Table 2.13.

Table 2.13: Reported health problems after birth⁽⁹⁾

Problem	Number	Percent
Fever/infection (mother)	365	24%
Delayed discharge of placenta	307	20%
Excessive bleeding	304	20%
Weakness of mother	282	19%
Fever/infection (baby)	270	18%
Weakness of baby	125	8%
Baby breathing problem	80	5%
Convulsion (mother)	51	3%
Convulsion (baby)	10	1%

Among women with post-delivery problems, nearly three quarters (73 percent) sought assistance. Table 2.14 shows the sources of assistance for health problems after birth.

Table 2.14: Sources of help for problems after delivery⁽⁹⁾

Source of help	Number	Percent
Nowhere	495	27
District hospital	420	23
Private clinic	378	21
Traditional healer	193	11
Health post	137	8
Dispensary	65	4
Sub health post	60	3
Untrained TBAs	47	3
Trained TBAs	25	1
Total	1838	100

Women who did not seek assistance for their health problems after delivery (27 percent) gave the following reasons: 57 percent thought it was not necessary; 22 percent said the facilities were too far away; 13 percent thought it was expensive; 9 percent said their family did not allow them to go; and 3 percent said they had no time.

Postpartum Care

In NFHS 1996, women were asked whether they received a check-up within 24 hours of delivery, and the majority reported that they did not receive post-delivery care from a skilled provider, either for the mother or the newborn. Of those who did receive a check-up, 7 percent were seen by a doctor, 2 percent by a nurse or midwife, 4 percent by MCHWs, and 24 percent by TBAs.

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3 Research in Newborn Health

Over the last decade, a number of studies have been published dealing with the issues of newborn health in Nepal. These studies have been feasible due in part to the increase in the number of pediatricians, obstetricians, public health specialists, and related professionals; to the establishment of professional bodies such as the Nepal Pediatric Society, the Nepalese Society of Obstetricians and Gynecologists, and the Perinatal Society of Nepal; and to the efforts of research institutions, among which Mother and Infant Research Activities (MIRA) is perhaps the most prominent. These developments have been supported and strengthened by various international agencies, such as UNICEF, WHO, and UNFPA, and by bilateral donors such as USAID, DFID, GTZ and others. A number of new professional journals have appeared during this period, thereby enabling researchers to disseminate their results more widely.

This chapter will describe the research on newborn health that has been done over the last decade, point out the strengths and weaknesses of the current research trends, and identify gaps where more research needs to be done. The information reviewed here, much of which has been used in the other chapters of this analysis, was gathered through literature searches of national and international databases, discussions with colleagues, and a review of the publications available in SC/US office and the Health Learning Materials Center. Abstracts from the different studies mentioned in this chapter can be found in Annex 2.

Earlier Research

While most of the newborn-related research has been conducted in hospitals, a number of population- or community-based surveys (such as the Family Health Surveys) have also been conducted and provide useful insight into the status of newborns. (Results from these studies have been cited extensively in the previous two chapters.) A quick review of published materials (see table 3.1 below) shows that the most common newborn health topics that have been researched are:

1. Mortality rates and their causes
2. Birth asphyxia
3. Hypothermia in newborns
4. Hypoglycaemia
5. Hyperbilirubinaemia
6. Low birth weight
7. Intervention studies (on the impact of nutritional supplementation, health education, and the utilization of health services)
8. Advocacy for newborn health
9. Nutritional problems in mothers

Table 3.1: Hospital- and community-based studies, with study subjects

Subject	Hospital-based	Community-based	Total
Mortality related	4	1	5
Birth asphyxia	5	--	5
Hypothermia	3	--	3
Hypoglycaemia	2	--	2
Hyperbilirubinaemia	2	--	2
LBW	4	1	4
Intervention studies:			
a. Maternal nutrition and newborn health	--	7	7
b. Health education	1	1	2

Most of the studies cited in this table, including the mortality-related research, are based on retrospective or prospective analysis of hospital-based records. The issues studied and reported on have been neonatal mortality, causes of morbidity and mortality in the newborn, prevalence and determinants of birth asphyxia, low birth weight, hypothermia, hypoglycemia, and jaundice in the newborn.

Most of the studies done on birth asphyxia, have shown it to be a major contributor to perinatal mortality. The study on neonatal encephalopathy (Ellis M., et. al.) has made an important contribution to our understanding of this condition in a hospital setting. Low birth weight studies too have been done in the hospitals and have shown the LBW rates to be as high as 20 percent. The predisposing risk factors for LBWs were identified to be low socio-economic status, poor nutritional status and short stature of mothers, short birth intervals, heavy workload during pregnancy and previous still births. Studies on hypothermia (Costello, et. al., Johanson, et. al.) in newborns born in a hospital setting have revealed 24 hours mean ambient temperature were lower than 25 degrees Centigrade, indicating severe and prolonged thermo-control problems among newborns born in Nepal. The studies on hypothermia have shown that most of the infants who were cold at 24 hours had initially become cold at the time of delivery, emphasizing the need for immediate care to prevent hypothermia at the time of delivery.

The community-based nutrition studies have been mainly in the area of maternal nutrition, aimed at identifying the most common nutritional problems of mothers and the relationship to neonatal outcome. The John Hopkins University nutrition intervention trial in the Sarlahi district is the most prominent example of this kind of research. Two papers that emerged from this trial are especially relevant to newborn health. The trial was conducted to assess the effect of maternal vitamin A or beta-carotene supplementation on mortality related to pregnancy and on fetal loss and survival of infants less than six months of age. The first paperⁱ concluded that supplementation of women with either vitamin A or beta-carotene at recommended dietary amounts during childbearing years can lower mortality related to pregnancy in a rural, undernourished population in south Asia. The second paper,ⁱⁱ based on the same trial, concluded that small weekly doses of vitamin A or beta-carotene given to women before conception, during pregnancy, and through 24 weeks postpartum did not improve fetal or early survival in Nepal.

The one community-based health education study listed in table 3.1 was a MIRA-led effort to measure the impact of health education on maternal health and newborn care.

ⁱ Published in *British Medical Journal*, 318 (7183):570-5.

ⁱⁱ Published in *American Journal of Clinical Nutrition* 2000 June: 71(6): 1570-6.

Ongoing Research

MIRA, the Ministry of Health of Nepal, and the Institute of Child Health/London (ICH/L) are currently conducting an operations study in the Makwanpur district. The purpose of the study, called Improving Essential Newborn Care in Rural Communities in Nepal, is to enhance newborn care in the home and at health facilities through sustainable interventions. The study includes an evaluation of the role of preventive and referral services in reducing neonatal mortality and will try to increase the availability of safe delivery kits and essential supplies. It will also work closely with the District Public Health Officer to develop appropriate essential newborn care (ENC) training modules for health workers.

Essential newborn care is comprised of the basic principles of resuscitation, avoidance of hypothermia, improvements in hygiene, early breastfeeding, and protecting mother-infant bonding. It also promotes antenatal care and the treatment or referral of high-risk or sick infants. A key question the study will look at is whether mothers in resource-poor communities can practice ENC more effectively. Networks of women who are interested in tackling ENC will be encouraged to identify, prioritize, and plan for improvement.

The interventions will be evaluated in randomized controlled trials in order to estimate their impact on neonatal mortality. Twenty village development committees (VDC) will be matched into 12 pairs; one VDC in each pair will receive the intervention from the beginning of the study, and the other VDC will receive it after two years. The evaluation will look at whether and how the interventions resulted in:

1. Increased awareness of ENC and ways of approaching it in the community.
2. Increased number of deliveries attended by a trained person in a clean environment.
3. Improved knowledge and skill of health workers.
4. Improved availability and use of antenatal care, safe delivery kits, and referral systems.
5. New knowledge about the effectiveness of this sort of intervention on neonatal mortality.
6. New knowledge about the effectiveness of this sort of intervention on newborn health status.

Planned Research

MIRA and the Institute of Child Health, London have plans to collaborate on research to study the effects in Nepal of antenatal supplementation on birth weight, gestation, and perinatal mortality and infection. The study, based in Janakpur Hospital where eligible women will be recruited at antenatal clinics, will examine the effects of providing multiple micronutrient supplements to pregnant women on birth weight, prevalence of preterm delivery, gestational age, maternal and neonatal infection, and neonatal morbidity. The study will also assess the acceptability of the supplements to the enrolled participants.

The total sample size will be 1,200, 600 in each of two groups. The women in group I will receive free of charge the supplements currently recommended in HMG guidelines (iron and folic acid tablets), and the women in group II will receive a micronutrient package from 24 weeks of gestation through delivery. The multiple micronutrient packages will contain vitamins A, B1, B2, B6, B12, C, D, E, niacin, folic acid, iron, zinc, copper, selenium, and iodine at levels recommended by recent WHO/UNICEF guidelines. The daily supplements will be self-administered and will be provided through weekly home visits at which compliance will be monitored by pill counting. A card registration system will allow women participating in the trial expedited access to maternity services at the hospital. Community follow-up will be carried out to collect morbidity and mortality information.

Research Gaps

A quick review of publications which report on newborn health research reveals that most studies are based in hospitals and are therefore confined to that population of women who come to hospitals for their services. Most of these studies have looked into the ways in which the hospital environment can be made more efficient so that newborn health could be promoted. In our context, however, where hospital- or facility-based deliveries are the exception rather than the rule, the usefulness of such studies is limited.

The following are important research priorities:

1. Studying the feasibility of implementing a registration system in the community to record neonatal birth and death within seven days of birth.
2. Identifying local practitioners in maternal and child health services, the activities carried out by them, and their levels of competence, including communication skills.
3. Studying the home care practices of pregnant women, including care during pregnancy, labor, delivery, and the postpartum period.
4. Studying health-seeking behavior at the local level and practices of payment for health services.
5. Monitoring and evaluating of the health services at different levels.

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4 Policies, Services, and Stakeholders

The purpose of this chapter is to discuss policies related to neonatal health, describe the existing services, and identify major stakeholders and their present and future roles in neonatal health. In compiling this information, most of the government and non-government organizations involved in the maternal and neonatal health sector were contacted about their programs.

Policies

The key players in policy making in Nepal are the National Planning Commission, the Ministry of Health, the Department of Health Services, and the donor community. While there are a number of policies which indirectly affect neonatal health, there are no policies, which specifically target newborns. Neonatal health is often “included” with maternal health policies and goals, but it is not normally given high priority. The major policies and programs related to maternal and neonatal health are given below:

The Five -Year Plan (1997-2002) and the Long-Term Health Plan (1997-2017)

Nepal has implemented eight five-year plans and is currently in the third year of its ninth plan. This plan recognizes health as a basic human right and continues the eighth plan's commitment to “Health for All” by providing primary healthcare services with community participation. The current plan is guided by the health policy of 1991 and the second long-term health plan that had as an overriding goal “raising the health standards of the rural population by strengthening the primary health care system.” The objectives of the current five-year plan are:

1. Comprehensive improvement in public health status will be brought about by accepting public health as an important organ of human rights and strengthening the existing infrastructure for preventive, promotional, curative, rehabilitative, and family planning services.
2. Public health status will be improved by the development and extension of health services, and the concept of the small family will be expanded through providing health and family planning services and thereby bringing down the population growth rate.
3. A contribution to poverty alleviation will be made by increasing income through the participation of healthy manpower for enhancing the capability of people going into the labor market.

There is also a long-term (20-year) health policy formulated by the Ministry of Health. The followings chart presents the targets of the ninth plan and the long-term health plan.

Table 4.1: Health indicators with status and targets

Health indicator	Status in 1996/97	Target for ninth plan (2002)	Target for 20 years (2017)
1. Infant mortality rate (per 1000)	74.7	61.5	34.4
2. Child mortality rate (per 1000)	118	102.3	62.5
3. Total fertility rate (per woman)	4.58	4.2	3.05
4. Average life expectancy (years)	56.1	59.7	68.7
5. Maternal mortality rate (per 10,000 live births)	47.5	40.0	25.0
6. Contraceptive users (percent)	30.1	36.6	58.2
7. Obstetric service by trained manpower (percent)	31.5	50.0	95.0
8. Birth of infant below 2500 gm (percent)	-----	23.0	12
10. Crude birth rate (per 1000)	35.4	33.1	26.6
10. Crude mortality rate (per 1000)	11.5	9.6	6.0
11. Basic health service accessibility (percent of people)	-----	70.0	90.0

Source: Nepal Family Health Survey, 1996; Population Report, 1998; and Projections made by the Ministry of Population and Environment, Central Bureau of Statistics, National Planning Commission and New ERA..

Reproductive Health

The International Conference on Population and Development (ICPD) held in Cairo in 1994 established the importance of safeguarding reproductive health. In this regard, His Majesty's Government has endorsed the ICPD Plan of Action, as well as the 1995 WHO Global Reproductive Health strategy, both of which serve as a basis for Nepal's national reproductive health strategy.

The definition of reproductive health, adopted in the ICPD Plan of Action and endorsed by the United Nations General Assembly in its resolution 49/128, serves as the basis for action by all UN agencies and Member States, including Nepal.

Reproductive health, within the context of primary health care, includes the following essential components:

- Family planning counseling, information, education, communication, and services (emphasizing the prevention of unwanted pregnancies)
- Safe Motherhood education and services for healthy pregnancy, safe delivery, and post-natal care including breastfeeding
- Care of the newborn
- Prevention and management of complications of abortion
- Prevention and management of RTIs, STDs, HIV/AIDS and other reproductive health conditions

- Information, education and counseling, as appropriate, on human sexuality, reproductive health, and responsible parenthood for individuals, couples, and adolescents
 - Prevention and management of sub-fertility
 - Life cycle issues including breast cancer, cancer of the reproductive system, and care of the elderly

The reproductive health program is being implemented at the family and community level, at health and sub health posts, in primary health care centers, and at the district level.

Safe Motherhood

Safe Motherhood is another major program of the Ministry of Health which influences neonatal health. Nepal's health policy of 1991 identified safe motherhood as a priority health area, and a national Safe Motherhood Program began in 1994, with the primary objectives of improving the health status of women and reducing maternal mortality in Nepal. The main strategies of the Safe Motherhood Program are to improve the quality and coverage of maternity care services to all women at the primary, secondary, and tertiary levels. A set of National Maternity Care Guidelines (NMCG)—which defined the basic care for women and newborns during pregnancy, delivery, and the postpartum period at all levels—was developed as a tool for implementing the Safe Motherhood Program.

The specific objectives of the Safe Motherhood Program are:

- To increase the accessibility, availability, and utilization of maternal healthcare facilities.
- To strengthen the technical capacity of maternal healthcare providers at all levels of the healthcare system.
- To strengthen referral services for maternity care, particularly at the district level and with specific emphasis on appropriate referral of high-risk cases.
- To increase the availability and use of contraceptives for child spacing and family planning purposes.
- To raise public awareness about the importance of the healthcare of women and in particular maternal healthcare and safe motherhood.
- To improve the legal and socioeconomic status of women.

The Safe Motherhood Program had set the following targets for the year 2000, but no evaluation has been carried out to date to measure whether these targets have been met.

- Reduce maternal mortality rate from 850 per 100,000 live births to 750 by 1996 and to 400 by the year 2000.

Chronology of maternal and neonatal health policies and events in Nepal	
1991	National Health Policy cites safe motherhood as a priority.
1992	Formation of Task Force on Safe Motherhood
1994	Safe Motherhood Plan of Action (1994-97) prepared
1996	Maternity Care Guidelines finalized
1997	Second Long Term Health Plan (SLTHP) prepared and the ninth five-year plan enacted
1998	Safe Motherhood Policy and the National Reproductive Health Strategy finalized
1999	Development of clinical protocols for various cadres of health workers
2001	National Safe Motherhood Training Strategy prepared
2001	Safe Motherhood Plan (July 2001-July 2016) developed

- Increase contraceptive prevalence rate (CPR), with particular focus on spacing methods, from 24% to 30% by 1996 and to 38% by the year 2000.
- Increase the coverage of antenatal care services from 18% to 25% by 1996 and to 50% by the year 2000.
- Ensure that at least 25% of all deliveries are attended by trained health workers by 1996 and 50% by the year 2000.
- Increase the number of first level referral hospitals with capacity to provide essential obstetric functions from the present number of 14 to 24 by 1996.
- Reduce anemia (i.e. Hb<11gm%) in pregnant women from 78% to 70% by 1996 and to 50% by the year 2000.
- Improve tetanus toxoid (TT) immunization coverage among women of childbearing age to 90% by the year 2000.
- Increase the enrollment of female students in primary school from 54% to 76% by 1996 and to 100% by the year 2000.
- Ensure the completion of primary education by girl children from the present estimate of 27% to 55% by 1996 and to 70% by the year 2000.
- Increase female literacy from the present rate of 21% to 38% by 1996 and to 61% by the year 2000.
- Initiate policy development on legal and programmatic aspects of abortion and work toward the legalization of abortion.
- Introduce (monitor and encourage) the enforcement of the legal age of marriage in coordination with the relevant government entities.

The Safe Motherhood Program has been implemented in 24 districts of Nepal and is being funded by WHO, DFID, GTZ, UNICEF, USAID, CARE/Nepal, PLAN International, Swiss Development Cooperation, EC, and SC/US.

As noted earlier, none of the above policies has neonatal health as a priority, due in large part, no doubt, to the lack of community-based data which would show the plight of newborns to be much greater than it otherwise appears. At the same time, it is interesting to note that the Safe Motherhood program does not include neonatal health as one of its primary objectives. During our situation analysis, we found that there is a serious gap in relevant research data on neonatal health.

Reviewing the chronology of national policies in maternal and neonatal health, it seems that Nepal has achieved more progress in policy formulation in safe motherhood than any other field in health. While this national commitment to safe motherhood is encouraging, it has not yet translated into the allocation of resources at a sufficient level to decrease the number of maternal deaths. The fact that awareness has been raised and money allocated for safe motherhood does not necessarily ensure the continuation of a conducive policy environment nor of widespread support to implement policies. Unless the momentum that has already been achieved, culminating in Nepal's adoption of the program of action of the ICDP, is sustained with continued policy advocacy and implementation, we should not expect dramatic gains in maternal health.

Family Planning

Family planning has a high impact on neonatal and maternal mortality in developing countries, in some cases reducing maternal and neonatal deaths by as much as 25 percent. Family planning activities in Nepal began in 1959 through an NGO called the Family Planning Association, and ten years later it became a part of the government structure. Family planning services in the country are designed to provide comprehensive assistance that reduces maternal and neonatal mortality, enhances child survival, and brings about a balance in population growth and socio-economic development, resulting in an environment that will help the Nepalese people improve their quality of life.

The main aim of the family planning program, as a part of reproductive health, is to expand coverage and sustain adequate quality family planning services to the village level through all health facilities and mobile surgical contraceptive camps (VSC Camps). It also aims to encourage NGOs, social marketing organizations, and private practitioners to complement and supplement government efforts. Community health volunteers and trained traditional birth attendants are mobilized to promote condom distribution and resupply of oral pills.

The major activities are:

1. Voluntary Surgical Contraceptives (VSC) services, which include vasectomy, minilap, and laparoscopy, are made available in all districts through hospital or mobile camps.
2. Spacing methods, such as injection Depo-Provera, oral pills, and condoms, are made available throughout the country, including at the community level. Norplant and IUCDs services are provided in selected areas, and spacing methods are also made available through private practitioners, contraceptive retail sales (CRS), company outlets, pharmacies, and other NGOs/INGOs.
3. Family planning counseling services are provided through limited facilities at present, but will be made available throughout the country in the future.
4. Quality of care (QOC) management activities are provided to improve overall family planning services in the country. The QOC project has been established under the leadership of UNFPA and is worked on jointly by UNICEF, WHO and ILO. This program is implemented with the technical assistance of Nepal fertility care center, through the support of the Engender Health country project.

Existing Health Care Structure in Nepal

In keeping with various health mandates, the government of Nepal has established systems for delivering health services at all levels, from the community at one end to the national level at the other. So this section will begin at the community primary health care outreach level and move through the other facilities: health post, primary health care center, district/zonal hospital, and central hospital.

Primary health care outreach (PHC Outreach) services

The outreach clinics are an extension of health posts and sub health post services found at the community level. These institutions send their staff—mainly MCHWs, VHWs and at times even AHWs—to conduct clinics at predetermined places in a VDC once a month. The main objective of such clinics is to improve the accessibility and coverage of primary health care by developing a net work of three to five outreach clinics per VDC per month.

Outreach clinics provide a basic minimum service package that includes:

- Health education
- Counseling and IEC
- Family planning services such as oral pills, condoms, Depo Provera
- Basic maternity services, such as ANC (if there is space for examination), distribution of iron and folate/deworming tablets, and giving TT to pregnant mothers
- Minor treatment
- Referral and follow-up

These services are conducted in conjunction with local level volunteers and schoolteachers as and when required, and there is a nominal charge. The success of the PHC outreach clinics depends on the commitment of the management committees that are responsible to generate community participation for maintaining the clinic. Only 65 percent of the target coverage was met in the year 2001, with the main reason for lower than expected coverage being lack of supplies, such as iron and deworming medicines.

Sub health posts

Sub health posts (SHP) are established at the level of village development committees (VDC). There are currently 3,195 SHPs, each one staffed by an assistant health worker (AHW), a maternal and child health worker (MCHW), and a village health worker (VHW). The primary maternity care provider at these posts is the MCHW, who is expected to provide quality antenatal care regularly at the post and delivery care at home when called. Some of the AHWs from SHPs also make home visits to conduct deliveries. MCHWs are also responsible for providing family planning services and postnatal care at home and in the clinic, including immunization and essential obstetric care (EOC) first aid services using the EOC kit box.

The consultants visited SHPs in Kailali, Kanchanpur, Nuwakot, and Siraha districts and learned that antenatal clinics are not held at these sites; in lieu of clinics, MCHWs see all antenatal cases in their outreach clinics. When a pregnant woman comes to a SHP, she is seen by whoever is there.

Health posts

Currently there are 611 health posts (HP) in the country. The role of health posts is to provide integrated preventive and curative primary healthcare services, including antenatal, postnatal, first aid for emergency obstetric cases, and family planning services. There are four technical positions sanctioned for each health post: health assistant (HA), AHW, auxiliary nurse midwife (ANM), and VHW. The ANM is the key maternal child health/family planning service provider here. Health post staff are supposed to provide supervision and training to SHP staff and community-level workers and attend normal deliveries at home.

A number of HPs were visited by the consultants, who met with the ANMs and discussed their experience in providing maternal and newborn services. Even though there is a master schedule for all HPs, most posts seem to follow their own schedule. Generally, they conduct four antenatal clinics each month, but pregnant women do not necessarily come on clinic days and are examined whenever they come. The average attendance of pregnant women at clinics seems to run anywhere from 25-60 women per month. These women are asked questions about their pregnancy, given an abdominal examination, and have their blood pressure taken and recorded on the antenatal card. Weights are not always taken and heights are rarely taken. They are given routine advice to increase the amount of food consumed and to eat nourishing food during pregnancy. ANMs and other staff seem to identify high-risk cases mainly on the basis of age and number of pregnancies.

In-service training of TBAs seems to be conducted every six months by the auxiliary nurse midwives, even though many of these midwives have not received training-of-trainer classes. ANMs do not supervise SHP staff, principally because of the distances involved and/or the lack of public transport.

Primary health care center (PHCC)

Primary health care centers are gradually being established in each electoral constituency; there are currently 137 centers and there will be 205 when all are up and running. Each PHCC has the following staff:

- A medical doctor
- A staff nurse
- HA/Sr. AHW
- Two AHWs
- Two ANMs
- One laboratory assistant
- One VHW

The job of the health care centers is to promote sound health practices and provide preventive and curative services, including emergency care. Most of these services are outpatient, but a limited number of beds are allocated for in-patient emergency care, and one bed is allocated for maternity.

The key maternity service providers at this level are ANMs, the staff nurse, and the doctor. Routine and quality procedures are to be managed by the staff nurse and the ANMs, and complicated cases and emergencies are to be managed by the doctor and/or referred to a district hospital (which is mandatory for those emergencies requiring blood transfusion or major surgery). In addition to routine antenatal and postnatal care and normal delivery, high-risk and basic EOC are to be handled at this level.

For newborns, PHCC staff is supposed to provide essential neonatal care, plus the following services:

- Resuscitation of an asphyxiated newborn using a bag and mask
- Treatment of hypothermia
- Treatment of hypoglycemia
- Examination of a newborn for any problems or abnormalities
- Treatment of complications such as jaundice, pyrexia, sepsis, and neonatal tetanus
- Referral of cases requiring specialized care and follow-up to the district or specialized hospital

The team of consultants visited one PHCC and observed the nursing staff as they provided antenatal care and discussed their experiences in delivering maternal-newborn services. In this PHCC all of the sanctioned posts were filled except for that of the medical officer, who had been transferred several months back and whose replacement had not yet arrived. A senior AHW was acting in-charge.

The nursing staff consisted of one staff nurse, who had been there since the opening of the center seven years ago, and four ANMs. Nursing staff stated that they work as a team with the nurse as the team leader and their primary focus is to provide safe deliveries. Women who deliver at this PHCC are kept for 24-hour observation. The ANMs conduct all the normal deliveries, and the staff nurse helps with difficult cases, conducts vacuum extractions, supervises the use of oxytocin, maintains a record of supplies and instruments, and orders supplies as needed.

An average of 18-20 deliveries take place here every month, and most of these are normal. The few newborns with a low APGAR score are wrapped warmly and kept next to their mother which seems to revive them. The staff refer cases requiring additional care to the Seti District Hospital (by telephone) and, when needed, accompany a patient in serious condition to the hospital.

The team observed four ANMs giving antenatal check-ups. All ANMs made use of the antenatal card and routinely checked the woman's weight, conducted an abdominal examination, provided health education, and ensured that the initial lab work was completed. The ANMs lectured (rather than counseled) the women on diet, on getting plenty of rest, and on when to return to the clinic, but they did not ask the women about their eating habits, work load, or any problems they might be experiencing.

Thus the team found that while the ANMs could carry out an initial exam, they were weak in providing follow-up care. Findings from the initial procedures and lab work, for example, were not used in giving advice, and after the initial exam was completed, the ANMs did not know what to do on the next visit except repeat the same exam. In one case, a woman's record showed that she had had albumin in her urine during the previous visit, but when the team asked the ANMs if they rechecked her urine on this occasion, they asked whether this should be done. This suggests that ANMs need better supervision in order to grow in their jobs.

The team also found that PHCC nursing staff appeared to be unfamiliar with local customs and were unable to deal constructively with some of the obstacles they encountered. When asked about local customs and behavior patterns, they made the following comments:

- “These people are different kinds of people and have different customs.”
- “These people are hard to change because they are not educated.”
- “These women have to eat what their mother-in-law gives them.”
- “These people are poor so they cannot improve their diet and lifestyle.”
- “The new mothers sleep until the baby’s cord falls off.”
- “They will not change their eating habit because they continue to grow the same things they used to grow.”

Nursing staff are doing their best to provide maternal, newborn, and child health services based on their training, but this is not enough. They need supportive supervision to help them provide follow-up services based on individual needs rather than generic care, and they need to be more familiar with local customs and behaviors so that they can provide better advice and care. The staff also need to understand the importance of finding out what the women are doing to care for themselves so that staff can then help mothers continue healthy behaviors and change unhealthy ones.

District hospitals

The PHCC’s first level of referral for maternity and newborn care is the district hospital, which provides essential services for normal, high-risk, and complicated pregnancy, labor, and delivery. It also manages abortions, comprehensive obstetric cases, and newborn emergency care. Each district hospital has 15-25 beds, including 2-3 maternity beds. Only a few of these hospitals have positions for an obstetrician and a pediatrician, but all of them have positions for the following staff:

- Doctors (3-5)
- Senior nurse (1)
- Staff nurse
- ANM
- HA
- AHW
- Laboratory technician
- Radiologist

The doctors in many of these hospitals are not present year-round, which causes serious problems, especially in the summer months.

Central level hospital

There are currently three central level hospitals in Kathmandu that provide maternal and newborn care: Maternity Hospital at Thapathali, Patan Hospital at Lagankhel, and Tribhuvan University Teaching Hospital at Maharajagunj, all three of which have level II neonatal care units. Kanti Hospital, a children’s facility, is the only central hospital with level III neonatal care facilities with ventilators. The newly opened private medical colleges, the Nepal Medical College and Kathmandu Medical College, are currently establishing level II neonatal services.

Obstetric services

The Safe Motherhood Program conducted a survey of the availability of emergency obstetric care in 45 districts and 157 health facilities in the Eastern, Western, and mid-Western regions of Nepal (see table 4.2). In these 157 health facilities, 112 (71 percent) admitted a total of 24,000 obstetric cases from February 1999 to February 2000. Of these, 86 percent were admitted in government and 14 percent in nongovernment facilities. Out of all 112 facilities, only 23 offered full comprehensive emergency care services, while the rest (89) offered only a few or no emergency care services. This finding indicates that facilities established for the purpose of providing obstetric care are far from meeting the existing need. In addition to improving

emergency and basic obstetric care, there is a corresponding need to establish a better referral system to help reduce maternal and newborn mortality rates.

Table 4.2 Status of emergency obstetric care (EmOC) in government and nongovernment health facilities in three regions of Nepal.

	Government	NGO	Total
Comprehensive EmOC services	8	10	18
Basic EmOC services	4	1	5
Single function of comprehensive EmOC	3	4	7
Some type of basic EmOC	88	9	97
No EmOC services	29	1	39
Total:	132	25	157

Training of Neonatal Health Personnel

Another dimension of newborn service relates to the training of skilled health providers. If maternal and neonatal mortality are to be reduced in Nepal, mothers and newborns must have access to skilled care at birth and during the neonatal period. For there to be skilled care, there must be trained service providers in the community, at health posts, and in hospitals throughout the country.

There are several training institutions in Nepal which provide training in maternal and neonatal health, the most prominent of which is the Institute of Medicine (IOM) which presently provides academic courses in MBBS, BPH, Bachelor in Nursing, Master in Nursing, MDGP and MD Obstetrics and Gynecology.

Another institution, the National Health Training Center (NHTC), was established in 1993 for the purpose of training the staff of sub health and health posts, PHCCs, and hospitals of the Health Ministry. NHTC, which has full responsibility for training all MCHWs, VHWs, FCHVs and TBAs, has five regional training centers, three MCHW training centers, and between three and five training health posts in each region. The Center works in partnership with other organizations to conduct training for MCHWs and ANMs and uses the TU teaching Hospital, Bir Hospital, and Maternity Hospital as sites for practical skills training. NHTC provides most of the maternal and neonatal health in-service training offered in Nepal.

The Council for Technical Education and Vocational Training (CTEVT) is another major stakeholder in the field of health training, responsible for all staff nurse and ANM training. Presently, there are 46 private and public ANM training centers and 18 staff nurse training schools affiliated with CTEVT. Private and public schools are required to affiliate with at least one hospital for clinical practice.

Occasional training on newborn care had been conducted at Kanti Children's Hospital for the doctors and nursing staff of various hospitals around the country, and training on newborn care has also been conducted at Maternity Hospital for the nursing staff. Pretests taken by the trainees in both hospitals revealed that the knowledge of newborn care among the doctors and the nurses was less than adequate, pointing to the need for conducting such training programs in all the zonal hospitals.

In response, Mother and Infant Research Activity (MIRA) has conducted a number of training sessions on essential newborn care in districts with an ongoing Safe Motherhood Program, such as Baglung, Kailali, and Surkhet, and there are plans to conduct more training in the future. MIRA has also conducted a number of other ENC training sessions for various groups, including: health workers at Hetauda Hospital, field workers working in the MIRA project in the Makwanpur district, and Dhanusa and Kailali district health workers. While post-tests always reveal an improved knowledge of ENC among trainees, the impact of such training on newborn health has yet to be evaluated.

Facilities and Providers—At a Glance

The following chart presents an overview of the various maternal and newborn services offered at the various levels of the health system in Nepal (as presented and described thus far in this chapter).

Summary of maternal and newborn services at the community, PHCC, and hospital level

Level of care	Role/services provided	Sanctioned staff/service provides
Primary level A) Family	<ul style="list-style-type: none"> • Knowledge of pregnancy delivery and newborn care. • Knowledge and utilization of available resources 	NA
B) Community <ul style="list-style-type: none"> • Support group • TBAs • FCHVs • MCHW 	<ul style="list-style-type: none"> • Provide basic knowledge on care to family. • Attend home deliveries • Follow-up home visit during postnatal period 	TBA* FCHVs MCHW
Primary health services C) Sub Health Post (3199)	MCH/FP services, antenatal, postpartum care, home visits, immunizations	AHW, MCHW* and VHW
D) Health Post (611)	<ul style="list-style-type: none"> • Basic integrated promotive, preventive and curative health care services including antenatal and postnatal care • Supervision and training to SHP staff • Attend normal deliveries at home 	HA or Sr. AHW, ANM* and VHW
First Referral Level E) Primary Health Center	Antenatal delivery, postnatal and newborn care	A medical doctor, staff nurse, HA/Sr. AHW, 2 AHW, 2 ANMs, Laboratory Asst. and VHW
F) District Hospital (74) (15-25 general beds; 2-3 maternity beds)	First referral centers <ul style="list-style-type: none"> • Routine antenatal delivery and postpartum and newborn care • Complicated pregnancy 	3-5 doctors, senior staff nurse, ANMs, HA, AHW, Laboratory technician, radiographer
Tertiary Level Health Services G) Regional, subregional and zonal hospital	<ul style="list-style-type: none"> • Secondary referral centers • Specialist services • Blood bank • Surgical services 	<ul style="list-style-type: none"> • Obstetrician, pediatrician • Anesthetist
H) Central Level Hospital	<ul style="list-style-type: none"> • Functioning operating theaters • Blood bank • Referral hospitals and academic teaching institutions • Management of complicated pregnancies and neonatal problems. 	<ul style="list-style-type: none"> • Obstetrician • Pediatrician • Surgeons and other specialists • Anesthetist

Source: Ministry of Health, National Maternity Care Guidelines, Nepal 1996

In another effort, the Nepal Paediatric Society (NEPAS) and the Perinatal Society of Nepal (PESON) have been training doctors and nurses in resuscitation of newborns by conducting neonatal advanced life support (NALS) courses at different medical college and other hospitals. It is expected that the quality of neonatal care in these hospitals will improve as a result of these training courses.

Table 4.3: Training Institutions in Maternal and Neonatal Health

Position Title	Number of Posts	Entry Level Education	Qualification title	Duration of Preservice Training	Responsible Agency	
					Preservice	Inservice
MDGP		MBBS	MDGP	3 Years	IOM	
MD Obs & Gynae		MBBS	MDGO	3 years	IOM	
MBBS		10 + 2	MBBS	4.5 years	IOM	
Master Level Nursing		Bachelors in Nursing + 3 years experience	Ms in Nursing	2 years	IOM	
Bachelor Level Nursing		PCLN + 3 years experience	B.Sc in Nursing	2 years in any area (e.g., surgical, pediatrics, medical)	IOM	
Basic Bachelor Level Nursing		10 + 2 in science	Bs in Nursing	2 years	BPKIHS	KU
Registered Nurse		SLC 2 nd division in science & math	PCLN	3 years	IOM	NHTC
Auxiliary Nurse Midwife (ANM)		SLC	ANM certificate	18 months (4 months in SM)	CTEVT + Public and private institution	NHTC
Auxiliary Nurse Midwife (ANM)		Class 10	ANM certificate	2 years	CTEVT+ Public and private institution	NHTC
Maternal Child Health Worker (MCHW)		Class 8	MCHW certificate	3 and half months	NHTC	NHTC
FCHV		Literate Female	-	15 Days	NHTC	DHO
TBA		Literate Female	-	12 Days	NHTC	DHO

Source: National Safe motherhood Training Strategy FHD and NHTC Kathmandu 2001 (Draft)

Retention of Staff

In accordance with the target of the eighth plan, nearly 3,300 new health institutions were established in Nepal, giving 88 percent of the country's households access to health institutions. (CBS, 1996). The mere presence or proximity of an institution, however, does not in itself guarantee the provision of health services. Simply stated, if there are no skilled providers in these institutions, there is no health care. In this context, one of the most serious challenges facing the Ministry of Health is the lack and rapid turnover of trained field staff.

A study of district hospitals carried out in the rural areas of Nepal in 1997 (New ERA) found that the following percent of the following positions were actually filled (i.e., occupied by an incumbent): 14 percent of the medical doctor positions; 0 percent of nurse positions; 71 percent of the senior AHW positions; and 29 percent of the staff nurse positions.

The same study yielded these results for PHCCs: 50 percent of the medical doctor positions were filled; 75 percent of the senior AHW positions; 25 percent of the staff nurse positions; 81 percent of the AHW positions; and 46 percent of ANM positions.

At the health post level, the numbers were more encouraging: 50 percent of senior AHW, 100 percent of AHW, and 79 percent of ANM positions were filled. Interestingly, there was no problem of retention at the sub health post level (New ERA Aug. 1997).

Unfortunately, the situation has worsened considerably since the New ERA study of 1997. In 1998 HMG decided to release all temporary staff from their respective positions, thereby reducing by almost 50 percent the number of staff working at the various levels.

The most common factors affecting retention were: frequent transfer of staff (one AHW was transferred 5 times within one 12-month period, New ERA Report), deputation to urban health institutions, low salary and allowances in rural areas, lack of schools for children in rural areas, lack of foreign training and study, lack of concrete promotion rules and regulations, lack of physical facilities in rural health institutions, and the attraction of urban centers.

Judith Justice (1986) conducted a study of rural health facilities in Nepal and drew the conclusion that health staff are generally absent from their working sites, with the result that "invisible health workers" (a locally hired peon) are the caregivers most likely to be found at a rural health facility. After the results of the Justice study were made known, HMG created the position of MCHW and assigned one such worker to every sub health post. Even though the MCHW must be from the same village in which the sub health post is located, this condition does not seem to have solved the problem of the missing caregiver; in a 2000 study of 24 sub health posts, only 12 posts had an MCHW (Kunchok 2000).

Due in part to the absence of caregivers in the health facilities, the number of private pharmacy outlets has grown in Nepal, and these institutions are apparently providing services that should be available at health and sub health posts. At the same time, faith healers are also playing an increasingly important role in the rural areas.

The growing number of medical colleges in the country, which now produce nearly 500 medical doctors per year, may help meet the need for trained manpower in rural areas. Even so, major policy steps have to be taken to solve this problem, especially in the form of providing incentives to health personnel who live and work in rural areas. Until and unless health personnel are convinced that policies will be strictly and impartially enforced, the situation will not change. In the absence of such policy changes, health personnel will continue to be attracted to urban centers, and health services for the rural population will continue to exist on paper but not in reality.

Major Stakeholders

A number of national and international NGOs work in Nepal, but only a limited number have programs designed specifically for newborn health. In this section brief descriptions of the various agencies and their programs are presented. The role of the various Nepali government entities, the major stakeholder in maternal and newborn health care, has already been described and will not be presented here.

International and bilateral agencies

World Bank. The World Bank itself does not work directly in the areas of maternal and neonatal health, but it does support various efforts of the Ministry of Health, including increasing access, coverage, quality, and use of existing services and institutional capacity building within the ministry. The World Bank has financed the construction and renovation of 202 sub health posts and the repair and maintenance of 500 health posts. All together, the World Bank has provided US\$23.75 million to Nepal.

UNICEF. United Nations Children’s Fund is a UN organization comprised of nine sectors: health, nutrition, education, water/sanitation, WFCP, DPCP, CP, C&A, PME. In health alone it focuses on improving the survival, normal growth, and development of children in the following areas through technical and financial support.

1. Extended program for immunization (EPI), including national immunization days and maternal and neonatal tetanus: Through Zonta International and the Child Health Division of the Ministry of Health, UNICEF has a program to eliminate maternal and neonatal tetanus in Nepal, with the goal of reducing the incidence of neonatal tetanus in every district to less than one case per 1000 live births by the year 2005. Last year, UNICEF supported the elimination of maternal and neonatal tetanus in eight districts of Nepal, and this year it is working in 14, with an additional 3 districts being supported by SC/US Saving Newborn Lives Program.
2. Safe motherhood: UNICEF has two projects related to Safe Motherhood. The first is the Women’s Right to Life and Health Project in four districts, (Kapilbastu, Saptari, Pachthar and Dang) in collaboration with the Ministry of Health and with support from the Bill & Melinda Gates Foundation. Its main objective is to strengthen the emergency obstetric care services at the district hospitals and PHCCs/HPs. The other project is the Community Based Mother and Child Care Project which is implemented in 15 DPCP districts. This project aims to increase family responsibility for maternal and child care through promoting knowledge and practices related to safe motherhood and to increasing the sense of community urgency for the management of complications of pregnancy and childbirth, resulting in timely and increased utilization of health facilities.
3. Integrated management of childhood illness (IMCI) in four districts and CDD/ARI nation-wide, jointly with other partners.
4. Nutrition programs such as the prevention and control of vitamin A deficiency throughout the country, deworming, PEM (including the baby friendly hospital initiative), the IDD program, and the anemia control program.
5. The Female Community Health Volunteer program throughout the country.
6. The Community Drug Program (CDP) in 10 districts.

WHO. The World Health Organization in Nepal takes a broad-based collaborative approach, working effectively with HMG and its development partners. It does not implement projects but builds capacity, establishes standards and guidelines, works on policy-level issues, mobilizes donors, conducts research, and then advocates for change. WHO uses its resources to catalyze new programs and policies.

WHO in Nepal has provided coordination and mobilization of resources in the following areas:

- Safe motherhood
- Prevention and control of tuberculosis/leprosy
- Disaster preparedness
- Disease surveillance
- Eradication and elimination of polio, neonatal tetanus and measles
- Health lab technology
- Health system research
- Health information and communication
- Healthy cities
- Human resource development
- Nutrition
- Oral health
- Integrated management of childhood illness(IMCI)
- Policy reform and restructuring of health system
- Prevention of blindness and deafness
- Prevention and control of malaria and other vector-borne diseases
- Prevention and control of STD/HIV/AIDS
- Promotion of healthy lifestyle
- Quality of care and health technology
- Rational use of drug
- Resource mobilization, aid management and coordination
- Strengthening district health systems
- Traditional medicine
- Water supply and sanitation

In 1992, WHO provided the Nepali government with technical assistance to initiate their Safe Motherhood plan of action, of which neonatal health is one component. In 1996, WHO worked with UNICEF to develop standard maternity care guidelines on safe motherhood, with a chapter specifically on neonatal care. In 2000, WHO globally changed its focus from safe motherhood work to “Making Pregnancy Safer.”

USAID. United States Agency for International Development is a bilateral organization which supports a variety of Ministry of Health programs, including those being implemented by Engendering Health, JSI, the Nepal Fertility Care Center, and MASS. The focus of USAID’s assistance is in the areas of family planning (with programs in 24 districts), maternal/child health, the control of infectious diseases, and HIV/AIDS. USAID’s MCH program builds on the results of more than ten years of basic research conducted in Nepal to identify ways to target the major causes of childhood illness and death. The various MCH interventions are implemented via an innovative collaboration between the the public sector and a number of NGOs. An important component of USAID’s child health program is its support to female community health volunteers (FCHV). USAID also funds the Child Survival Project in Kanchanpur district, which is being implemented by CARE/Nepal, JHPIEGO, and Maternal Neonatal Health Program/Nepal. Details of the program are given under the Maternal Neonatal Health Program/Nepal heading (next page).

USAID also supports the national vitamin A program, which is estimated to prevent 25,000 child deaths each year. Last year, USAID, JHPIEGO, CEDPA, and JHU/CCP reviewed the status of maternal and neonatal health in Nepal and made a number of specific recommendations. Details of the program are given in the JHPIEGO/CEDPA/JHU heading.

JICA. The Japanese International Cooperation Agency is a bilateral organization that focuses on child and maternal health, community health, school environment, promotion of medical care delivery systems, education, agriculture, and infrastructure.

In health, JICA works through its partners on training Female Community Health Volunteers and on IMCI activities, provides funds for National Immunization Day, supports the development of refrigeration systems for vaccines, and provides support for the development of health messages for school health programs. In addition JICA provides technical support to the government in nutrition programs, focusing on IDD and anemia. In terms of medical delivery systems, JICA has played a large role in the field of decreasing mortality and transmission of TB.

Previously, JICA ran a Primary Health Care project in a few districts to help communities and families develop health-seeking behaviors and provided information booklets for clients when they come to the clinics. While the program was phased-out in 2001, the activities are being continued by the government.

International NGOs and private institutions

Save the Children US. SCF/US has been working in the country since 1980 and is currently implementing Child Survival, Maternal Health/Family Planning, Adolescent Reproductive Health, School Health, and HIV/AIDS/STD prevention and education programs in close coordination with the District Health Offices. Health programs funded by SCF/US private funds are implemented in 5 VDCs of Kailali District and 3 VDCs of Kanchanpur district, all in partnership with local NGOs. It also works in 24 VDCs of Siraha and 12 VDCs of Nuwakot. SCF/US also conducts parenting education, early childhood development and nonformal education programs.

CARE. CARE has several integrated rural development programs in different parts of Nepal, including the Family Health Project in the Mahottari and Bajura districts, which aim to reduce infant mortality and improve the health status of young and pregnant women. Two different models of health services delivery were tested in these districts. In Bajura, PHC emphasized intensive health education activities carried out by trained health personnel, while in Mahottari women who had completed nonformal education classes on health nutrition and sanitation formed health information groups to deliver health messages within their communities. CARE later implemented primary health care activities, which combined elements of both models, in programs in Solukhumbu and Mustang. These programs address health and nutrition problems specific to local communities.

With funding from USAID, CARE recently started a child survival project in the Kanchanpur district. The project is also studying new approaches, such as community birthing centers, and positive ways of encouraging people to address maternal and child malnutrition.

Maternal Neonatal Health Program/Nepal. MNH Program/Nepal is a USAID-funded project led by JHPIEGO in partnership with CEDPA and JHU/CCP that supports the National Safe Motherhood Program efforts by providing technical assistance to promote the survival of mothers and newborns. MNH/Nepal has prepared a comprehensive report on maternal and neonatal health in Nepal. The specific objectives of the program are to:

- Improve the policy environment, facilitate coordination, and strengthen the capacity of the Family Health Division of MoH
- Increase the quality of services in maternal and neonatal health
- Increase demand for and access to services

At the present time, MNH is:

- Helping to develop a 15-year safe motherhood plan of action
- Publishing a safe motherhood newsletter
- Developing a safe motherhood training strategy
- Working on message development and dissemination
- Developing MNH training centers
- Helping to develop an SM training curriculum for ANMs and MCHWs
- Conducting community-based study/research related on SM issues.
- Developing a birth preparedness package

The MNH Program has reviewed global safe motherhood experiences and has developed an Essential Maternal and Neonatal Care (EMNC) package as the foundation for activities and interventions. There are six major components of EMNC.*

JHU/CCP. JHU/CCP started working in Nepal in 1993. Their area of specialty is communications for behavior change in family planning and reproductive health. In 1995, they primarily provided technical assistance to the government to develop and to broadcast two radio programs: a distance learning program for health workers and a soap opera for the general public. Although these programs focused primarily on family planning, they also addressed maternal and neonatal care. JHU/CCP has since phased out of the radio programming, but the serials are continually being updated and rerun by the government.

Since 1999 September JHU/CCP has been working on the Maternal and Neonatal Health Project in Nepal. JSI is the prime manager, while JHU/CCP, CEDPA and JHPIEGO are the cooperating agencies, and CARE and Save the Children US are the implementing partners. This program has three components: training (managed by JHPIEGO), communication (managed by JHU/CCP), and social mobilization (managed by CEDPA). So far, these three groups have been working on standardizing the messages and developing prototypes for radio and print media as well as street theater. These messages all address safe motherhood, with elements of neonatal health built in. The MNH project has worked with the government to develop a seven-year communications strategy for safe motherhood (which should be out in March 2002).

Recently, JHU/CCP has also been working to develop “job aides” for health workers, and Job Aids is now available for the MCHW. This has been field-tested in Kailali district and is ready for finalization.

JHPIEGO. JHPIEGO, which started working in Nepal in 1995, initially focused on family planning and reproductive health. Its primary area of expertise is in training and curriculum development. Currently, JHPIEGO is implementing a reproductive health project and providing training and technical assistance in pre-service and in-service training for health workers on comprehensive family planning and infection prevention practices. JHPIEGO has developed a training site in a family planning clinic where it conducts training of trainers. In addition to the reproductive health project, JHPIEGO is managing the training component of the Maternal and Neonatal Health Project. JHPIEGO has also provided technical assistance to the National Health Training Center and developed curriculum with the government. Recently, JHPIEGO has unified the curriculum for refresher courses for auxiliary nurse midwives and maternal child health workers, adding a neonatal health component in the process. In addition, JHPIEGO has helped the Family Health Division in the government develop a training strategy for safe motherhood (released in March 2002).

Center for Population Development and Activities. CEDPA is an international organization to empower women at all levels of society to be full partners in development by providing them with knowledge and resources to understand, articulate and effectively address their educational, social and reproductive health needs.

CEDPA at present works in six districts of the country—Dhanusa ,Udayapur, Saptari, Kathmandu, Baglung , Kailali, and Doti—in the areas of reproductive health, women’s participation and youth development. CEDPA is involved in three reproductive health projects:

- Enabling project (RH service delivery-CBD)
- Maternal and Neonatal Health Project (MNH-BCC and mobilization)
- JHU/PCS Partner Project (BCC)

In the area of women’s participation, CEDPA has programs such as:

- Women in move project (NFE for neo-literate women)
- ICPD+5 (an advocacy initiative)
- WEI-HEAL (literacy linkage project)

Programs for youth development include:

- Better Life Options (NFE ,vocational skills, advocacy RH/FP)
- Asha-Hope Project (prevention of girl trafficking)

CEDPA is at present working on the Birth Preparedness Package, which is being developed as a tool to encourage families and communities to prepare themselves for normal pregnancies and for obstetric emergencies. The package is in the pilot stage in the Thapapur VDC of Kailali and then will be implemented through Female Community Volunteers (FCHVs), Traditional Birth Attendance (TBAs), and Maternal Child Health Worker (MCHWs).

John Snow, Incorporated. JSI has been working in Nepal continuously for the past 20 years providing support to the MOH for strengthening various health programs. Under the Logistics and Child Health Support Services Project (June 1997 – June 2002), JSI provided technical assistance for the implementation of USAID’s bilateral agreement with the MoH for support to logistics and child health programs. JSI assists the Logistics Management Division in the development, implementation, and institutionalization of an integrated Logistics System Improvement plan to ensure year-round availability of family planning and specific health commodities at all MoH health facilities at the district and sub-district level.

In child health JSI provides technical assistance to the MoH for the conduct of the National CDD, ARI, FCHV and Vitamin A programs. JSI has also assisted the MoH in expanding community-based pneumonia control intervention to 14 districts, supported the expansion of the vitamin A supplementation program for children 6- 60 months to 73 districts (along with NTAG), and coordinated activities to assist the MoH and partners in developing a program to merge IMCI with the CB-pneumonia program, now being implemented jointly as the CB-IMCI initiative.

Under the newly awarded Nepal Family Health Program (NFHP) contract, JSI will work with multiple partners to assist the MoH in an expanded role to strengthen the delivery and use of high impact FP/MCH services delivered at the household and community level. Support will continue to be provided to the National CB-IMCI, Vitamin A and FCHV Programs and be expanded to include the National FP and Safe Motherhood Programs.

United Mission to Nepal. UMN, one of the largest international NGOs in the country, arrived in Nepal in 1953. UMN works in four key areas: health services, engineering and industrial development, education, and rural development. More than 50 percent of its entire program is in health, which is further divided into hospital care, community health programming, and specialized health issues (i.e. TB, HIV/AIDS, mental health, nutrition, oral health, etc.). UMN was the first NGO to train traditional birth attendants. UMN also develops registered nurses and bachelor nurses as part of its IOM program. UMN hospitals are used by many organizations as training sites, in conjunction with the government, to provide post-graduate training to MDGPs and other cadres of health workers.

The hospital care program covers Lalitpur, Tansen and Okhaldhunga, which are part of the government's district hospital system. The community health and development program covers Lalitpur (including sub-municipal and rural activities), Okhaldhunga, Tansen, and Makwanpur. UMN's formal training institutes are the nursing campuses in Lalitpur and Tansen.

German Technical Cooperation. The GTZ has two major health projects: the Primary Health Care Project and the Reproductive Health Project. Of these two, the Reproductive Health Project, which is in the early stages of implementation and needs assessment, focuses more on maternal and neonatal health. While the specific interventions have not yet been defined, the focus of this project is two-fold: to help communities meet their expressed health needs through community development and to improve the government health services at all levels in Achham, Bardia, Dhading, Siraha, and Doti. The Primary Health Care Project has activities in Dhading and Siraha.

Department for International Development. The DFID works in four main areas: reduction of child and infant mortality, reduction of maternal mortality, universal access to reproductive health services, and reduction of HIV infection rates. DFID technical support consists of a health advisor, part of the DFID Nepal team providing strategic and advisory program support, and a technical staff which work on the Nepal Safer Motherhood Project (NSMP) and district health projects. The Civil Society Challenge Fund (CSCF) is a country-wide program organized through British INGOs by DFID. At the national level, DFID provides support for procuring contraceptives and for the national TB and HIV/AIDS programs.

Nepal Safer Motherhood Project. The NSMP supports government hospitals to improve the quality of maternal/neonatal care and the mobilization of community resources to promote quick decision-making in obstetric emergencies and access to transport. NSMP will improve the quality of emergency obstetric care in targeted hospitals in phase one in Baglung, Surkhet, and Kailali districts. Through the District health support project in Baglung, Surkhet, and Rupandehi, NSMP will address the issue of access by investigating barriers to obstetric care that women face and by helping local communities eliminate these barriers.

Plan International Nepal. PLAN International is a sponsorship-child-focused organization with an integrated human development approach. PLAN has been implementing child survival programs in two central districts of Nepal (Bara and Rautahat) with financial support from USAID. Activities include promoting MCH services with a focus on the sub health post level; creating informed demand for services; training health post and sub health post staff with a focus on TBAs, FCHVs and MCHWs; construction, renovation and equipment provision of health posts and sub health posts; promotion of the clean home delivery kit; promotion of iron tablets; and providing support to tetanus and vitamin A programs.

European Committee/UNFPA initiative for reproductive health in Nepal. In 1999, EC and UNFPA began a reproductive health project implemented through five NGOs: Aama Milan Kendra, Environment, Health and Development Advisory Group, Public Health Concern Trust, Family Planning Association of Nepal, and Sunaulo Parivar Nepal. Each of these national NGOs is linked with an international NGO that provides technical assistance.

- Aama Milan Kendra was established in 1975 and is currently engaged in the project called Strengthening Access to Community-Based Reproductive Health which addresses maternal and newborn health care in 243 VDCs of four districts—Morang, Rupandehi, Syangza and Lalitpur—through the efforts of a large cadre of volunteers.
- Environment, Health and Development Advisory Group works on reproductive health issues in the slum areas of Lalitpur and Kathmandu and includes maternal/newborn health in its scope of work.

- Family Planning Association of Nepal is the leading nongovernmental organization working in the field of reproductive health. It provides extensive coverage of family planning services in 34 districts and works on maternal and newborn services by helping expand and strengthen service outlets and ensuring the quality of maternal and child care.
- Public Health Concern Trust is involved in providing maternal and childcare in Kritipur sub-municipal areas.
- Sunaulo Parivar Nepal (a limited guarantee company) is a UK-based charity whose mission is to enable people to have a child by choice not by chance. It supports the government in FP/RH services via its Marie Stopes centers and mobile outreach services, including VSC camps.

MCH Product Pvt. Ltd. MCH Pvt Ltd., a private company established in 1994, designs, field tests and sells low-cost health and health education products to the general public, NGOs, INGOs, Health Training Institutes and government institutions. The company develops model products on demand and also produces and sells clean home delivery kits (CHDK), disposable kits, and a delivery kit box for Traditional Birth Attendants. It has also developed an advanced delivery kit which contains gloves, aprons, and visual instructions (in addition to the regular CHDK materials). CHDKs are distributed and marketed via social marketing to different parts of the country, mainly through the CRS company. MCH Pvt. Ltd. also provides training and technical assistance on health-related issues upon request.

Mother and Infant Research Activities and the Mawkanpur Program. MIRA is an NGO established by a group of medical and health professionals to carry out research on mothers and infants to improve maternal and infant health through research, advocacy, and training. With financial assistance from DFID, MIRA has recently begun a three-year (2001-2003) innovative action research program in the Makawanpur district of Nepal, with the following objectives:

- To develop a generalized, low cost, and potentially sustainable community-based methodology for improving newborn care.
- To evaluate the impact of the intervention on care, behavior, and referral patterns of high-risk infants and on neonatal mortality.

The methodology adopted by the program, which has five phases, involves hiring local facilitators to work with women's groups. In the first phase, community entry is accomplished through existing networks and local facilitators. In the data collection phase, the aim is to produce a social inventory of groups and support structures in order to understand the social context of giving birth, the social actors who are significant to mothers, sources of information, and prevailing practices surrounding newborn care. The diagnosis phase also aims to identify what kind of collective help networks already exist and their potential for developing user groups in the ultimate interventions. Diagnosis is succeeded by the planning phase and, finally, the intervention phase which consists of programs based on the community's own analysis of local problems and resources.

It is hoped that MIRA's research on this project will result in lessons that can be used elsewhere by the various stakeholders in neonatal health.

Nepal Safe Motherhood Network. The Nepal Safe Motherhood Network is comprised of more than 70 I/NGOs, donor agencies, professional organizations, and private firms. These organizations are working hand in hand with the Government of Nepal to achieve the Network's goal: "to improve the status of women by contributing to safe motherhood through advocacy and awareness creation." The Network's activities are designed to:

- ensure adequate government, donor, and private sector resources/services for maternal/neonatal health by sensitizing policy and decision makers about safe motherhood issues.

- strengthen the commitment, capacity, coordination, and effectiveness of the government, donors, international and indigenous NGO's safe motherhood programs.
- establish and sustain district networks to disseminate standardized safe motherhood messages and advocate for safer motherhood at the family and community levels.
- positively influence the knowledge, attitudes, and behavior of families, community leaders, health care providers, and other stakeholders for improved care during the pregnancy, delivery, and postpartum periods.

There is also a Safe Motherhood Subcommittee supported by JHPIEGO and other stakeholders under the Family Health Division in the Ministry of Health, which coordinates the activities of stakeholders in the field of safe motherhood.

5 Future Directions

Assessment of Gaps

In the previous chapters, this situation analysis has identified a number of areas where improvements in neonatal health are urgently needed. Some of the more important ones are recapitulated here to provide context for the remainder of this chapter.

- There is a serious lack of community-based research in Nepal. Most of the existing research has been hospital-based (where less than 10 percent of all births occur), but in such a predominantly rural society, hospital statistics will not begin to tell the whole story. Any decisions, policies, programs, or priorities based on the existing research will not only be suspect but potentially counterproductive. There is, therefore, an urgent need for considerably more community-based research.
- More than 90 percent of all births occur in the home with the assistance of family members or neighbors. This means that truly effective neonatal health interventions must in large part be aimed at the home, albeit supplemented by efforts to equip health facilities and provide skilled personnel for referral cases.
- There is a chronic and worsening shortage of health personnel at the rural sub health posts, health posts, and primary health care centers—the very locations where the need for skilled care is greatest.
- Due to the frequent absence of skilled personnel (who generally come from other districts) at sub health posts, health posts, and primary health care centers, locally hired, lesser-skilled staff such as MCHWs, FCHVs, and TBAs are required to play an increasingly significant role in neonatal health. Every effort should be made to recruit local staff and to place skilled staff, including doctors (see NEW ERA 1997), in their local community, as the evidence has shown that it is easier to retain local staff and that they are more likely to report to work. It should be noted in this context that to date Ministry of Health policy fails to recognize (or at least act on) this phenomenon.
- Presently, health programs at the community level are effectively “owned” by the government rather than the community, even though government policy stresses the importance of community participation. A challenge for the future is how to mobilize the local people and make them owners of local health programs. A related challenge is how to convince people in rural areas, who regard childbirth as a natural as opposed to a medical phenomenon, to take childbirth more seriously, to recognize the vulnerability of the mother and the newborn at the time of birth, and to take steps to prepare for a more healthy at-home delivery and successful maternal and neonatal outcome.
- Neonatal health is not by itself the focus of any existing policy of the government of Nepal.
- To date, neonatal best practices at the community level in Nepal have neither been identified nor disseminated. There are several such practices that should be highlighted and widely publicized.

As a general observation, it should be noted that in most of the public health programs targeted at improving maternal health, services for neonates are mentioned only in passing. There is, consequently, no systematic effort to collect information on newborns and their pattern of illness and death. In the absence of such an effort and of an effective vital registration system, information regarding dead neonates is most likely to be ignored. Consequently, there are no programs aimed at prevention, early detection, and the appropriate treatment of those conditions that cause neonatal deaths.

Future Directions in Brief

Hospital data on newborn health indicate that birth asphyxia, sepsis, low birth weight, prematurity and congenital anomalies are the causes of death in the newborn period. Conditions that predispose a neonate to sickness and death are associated with maternal health; an undernourished, micronutrient-deficient mother is at higher probability of having a low birth weight newborn. Conditions that need to be addressed include the availability of antenatal, delivery, and newborn care services and the low status of women. In addition, some traditional practices, which do not conform to current advances in maternal and neonatal care, are still the norm for a majority of the population.

In this context, there is a need to develop coordination and synergy among programs within SCF and other stakeholders and between various national programs. These national programs are expressed by different strategies, particularly the national reproductive health strategy, safe motherhood (SM) policy, the SM plan of action, SM information, education, and communication strategy, and tetanus toxoid (TT) immunization policy. The coordination between and within the HMG, SCF, and other stakeholders will be achieved within the larger framework of the survival of the newborn.

SNL will achieve reduction in newborn deaths by improving the technologies and approaches available to address these critical needs, focusing national attention on the issue and developing as well as implementing programs. The future direction for SNL in Nepal can be considered under the following headings:

- Advocacy and policy
- Program
- Research

Advocacy and policy

SNL will support efforts to implement policies at all levels that take into account the special needs of newborns and that will lead to research and programs to help this vulnerable group. SNL will advocate for recognition of the rights of newborns, for greater research and understanding, for programs, and for increased resources.

Advocacy for rights. More effort must be made to publicize and protect the rights of newborns and to incorporate these rights into various international protocols and conventions. These rights should be reflected in national policies, development strategies, and laws. To that end, the status of the newborn must be part of the conversation wherever and whenever health issues and health policies are discussed and decided upon.

Advocacy for increased understanding and research. SNL will play an essential role in enhancing the knowledge and understanding of newborn health among policy makers, program managers, service providers, the private sector, civic society, and other stakeholders. There will be efforts to convince all players to prioritize for community-based research, program delivery, human resource development, and behavior change communication.

Advocacy for programs. Advocacy is needed to improve the quality, availability, accessibility, and acceptability of services for the newborn. SNL will work to improve the policy environment to support community interventions such as postnatal contacts with mother and baby and to increasing the presence of skilled delivery care at all births.

Advocacy for resources. SNL will be part of efforts to convince policy makers, program managers, government, donors, and other stakeholders to invest more financial and human resources in the health and survival of newborns. SNL will help also help mobilize community resources to improve newborn care, as well as the resources of the private sector.

Programs

Nepal faces a number of challenges to improving the health and survival of its newborns, but they are challenges that are being successfully addressed elsewhere in the developing world and which do not, by and large, require either high-tech or high-cost interventions. With the help of targeted assistance, aimed mainly at the home and rural community and at the critical link between healthy mothers and their babies, Nepal can expect a brighter future for its newborns.

Essential newborn care in the community. SNL will focus on improving newborn care within the context of existing maternal and reproductive health programs, beginning with programs in the Kailali District of the western Terai and expanding into Siraha in the Eastern Terai. Working with key partners, SNL will prepare training curricula and materials and develop and implement behavior change strategies to improve the quality of newborn care services and increase the demand for antenatal, delivery, and postpartum services at the household and community level. Efforts will target mothers, family members, and community-based health care providers such as traditional birth attendants and village health workers. Special emphasis will be placed on such priority activities as: increasing and testing birth preparedness packages for families (in collaboration with the Center for Development and Population Activities and the Save the Children/Nepal Field Office); supporting newborn parenting programs and maternal tetanus toxoid immunization (with UNICEF, WHO, and the Ministry of Health); and improving the monitoring and evaluation of health interventions. The Ministry of Health has also requested assistance from SNL in developing a national neonatal health strategy.

SNL will help take promising, affordable health interventions to scale, focusing on community-level interventions that have been proven to be effective in reducing neonatal death in low-resource settings. It will focus in particular on interventions that need broad social and community support to achieve their full potential, such as maternal TT immunization, the giving of colostrum, along with exclusive breastfeeding. In most cases, bringing such programs to scale will involve a partnership between government, nongovernment, and private organizations.

Training. Many of SNL's planned interventions will have to be supported by increased training and skills development for a variety of health providers, including maternal/child health workers, village health workers, and traditional birth attendants, as well as the staff in various health facilities. The SNL initiative will review and update the curricula of training programs, develop new materials, and support or carry out training in the following areas: the essential newborn care package for delivery and postnatal home care, counseling and facilitation skills (to support behavior change and as part of efforts to increase the demand for skilled care at delivery), and developing and field-testing job aids and other materials for service providers.

Behavior change communications (BCC). This component of the SNL initiative will emphasize changing the behavior of three key target groups: 1) family members and community health workers; 2) health providers; and 3) national, regional, and local leaders and decision-makers (to encourage their support of newborn care in their policies, programs, and investment strategies). In conformity with SNL's global strategy, activities in Nepal will be carried out in two main areas: behavior change as part of field interventions and in the context of advocacy for policy change. The following practices will be the primary targets of BCC efforts: essential newborn care in the home, birth preparedness, and the recognition of danger signs and knowing when to seek professional help from health providers.

Research

Research will be focused on filling critical gaps in our knowledge of how to design and implement low-cost newborn programs. In some cases, the best interventions have been identified, but in others further research needs to be done. SNL will support research that will advance the state of the art, help in the development of model programs, and increase understanding of traditional practices.

Before the health problems of Nepal's newborns can be addressed, they must first be identified, documented, and publicized. Research, which will be driven by and coordinated with the other activities mentioned above, will focus on three areas: 1) the knowledge, attitudes, and practices of local communities vis-à-vis newborn care, and the social, cultural, and economic factors which influence them; 2) the attitudes and practices of health providers; and 3) the health-seeking behaviors of family members (especially with regard to the role played by traditional healers). Specific research topics will include such issues as family decision-making patterns and community-based management of newborn illness. SNL will support research on developing indicators to measure program achievements and the impact of new policies.

Approaches to Interventions

Collaboration and coordination. SNL will develop and support collaboration with key professional organizations of obstetricians and pediatricians and establish collaborative relationship with other key decision-makers and stakeholders working in the community. It will help partners develop their capacity in such areas as planning, implementation, management, and evaluation of newborn health programs. SNL will identify opportunities for joint action with a variety of other players, such as the Maternal and Neonatal Health Project and the Nepal Safer Motherhood Project, and, in the research sector, the Nepal Health Research Council (NHRC) and MIRA.

Human resource development. SNL will support the human resource base responsible for newborn health, in part by adapting health training curricula and in other efforts to ensure pre-service education and in-service training for health service providers, particularly MCHWs and health volunteers. Among other things, this will help in the early recognition of and appropriate response to danger signs in the newborn during the early postnatal period and in deterring harmful practices. SNL will collaborate with educational and training institutions responsible for human resource development and integrate newborn care into the national health training system.

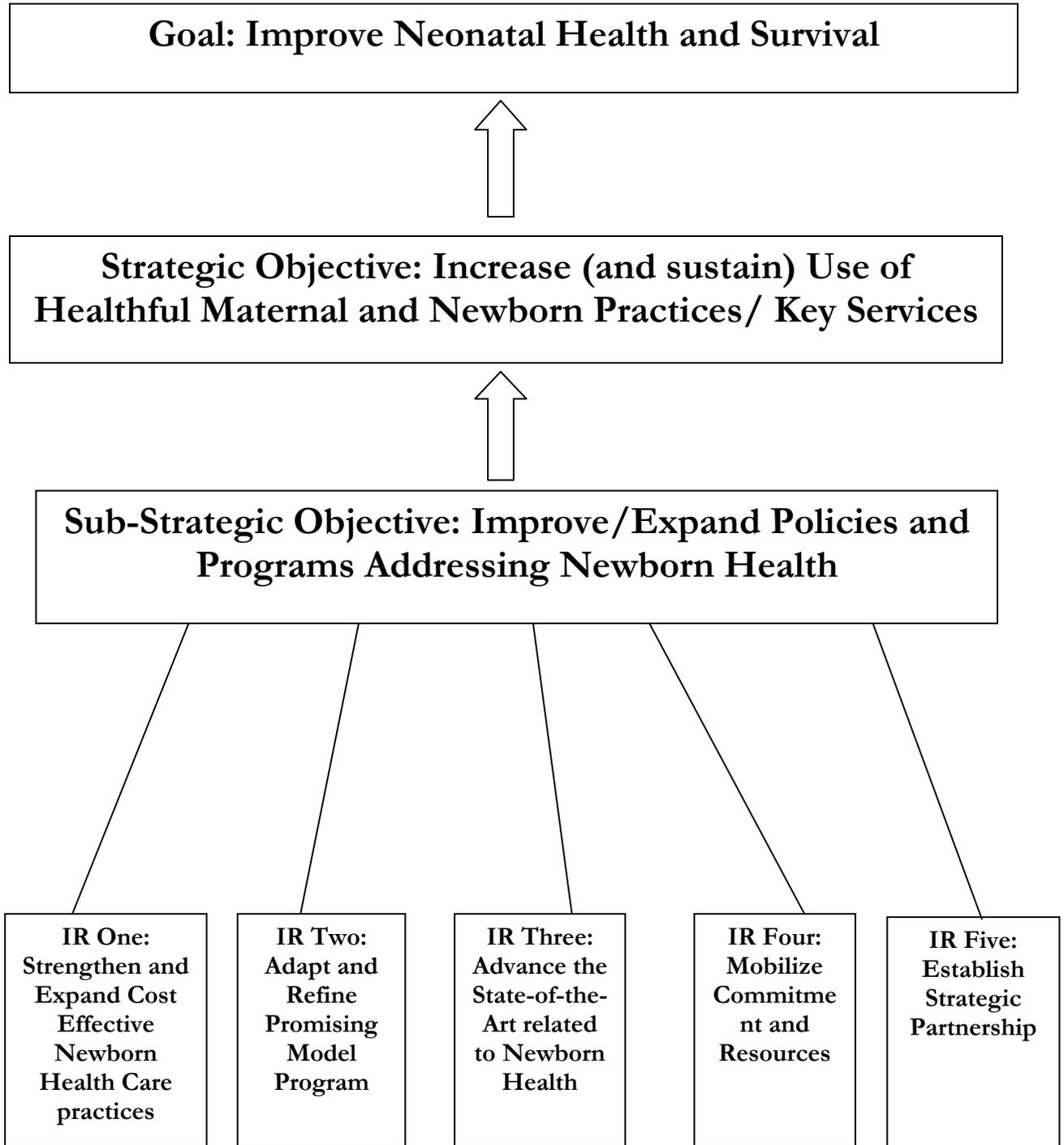
Management strengthening. SNL will support management strengthening in the government, particularly at the district level. Areas to receive support will include planning, monitoring and evaluation, logistics management, and health information management. In addition, SNL will focus on making improvements in health care delivery and on further integrating a newborn care package into the Demographic and Health Survey (DHS), into reproductive health management guidelines, and clinical protocols. This type of support will help bring to scale proven effective interventions like maternal TT immunization.

Increasing knowledge of and demand for care. Many women do not know the proper preventive and curative measures for good newborn health, how to safeguard the health of the newborn and mother and how to recognize and manage potential complications. Therefore, SNL will support efforts to increase the knowledge of and demand for newborn care in all forums and at all levels.

Nepal's newborns face serious challenges to their survival and well-being, but low-cost, low-tech solutions are within reach. There is no reason the interventions that have worked elsewhere to bring down newborn mortality will not work in Nepal. If the call goes out—if the players in Nepal's neonatal health drama will but take up the cause—help is at hand.

Annexes

Annex 1: SNL Strategic Result Framework



Annex 2: An Annotated Bibliography of Research on Newborn Health

Introduction:

Over the last decade, a number of studies have been published dealing with the issues of newborn health in Nepal. This has been possible due to the increase in the number of pediatricians, obstetricians, public health specialists and related professionals, establishment of professional bodies such as Nepal Pediatric Society, Nepalese Society of Obstetricians and Gynecologists and Perinatal Society of Nepal and research agencies such as Mother and Infant Research Activities (MIRA). These developments were supported and strengthened by international agencies (UNICEF, WHO, and UNFPA) and bilateral donors (USAID, DFID, GTZ, and others). Through a number of new professional journals, researchers have been able to publish their findings.. It is important, however, to continually examine the types of research being conducted, their influence on improving the status of newborn health, and their contribution in the design of better health programs for newborn.

This bibliography is an attempt to list the research on newborn health over the last decade in order to identify the major findings and point out the strengths and weaknesses of current trends in research. It is expected that such an exercise would lead to identification of the gaps and suggest the future direction in research. This compilation is based on literature searched both on national and international database, discussion with the colleagues and review of the publications available in SCUS office and Health Learning Materials Center.

Most of the newborn related studies have been conducted in the hospitals. The population or community-based studies are not meant to be directly related to newborn health, but information on newborn is available as additional information.

Mortality:

A number of studies have been published on this topic. Most of these studies were done at the Maternity Hospital in Kathmandu.

Manandhar N; Manandhar DS; Shrestha M reported on their study of early neonatal deaths conducted at Maternity Hospital and published in NPAS J in 1994.

This was a prospective study of all early neonatal deaths (ENND) in the Maternity Hospital, Kathmandu, in one year period (Baisakh - Chaitra 2049, 1992-93 AD). Out of 13367 total births, 13041 were live births and 326 were stillbirths. 237 live births died within 7 days of birth. 31 stillbirths and 18 early neonatal deaths were among babies who weighed 1 kg or less. Extended perinatal mortality rate (EPMR) for the period was 42.12/1000 total births and corrected PMR (that is excluding those weighing 1kg) was 38.59/1000 births. ENND rate was 8.17/1000 live births and when those weighing 1kg were excluded, the ENND rate was 16.81/1000 live births. Out of 237 ENND 139 (58.69p.c.) were male and 98 (41.35p.c.) were females. As expected mortality was highest among extremely low birth weight babies i.e. those weighing 1 kg, and least among those weighing 2.5 kg or above at birth. The mortality rates in those weighing 1kg,1-1.5kg, 1.5-2kg, 2-2.5kg and 2.5kg and above were 94.74p.c., 56.35p.c., 13.2p.c., 1.08p.c. and 0.63p.c. respectively. Mortality rate in the preterm babies (37 weeks) was 64.97p.c., while in the term (37-42 weeks) and postterm babies (42 weeks) were 32.07 p.c. and 2.95p.c. respectively. Those weighing 2.5kg at birth accounted for 73.41p.c. while those weighing 2.5kg and above accounted only 26.59 p.c. of deaths. There were more deaths in the summer months than in the winter months. Severe birth asphyxia was the commonest cause (54.42p.c.), followed by septicaemia (11.81p.c.), respiratory distress syndrome (8.02p.c., congenital anomalies (6.33p.c.) and miscellaneous causes (19.41p.c.). Severe birth asphyxia again was the most important cause of ENND in those weighing 2.5kg or more at birth. Prevention of, or early detection and appropriate management of perinatal hypoxia are the most important intervention strategies in reducing ENND and PMR. Many deaths due to septicaemia and hypothermia could be prevented by taking measures to reduce infection in the special care baby unit and hypothermia in postnatal wards.

Adhikari N; Shah G and Amatya A published a paper titled "Perinatal mortality—a hospital based study" in the NEPAS Journal in 1995 (vol.15 (1) 21-29).

The article is based on an analysis of four thousand and twenty nine consecutive births during the year 2050 B.S. (1993 - 1994) at Patan Hospital, Kathmandu. The perinatal mortality rate (PNMR), still birth rate (SBR) and early neonatal death rates (ENDR) were found to be 20.4/1000, 11.4/1000 and 9/1000 respectively. The preterms had much higher PNMR, SBR and ENDR as compared to term babies. In lower birth weight ranges, mortality was considerably reduced with increased gestation. The outcome of deliveries without antenatal attendance was worse than the ones with antenatal care. The major causes of early neonatal death were hyaline membrane disease, congenital malformations, infections and birth asphyxia.

Manandhar N; Malla K; Manandhar DS: A study of perinatal mortality at the Maternity Hospital, Kathmandu 2050 (1993). Presented to the NESOG conference in 1995.

The presentation was about the perinatal mortality rate of this hospital in the first 6 month period of 2048 (1991). The perinatal mortality rate for the first 6 months of the year 2050 (1993) is presented so as to compare with the previous study. There were 7130 births in the first 6 months of 2050 out of which 6935 were live births and 195 were still births. 199 babies died within 7 days of birth giving a perinatal mortality rate of 55.26 per 1000 births. When those weighing less than 1000 grams at birth were excluded the PMR rate became 48.72 per 1000 births. The PMR in the same period 2 years ago was 46.2 and when those weighing less than 1000 grams were excluded it was 40 per 1000 births. As expected the rate was high among very low birth weight babies, and low in those weighing above 2 kg and more. Like in previous study there were more male perinatal deaths than females. Intrauterine asphyxia (38.5%) was the most important cause of still births, other causes being placental insufficiency (10.7 %), congenital anomalies (8.7%), cord prolapse (8.7 %), antepartum haemorrhage (7.7%), miscellaneous causes (5.7%). In 20% of stillbirths no definite cause could be described. Among the causes of early neonatal deaths, severe birth asphyxia was the most common (30.7%), other causes being respiratory distress syndrome (26.6%), septicaemia (13.1%), congenital anomalies (2.5%) and miscellaneous causes (27.1%). There has been no decrease in perinatal mortality, in fact the rate has gone up. Severe birth asphyxia, respiratory distress syndrome and septicaemia are the most important causes of early neonatal deaths and intrapartum asphyxia, placental insufficiency and antepartum haemorrhage are the common causes of still births. Most of the perinatal deaths due to these caustive factors could have been reduced by better care during delivery and after birth specially by taking measures to prevent infection. Early detection of intrapartum asphyxia, timely and appropriate intervention for early delivery of asphyxiated babies and prompt and adequate resuscitation of asphyxiated babies would be the most important intervention measures to be taken to reduce such high perinatal deaths in this institution. Exclusive breast feeding to all the newborns in the hospital i.e. making the hospital completely baby friendly will help in reducing neonatal deaths due to infections.

Geetha T; Chenoy R; Stevens D; Johanson RB had published an article titled "A multicentre study of perinatal mortality in Nepal" in Pediatric and Perinatal epidemiology 1995, 9(1):74-89.

This prospective survey was carried out in 2 Kathmandu hospitals and 2 rural districts to establish urban and rural perinatal mortality rates (PNMRs) and to ascertain the causes of perinatal mortality. The sites chosen for community-based studies were in Lalitpur district in the Kathmandu valley and Jumla in the remote north-west of Nepal as the second site. All perinatal deaths occurring over a 1-year period in the 4 centres were included. Cause of death was established by contemporary review of hospital case records or by structured questionnaire in the rural areas. The previous pregnancy was a live birth in 82 percent of cases at the Maternity Hospital, in 76 percent at Patan Hospital, in 87 percent in Jumla, and in 79 percent of cases from Lalitpur. On the other hand the overall poor outcome from previous pregnancies appeared to correlate with the present perinatal mortality rates. The PNMRs in the hospitals were 48.0 and 23.7 per 1000 total births, respectively, while those of the rural settings were 96.2/1000 and 42.5/1000 births. Perinatal asphyxia, low birth weight, and infection were the most common causes, but many of the deaths were unexplained. 32 percent of women at the Maternity Hospital had a previous pregnancy loss compared with 29 percent at Patan Hospital, 24 percent at Lalitpur and at Jumla. At Patan Hospital nearly 90 percent of patients had attended an antenatal clinic. Conversely, at the Maternity Hospital only 40 percent of women with a perinatal loss had received antenatal care; and in Jumla and Lalitpur less than 20 percent of women had. In Jumla 79 percent of the perinatal deaths were preterm and in Lalitpur 50 percent. At Patan Hospital, the PNMR in this

weight category was 769.2/1000 and at Maternity Hospital 876.6/1000 total births. PNMRS were higher for male infants in the Maternity Hospital (51.7/1000 vs. 43/1000), in Patan Hospital (32/1000 vs. 15/1000), and in Jumla (108/1000 vs. 81/1000). Recognised risk factors for perinatal mortality were confirmed, such as increasing parity, increasing age, and being male.

Birth asphyxia:

The group of researchers associated with MIRA extensively studied the problem of birth asphyxia. Most of the studies described here were conducted by MIRA in Maternity Hospital.

Malla K; Manandhar DS; Shakya U; Manandhar N have published their study of antepartum and intrapartum factors in severely asphyxiated babies born at the Maternity Hospital, Thapathali in the year 1995.

This study was based on a prospective analysis of perinatal deaths and it has revealed that birth asphyxia was the most important cause of perinatal deaths. This study was done to find out antepartum and intrapartum factors which were present in severely asphyxiated babies born in this hospital. The study includes all affected babies in one year period from Poush 2049 to Marg 2050 (Dec. 1992 - Dec. 1993). Severe birth asphyxia was defined as an Apgar score of 3 or less at 1 minute after birth. Details of the antenatal and intrapartum period of pregnant women, who delivered severely asphyxiated babies, were taken soon after a diagnosis of severe birth asphyxia was made. Out of 13,732 total births 13,383 were live births and 653 babies were found to be severely asphyxiated at birth giving an incidence of 47.6/1000 total births and 48.8/1000 live births. There were 2704 admissions in the special care baby unit in that period and severely asphyxiated babies accounted for 24.15% of total admissions in the unit, 90 babies (13.78 % of affected babies) died and 7 babies (1.07%) showed evidence of early brain damage. Among the mothers who delivered severely asphyxiated babies, 141 mothers (21.59%) were aged 19 years, 473 mothers (72.43%) were aged between 19-30 years and 39 mothers (5.97 %) were above the age of 30 years. Majority (57.58%) were primiparas and only 41.96% had 2 or more antenatal check ups. Most of the pregnant women (81.93%) were from low socio economic class. 4.4% of the mothers gave history of previous still births and 4.9% of them had previous neonatal deaths. Nearly 23% of the deliveries were preterm and 7% post term. Foetal distress was present in 11.7% of mothers at the time of admission while in 21.8% it was detected after admission. No foetal distress was noted in 66.6% of asphyxiated babies. While monitoring was done at 1-2 hourly intervals in nearly 50% of the mothers, the interval was more than 2 hours in 21.9% and no monitoring was done in 28.9% of the mothers. The time interval between diagnosis of foetal distress and intervention was more than 1 hour in 66% and the delay was more than 2 hours in 26%. Caesarian section had to be delayed over 2 hours in 10 cases due to non availability of operation theatre. Poor antenatal check up in majority of the mothers, lack of or delay in intervention are 3 important reasons for such a high incidence of severe birth asphyxia among babies born in this hospital. While improving antenatal check up rate will take sometime and is beyond the control of the hospital at the moment, serious thoughts must be given in early diagnosis, appropriate and timely intervention of foetal distress once pregnant women are admitted in the hospital. Frequent monitoring and using electronic monitoring devices in high risk pregnancies and use of partograph will help in early diagnosis of foetal distress. While equipments play an important role, the most important factors will be awareness and conscientious outlook among the health care professionals in reducing not only birth asphyxia but also in improving the overall services of the hospital.

Ellis M, Manandhar DS, Manandhar N, Wyatt J, Bolam AJ and Costello AM published a paper titled "Stillbirths and neonatal encephalopathy in Kathmandu, Nepal.

An estimate of the contribution of birth asphyxia to perinatal mortality in a low-income urban population" in *Pediatr.Perinat.Epidemiol.* 2000 Jan; 14(1):39-52. In this article, the researchers describe a prospective cross-sectional survey over a 12-month period in the principal maternity hospital of Kathmandu, Nepal, where over 50% of the local population deliver. The study aim was to estimate the contribution of birth asphyxia to perinatal mortality in this setting. During 1995, there were 14,371 livebirths and 400 stillbirths, a total stillbirth rate of 27 per 1000 total births. The fresh term (2000 g or more) stillbirth rate was 8.5 per 1000 total births [95% CI 7.1, 10.1]. Ninety-two cases of neonatal encephalopathy (NE) affecting term infants were detected (excluding those due to congenital malformations, hypoglycaemia and early neonatal sepsis). The birth

prevalence of NE was 6.4 per 1000 livebirths [95% CI 5.2, 7.8]. There was evidence of intrapartum compromise in 63 (68%) of the cases of NE and 65 (76%) of the stillbirths, but only in 12 (12%) of controls. The cause-specific early neonatal mortality rate for NE was 2.1 per 1000 livebirths [95% CI 1.4, 3.0]. Combining the NE deaths and fresh stillbirths gives an upper estimate for term birth asphyxia perinatal mortality rate of 10.8 per 1000 total births [95% CI 9.2, 12.6], 24% of all perinatal deaths before hospital discharge. This study suggests that birth asphyxia remains an important cause of perinatal mortality in developing countries.

Ellis M, Shrestha L, Shrestha PS, Manandhar DS, Bolam AJ and Costello AM authored a paper titled "Clinical predictors of outcome following mild and moderate neonatal encephalopathy in term newborns in Kathmandu, Nepal" in *Acta Paediatr.* 2001 Mar; 90(3): 316-22.

In this paper they have described a clinical grading system for the assessment of neonatal encephalopathy developed for a large prospective study in Kathmandu. Inter-observer variability testing of this system on 27 infants showed high agreement (kappa value 0.87). Validity for the prediction of major neurodevelopmental impairment at 1 y of age was tested using a cohort of 57 survivors of encephalopathy, all of whom were assessed using a combination of the Denver Developmental Screening Test and Bailey 2 at 1 y. The authors compared this with a modification of a scoring system previously validated in Cape Town. Both schemes converted a pretest probability of 31% (the prevalence of major impairment at 1 y of age in this cohort) to a post-test probability of 55%. This showed only marginal improvement over the traditional risk marker of neurological abnormality at discharge (post-test probability 51%). At 6 wk of age acquired microcephaly increased the probability of major impairment to 79%. The study had concluded that it seems to make little difference both in practical or predictive terms whether one describes the neurological condition of the neonate using a descriptive or scoring system. The important thing is to perform repeated systematic neurological examinations on a daily basis during the neonatal period. Many clinicians will justifiably continue to use the discharge examination as the deciding factor for the need for continued neurodevelopmental surveillance.

Ellis M, Manandhar N, Manandhar DS and deL Costello AM: "An Apgar score of three or less at one minute is not diagnostic of birth asphyxia but is a useful screening test for neonatal encephalopathy" in *Indian Paediatr.* 1998 May; 35(5): 415-21.

The objective of the study was to evaluate the relationship between an Apgar score of three or less at one minute of life and the subsequent risk of developing neonatal encephalopathy (NE). The study used a prospective design. The study was conducted in the maternity hospital of Kathmandu, Nepal. All liveborn infants over a 12 month period with a birthweight of 500 g or more were assessed by the Apgar scoring system at one minute of age. All term infants with neurological abnormalities presenting in the first day of life were systematically examined and described according to a conventionally defined encephalopathy grading system. Major congenital malformations and neonatal infections were excluded. The results of the study were: Over 12 months there were 14,771 total births of a weight of 500 g or more of which 14,371 were live births and 400 were stillbirths. Of 734 infants with 1 min Apgar of three or less, 91 developed NE. The positive and negative predictive values of 1 min Apgar of three or less for NE were 11.4% and 99.9%, respectively. The probability of developing NE rose from 0.6% (amongst all infants born at this hospital) to 11.2% (amongst infants born with a one minute Apgar of three or less). The conclusions of the study were as follows: An Apgar score of 3 or less at one minute is a useful screening test for clinically significant birth asphyxia (NE). It overestimates by eight fold the scale of the birth asphyxia problem, but identifies a high risk group requiring further observation of their neurological condition.

Hypothermia:

Ellis M; Manandhar N; Shakya U; Manandhar DS; Fawdry A; Costello AM published the results of their study on hypothermia in *Archives of diseases of children (Foetal and neonatal edition)* 1996; 75(1): F42-5 in an article titled "Postnatal hypothermia and cold stress among newborn infants in Nepal monitored by continuous ambulatory recording."

The objectives of the study were to describe the pattern of hypothermia and cold stress after delivery among a normal neonatal population in Nepal; to provide practical advice for improving thermal care in a resource limited maternity hospital. The methods used were to monitor the temperature of newborns at the maternity hospital in Kathmandu, Nepal, Thirty five healthy term neonates not requiring special care were enrolled for study within 90 minutes of birth. Continuous ambulatory temperature monitoring, using microthermistor skin probes for forehead and axilla, a flexible rectal probe, and a black ball probe placed next to the infant for ambient temperature, was carried out. All probes were connected to a compact battery powered Squirrel Memory Logger, giving a temperature reading to 0.2 degree C at five minute intervals for 24 hours. Severity and duration of hypothermia, using cut-off values of core temperature less than 36 degrees C, 34 degrees C, and 32 degrees C; and cold stress, using cut-off values of skin-core (forehead-axilla) temperature difference greater than 3 degrees C and 4 degrees C were the main outcome measures. The results of the study showed that the twenty -four hour mean ambient temperatures were generally lower than the WHO recommended level of 25 degrees C (median 22.3 degrees C, range 15.1-27.5 degrees C). Postnatal hypothermia was prolonged, with axillary core temperatures only reaching 36 degrees C after a mean of 6.4 hours (range 0-21.1; SD 4.6). There was persistent and increasing cold stress over the first 24 hours with the core-skin (axillary-forehead) temperature gap exceeding 3 degrees C for more than half of the first 24 hours. Conclusions drawn were that the continuous ambulatory recording identifies weak links in the "warm chain" for neonates. The severity and duration of thermal problems was greater than expected even in a hospital setting where some of the WHO recommendations had already been implemented.

Manandhar N, Ellis M, Manandhar DS, Morely DS and deL Costello AM have reported on their experience with the used of Liquid crystal thermometry in an article titled: "Liquid crystal thermometry for the detection of neonatal hypothermia in Nepal" in J.Trop.Pediatr. 1998Feb;44(1):15-7.

The researchers assessed the sensitivity, specificity and likelihood ratio of a low cost liquid crystal strip thermometer (LCT) compared with axillary mercury thermometry for the detection of neonatal hypothermia in Nepal. The subjects were 76 healthy newborns in the government maternity hospital of Kathmandu, Nepal in winter. The validity of LCT for the detection of neonatal hypothermia (less than 36 degrees C) showed a sensitivity of 83 per cent, specificity 96 per cent, positive predictive value 98 per cent and a likelihood ratio of 23. Use of LCT on newborns in this setting raises a measured pretest probability of first day hypothermia of 63 per cent to a post-test probability of 97 per cent. Liquid crystal thermometry is a simple, low-cost, and valid method for identifying core hypothermia in newborns. It is ideal for isolated rural communities where LCT strips could be added to delivery kits.

Johanson RB; Spencer SA; Rolfe P; Jones P; Malla DS :Effect of post-delivery care on neonatal body temperature. Acta Paediatr. 1992 81(11): 859-63.

A prospective observational study of post-delivery care and neonatal body temperature, carried out at the Maternity Hospital in Kathmandu was followed by a randomized controlled intervention study using three simple methods for maintaining body temperature. There were 500 infants in the initial observaiton study and 300 in the intervention study. In the observation study, 85p.c. (420/495) of infants had temperatures 36 degree C at 2 h and nearly 50p.c. (198/405) had temperatures 36 degree C at 24 h (14p.c. were 35 degree C). Most of the infants who were cold at 24 hours had initially become cold at the time of delivery.

Hypoglycaemia:

Ellis M, Manandhar DS, Manandhar N, Land JM, Patel N, de L Costello AM: Comparison of two cotside methods for the detection of hypoglycaemia among neonates in Nepal in Arch Dis Child Fetal Neonatal Ed.1996 Sep; 75(2) 122-5

The aims of the study were to compare two cotside methods of blood glucose measurement (HemoCue and Reflux II) against a standard laboratory method for the detection of neonatal hypoglycaemia in a developing country maternity hospital where hypoglycaemia is common. 94 newborn infants and 75 of their mothers had blood glucose assessed on the same venous sample using three different methods in the Special Care Baby

Unit and postnatal wards, Prasuti Griha Maternity Hospital, Kathmandu, Nepal: HemoCue and Reflolux II at the bedside; Roche Ultimate glucose oxidase method (GOM) in the laboratory. The results of the study revealed that the mean (SD) values for blood glucose in newborn infants were GOM 2.5 (1.1) mmol/l; Reflolux II 2.1 (0.9); and HemoCue 4.2 (1.2). For mothers the values were GOM 5.3 (1.2) mmol/l; Reflolux II 3.6 (1.2); and HemoCue 5.6 (1.0). Bland-Altman plots showed that Reflolux II consistently underreads GOM blood glucose in neonates by 0.5 mmol/l (SD 0.7) and that HemoCue overreads glucose by 1.7 mmol/l (SD 0.8). For the detection of hypoglycaemia (< 2.0 mmol/l), Reflolux II achieved a sensitivity of 83%, a specificity of 62%, and a likelihood ratio of 2.2. HemoCue produced a sensitivity of 0% and a specificity of 100% using measured values. If 2.0 mmol were subtracted from all HemoCue values this rose to 81% and 68% and a likelihood ratio of 2.5. The study concluded that although more accurate than Reflolux II for the measurement of blood glucose in mothers, HemoCue overreads glucose concentrations in neonates and is therefore potentially dangerous as a screening method for neonatal hypoglycaemia. Reflolux II is useful as a screening method for high risk infants (low birthweight, post-term) and could achieve a post-test probability of detecting hypoglycaemia in a high risk setting like Nepal of 50-60%.

Hyperbilirubinaemia:

Shakya U; Manandhar DS; Shrestha BL; Manandhar N; Shrestha M published the findings of their prospective study on incidence and causes of severe neonatal hyperbilirubinaemia in NEPAS J 1994.

A prospective study of incidence of severe neonatal hyperbilirubinaemia (SNHB) i.e. a total serum bilirubin of 15 mg or more per 100 ml of blood in neonates born at the Maternity Hospital, Kathmandu (Prasuti Griha) in one year period from 1st Poush 2049 to Marg 2050 corresponding to 16 December 1992 to 15 December 1993 was made. A total of 284 babies were found to have total serum bilirubin (TSB) of 15 mg or more per 100 ml of blood. There were 13,383 live births, and 2704 babies were admitted in the special care baby unit (SCBU) of the hospital during that period, giving an incidence of 21.2/1000 live births and 10.5% of total admissions in SCBU. More males were affected than females (168/116) and there was increased incidence of SNHB during summer months. There was also increased incidence of septicaemia during summer months which accounted for increased incidence of SNHB. Detailed investigations - Haemoglobin, blood group, Glucose 6 Phosphate Dehydrogenase enzyme (G6PD), total and direct bilirubin (when TSB was 20 mg%), total and differential leucocyte count and blood culture (when septicaemia was suspected) of the baby and blood group of the mother were done in 100 babies in 4 month period i.e. from 1st Bhadra 2050 to 30th Marg 2050. The main causes of SNHB were prematurity (28%), ABO incompatibility (19%), Traumatic delivery (9%), Septicaemia (7%), RH incompatibility (3%), G6PD deficiency (3%) and unknown in 31%. All of these babies received phototherapy and 4 babies required exchange transfusion, some requiring more than once. 9 babies expired but the cause of death was due to septicaemia or immaturity rather than hyperbilirubinaemia per se.

Rajbhandari S; Manandhar DS; Vaidya U; Shrestha LN reported the findings of a prospective study in 500 neonates born at the Maternity Hospital, Kathmandu for G6PD enzyme deficiency screening in neonates in NEPAS J, 1994.

Five-hundred neonates born at the Maternity Hospital, Kathmandu were screened for deficiency of G6PD enzyme by methaemoglobin reduction test in 3 months period between September-November '93. 23 babies (4.8%) were found to be deficient of G6PD enzyme. 12 babies (52.2%) were male and 11 babies (47.8%) were females. While parents of 11 (47.8%) babies were of Kathmandu, the rest i.e. 12 babies (52.2%) were from outside Kathmandu. Among 23 babies, 7 (30.4%) were of Newar families, 5(21.7%) from Brahmin families, 3 (13.0%) from Magar families, 2 (8.7%) from Chhetri families and 6 (26%) from other different communities. 2 babies developed moderate jaundice with maximum total serum bilirubin being 14.1 mg/dl and 13.8mg/dl. They responded well to phototherapy. 2 out of 12 mothers who were screened showed deficiency of the enzyme but none of the 6 fathers who were screened showed deficiency. This study has shown the presence of G6PD enzyme deficiency among various ethnic groups from Kathmandu and outside Kathmandu. Similar studies in other parts of the country would help in defining the extent of the problem among the Nepalese population. Use of certain drugs, contact with certain chemicals and taking certain food items can lead to acute haemolytic crises and severe neonatal hyperbilirubinaemia. Hence prior knowledge of deficiency of G6PD enzyme would help in preventing acute haemolytic anaemia or severe neonatal hyperbilirubinaemia by avoiding such drugs, chemicals of food items.

LBW:

Malla DS. Low birth weight, infant morbidity and mortality, a report published by Maternity Hospital in 1994.

This was a descriptive study with the objectives of determining low birth rate and risk factors related to birth weight for which specific preventive intervention is feasible. The study was carried out in Maternity Hospital of Kathmandu and at a community setting in the neighbouring area of the hospital. A total of 11879 deliveries were registered in the hospital of which 2459 (20.7%) were low birth weight as measured within 24 hours of deliveries. The factors having adverse effect on birth weight were: a. Low socio-economic (group) status b. Heavy work load during pregnancy c. Use of smoke producing cooking fuel. The average birth weight is 2779.9 g. The low birth weight rate is 20.7 percent. Indicator for effect on weight is taken as change in 250 g. The status of maternal health in this group was good on an average because the delivery station is in the urban area and about 60 percent of mothers come from centre. Factors affecting neonatal death : (i) Prematurity (ii) Low birth weight. Recommendations: (1) The findings should be discussed among the different category of health workers. (2) Messages may be conveyed to the mothers informing about the factors adversely affecting the foetal weight. (3) The detailed study is to be done to see other risk factors like vaginal infection and safe delivery.

Dali SM; Shrestha PN; Rijal B; Shrestha PS; Koirala S. Low birth weight: a study of 1000 live births at Tribhuvan University Teaching Hospital.(Mimeograph published by TU Teaching Hospital), 1989.

A total of 1000 consecutive live births delivered at the Tribhuvan University Teaching Hospital were studied in order to measure their birth weight and to identify factors influencing birth weight. Birth weights of the new born babies ranged from 1000 gm to 4450 gm with a mean of 2906 gm and standard deviation of 504. The incidence of low birth weight (LBW) i.e. birth weight below 2500 gm was 20.4 p.c. Predisposing risk factors for LBW were identified as previous still birth, short inter-pregnancy interval, non-use of contraceptives, short stature of mother and poor nutritional status of mother. The study did not identify any other significant risk factor. Implications and limitations of the study are discussed and recommendations are made for reducing LBW incidence.

Detection of Low Birth Weight newborns by foot length as proxy measure for birth weight: Shah SS, 1999: (Study conducted at TUTH as a Postgraduate thesis).

The majority of births in rural Nepal take place at home. Lack of weighing facilities make early and reliable identification of low birth weight babies difficult. One thousand live newborns of gestational ages 26-44 weeks were studied at Tribhuvan University Teaching Hospital, Neonatal Unit to find out the correlation between birth weight and foot length and to detect low birth weight newborns by using foot length measurement as proxy measure of birth weight. The foot length, crown heel length, head circumference, chest circumference and birth weight were recorded within 24 hours of birth. Foot length measurement showed highest correlation ($r= 0.92$) among various anthropometric measurements with birth weight. The correlation between foot length and other anthropometric parameters were higher in preterms than in term babies. The formula, length= foot length $\times 6.5$ +/- 20mm correlated positively. Thus it was concluded that when it is difficult to weight or measure the length accurately, foot length can serve as a useful measurement to assess baby quickly, especially in preterms nursed in incubators. The results showed a sensitivity of 70.6%, a specificity of 98.5% and a positive predictive value of 89.7% for identifying low birth weight newborns. The sensitivity, specificity and positive predictive value, all were 100% for very low birth weight newborns. The study concluded that foot length measurement can significantly enhance the yield of identification of LBW babies.

Advocacy :

Shrestha RPB: Nationwide neonatal service in relation to neonatal work in K.C.H. - a suggestion. NEPAS J, 1995, 15(1): 12-20

Starting with the evolution of neonatology, the article briefs about its important contribution for reducing perinatal and neonatal mortality. Nepal is one of those countries which has a very high perinatal and neonatal mortality. The infant mortality rate, which was 102 in 1992, is to be reduced to 50 by the year 2000. The

article shows that nearly 50 percent of childhood deaths occur in the first month of life and about a third of all first year death occur on the first day. The major problems in neonatal period leading to morbidity and mortality are prematurity and low birth weight, birth asphyxia and trauma, prenatal, natal and postnatal infections. Then, the article proceeds with brief description of neonatal care service in Kanti Children Hospital regarding its various resources, equipments, activities, services, constraints and other experiences. The hospital being a specialised one, has developed a special Neonatal Care Unit which has been upgraded from time to time depending upon need & its resources. It was remodeled in 1986 and was provided with equipment to operate 4 intensive care, 4 intermediate care beds and 12 cots. Altogether 1809 cases were admitted in this unit since its beginning to the end of 2050 (1992-93). The overall mortality was 33.8 percent. Then the article highlighted upon the present situation of neonatal care in the country. According to its suggestion, for the improvement of neonatal care, there is need of categorization of the level of care to be provided at various tier of the system. They include: (i) Community level care that can be provided at health posts, sub-health posts etc. (ii) Primary level care that can be provided at primary health care and district hospitals, (iii) Secondary level care that can be provided at zonal and regional level hospitals and (iv) Tertiary level care that can be given in specialized centres i.e. central/national level hospitals. For the development of nationwide neonatal service in the country, the article suggests following major points (i) Development of a Perinatal Centre to serve high risk pregnancies referred from all over the country, (ii) Categorization of existing services, (iii) co-ordination exchange of activities at central level, (iv) Training of all cadres of health workers, (v) Starting of a national monitoring system, (vi) Feedback system for planning and (vii) Formation of a neonatology forum.

Manandhar DS: Reducing perinatal mortality - time to focus. NEPAS J, 1992; 12(1): 33-34

Perinatal Mortality Rate (PMR) is considered as a good indicator of the services provided to the mothers and newborns. PMR has been brought down to a very low figure in many developed countries It is still very high in many developing countries including Nepal. Neonatal deaths constitute nearly 60 p.c. of the infant mortality in India and early neonatal deaths nearly 25 p.c. of the infant deaths . With immunisation, oral rehydration therapy, attention to early management of acute respiratory infection and infant malnutrition, considerable progress has been made in reducing post neonatal infant deaths. So far there has been no appreciable efforts in reducing perinatal and neonatal deaths.

Shrestha PS: Care of newborns. NEPAS J, 1995 15(1): 48-54

In this paper Shrestha PS makes the following suggestions to improve newborn health: Though neonatal paediatric field is a relatively new one in relation to other specialities, its importance and significance have now been well recognized in most part of the world resulting its further development. In most of the developed countries, neonatology has further expanded to perinatal care as well. The concept of perinatal care identification and proper management of high- risk pregnancy and in utero transfer to highly specialized perinatal centres has been developed. But in developing countries like Nepal the well being of the newborn baby is of least priority most probably due to consistently high neonatal mortality. The article stresses on the need for developing a system of periodic antenatal monitoring with necessary intervention and effective health education for protecting the foetus and pregnant mother from the untoward effect of lack of nutrition and for providing safe environment. The article reveals a very poor health status in Nepal which is indicated by very high infant mortality rate (as 107.3 per 1000), increasing maternal morbidity and mortality rate, lower life expectancy as 53 years, high percentage of child population, early marriage resulting too many pregnancies leading to pregnancy complications and undesirable health results etc. In order to improve the neonatal services, the article has proposed various plans and options as: (1) Development of various levels of neonatal care such as Community level care through sub-health posts and health posts, Level I care or Primary care through primary health care centres and district hospitals, Level II care or Secondary care through zonal and regional hospitals and training centres and Level III care or Tertiary care through specialized centres ie. (i) central/national level hospitals; (ii) Identification of one of the maternity units in close proximity to tertiary care centre as a perinatal centre; (iii) clear identification and categorization of the existing neonatal services including private nursing homes and maternity centres; (iv) coordination among all service units for sharing of ideas and experiences, (v) provision of different level of training programmes for different level of health workers/professionals, (vi) Development of a national monitoring centre for nation-wide monitoring of perinatal and neonatal morbidity and mortality (vii) Establishment of a Neonatology forum for appropriate

suggestion for further planning and improvement in the neonatal service. Besides, the article makes the Nepal Paediatric Society aware about its goals and objectives i.e. to be serious for care and welfare of children from womb itself. It also stresses on the need of incorporating the enough neonatal activities in each national plans in order to save newborns'life in future.

Intervention: Health Education

Dali SM; Thapa M; Shrestha S. Knowledge, attitude and practice of mothers-in-law regarding the intraconceptional care of their daughters-in-law before and after educational session. Yr: 1995.

The joint family system is widely prevalent in Nepal. The mother-in-law; in our society, is the key person of the family, a decision maker in relation to family upbringing and family welfare activities. She is the one who controls the activities of family members. Many traditional beliefs, regarding motherhood, are not safe, such as not sending for regular antenatal check-up, conducting delivery at home without precautions against sepsis, cutting the cord with unsterile instruments, restricting certain foods during the antenatal and postnatal period, etc. Therefore, education is needed to change their attitude, knowledge and practice regarding safe motherhood. With this in mind, an educational session was planned to increase the knowledge, attitude and practices of mothers-in-law regarding intraconceptional care and safe delivery of their daughters-in-law, in order, to reduce maternal mortality and morbidity. The seminars focused on the importance of antenatal care in the detection of high risk pregnancy, care during labour and delivery, and postnatal care including family planning methods. Self explanatory pictorial charts were used for the same. K.A.P. evaluation was done before and after the educational sessions. The assessment revealed marked improvement in knowledge and attitude as well as an appreciable degree of change in practice. It was concluded that mothers-in-law could be trained using visual literacy methods. This will certainly promote safe motherhood by decreasing maternal mortality and morbidity in Nepal.

Dali SM; Thapa M; Shrestha S: Safe motherhood initiative: study on "The knowledge, attitude and practice of mothers-in-law regarding the intraconceptional care of their daughters-in-law before and after educational sessions".YR: 1991.

This study was concerned with the evaluation of educational interventions directed at mother-in-law and aimed to improve effective use of maternal health services. This study has taken into account the traditional and cultural aspects of the Nepalese society. The main thrusts included exploration of traditional beliefs and practices related to intraconceptional care and development of a process directed at changing harmful practices in illiterate women in rural Nepal. The team thus attempted to identify a suitable target group for receiving relevant information. This study was carried out in Mahankal near Kathmandu. As only two villages of the Kathmandu Valley were covered the sample of mothers-in-law is not representative of the country as a whole nor of any one cultural group within the country. Also the study was limited to women willing to participate fully and the numbers involved was fairly limited.

Bolam A, Manandhar DS, Shrestha P, Ellis M, Costello AM: The effects of postnatal health education on infant care and family planning practices in Nepal: A randomized controlled trial. BMJ 1998 Mar 14; 316 (7134): 805-11

This study was aimed at evaluating the impact of postnatal health education for mothers on infant care and postnatal family planning practices in Nepal. The study design was a randomized controlled trial with community follow up at 3 and 6 months post partum by interview. Initial household survey of study areas to identify all pregnant women to facilitate follow up. The study was carried out in maternity hospital in Kathmandu and follow up was done in urban Kathmandu and a periurban area southwest of Kathmandu. 540 mothers randomly allocated to one of four groups: health education immediately after birth and three months later (group A), at birth only (group B), at three months only (group C) and none (group D). The interventions consisted of structured baseline household questionnaire; 20 minute, one to one health education at birth and three months later. The main outcome measures assessed were duration of exclusive breast feeding, appropriate immunization of infant, knowledge of oral rehydration solution and need to continue breast feeding in diarrhoea, knowledge of infant signs suggesting pneumonia, uptake of postnatal family planning. The results showed the mothers in groups A and B (received health education at birth) were slightly more likely to use contraception at six months after birth compared with mothers in groups C and D

(no health education at birth) (odds ratio 1.62, 95% CI 1.06 to 2.5). There were no other significant differences between groups with regards to infant feeding, infant care or immunisation. The study concluded that the recommended practice of individual health education for postnatal mothers in poor communities has no impact on infant feeding, care or immunization, although uptake of family planning may be slightly enhanced.

Bolam A, Manandhar DS, Shrestha P, Ellis M, Malla K, Costello AM reported on their study of factors affecting home delivery in the Kathmandu Valley, Nepal.

This nested case-control study compares the characteristics of mothers having home or institutional deliveries in Kathmandu, Nepal, and explores the reasons given by mothers for a home delivery. The delivery patterns of mothers were identified in a cross-sectional survey of two communities: an urban area of central Kathmandu (Kalimati) and a peri-urban area (Kirtipur and Panga) five kilometres from the city centre. 357 pregnant women were identified from a survey of 6130 households: 183 from 3663 households in Kirtipur and Panga, 174 from 2467 households in Kalimati. Methods involved a structured baseline household questionnaire and detailed follow-up of identified pregnant women with structured and semi-structured interviews in hospital and the community. The main outcome measures were social and economic household details of pregnant women; pregnancy and obstetric details; place of delivery; delivery attendant; and reasons given for home delivery. The delivery place of 334/357 (94%) of the pregnant women identified at the survey was determined. 272 (81%) had an institutional delivery and 62 (19%) delivered at home. In univariate analysis comparing home and institutional deliveries, maternal education, parity, and poverty indicators (income, size of house, ownership of house) were associated with place of delivery. After multivariate analysis, low maternal educational level (no education, OR 5.04 [95% CI 1.61-15.8], class 1-10, OR 3.36 [1.04-10.8] compared to those with higher education) and multiparity (OR 3.1 [1.63-5.74] compared to primiparity) were significant risk factors for a home delivery. Of home deliveries, only 24% used a traditional birth attendant, and over half were unplanned due to precipitate labour or lack of transport. The study concluded that poor education and multiparity rather than poverty per se increase the risk of a home delivery in Kathmandu. Training TBAs in this setting would probably not be cost-effective. Community-based midwife-run delivery units could reduce the incidence of unplanned home deliveries.

Nutrition related studies and interventions:

Christian P, West KP Jr, Khattry SK, Kimbrough-Pradhan E, LeClerq SC, Katz J, Shrestha SR, Dali SM, Sommer A. (Am.J.Epidemiol.2000 Sep.15:152(6): 542-7). Johns Hopkins School of Public Health, Baltimore, MD 21205, USA.

Night blindness due to vitamin A deficiency is common during pregnancy among women in Nepal. The authors assessed the risk of maternal death during and after a pregnancy with night blindness among women participating in a cluster-randomized, placebo-controlled vitamin A and beta-carotene supplementation trial in Nepal from July 1994 to September 1997. Subjects were 877 women with night blindness and 9,545 women without night blindness during pregnancy. Women were followed from the time they declared that they were pregnant through the end of the study, representing a median follow-up of 90 weeks (interquartile range: 64-121 weeks). Mortality of night-blind women in the placebo group was 3,601 per 100,000 pregnancies. In comparison, the relative risk of dying among nonnight-blind women in the placebo group was 0.26 (95% confidence interval (CI): 0.13, 0.55), and the relative risk among women with or without night blindness in the vitamin A/beta-carotene group was 0.32 (95% CI: 0.10, 0.91) and 0.18 (95% CI: 0.09, 0.36), respectively. Night-blind women were five times (95% CI: 2.20, 10.58) more likely to die from infections than were women who were not night blind. These findings show that night blindness during pregnancy is a risk factor of both short- and long-term mortality among women. Vitamin A/beta-carotene supplementation ameliorates this risk to a large extent.

Katz J; Khattry SK; West KP; Humphrey JH; Leclercq SC; Kimbrough E; Pokharel PR; Sommer A. Night blindness is prevalent during pregnancy and lactation in rural Nepal. J Nutr. 1995;125(8): 2122-7

This study assessed the prevalence of night blindness during pregnancy and lactation in a sample of 426 women living in the rural Terai of Nepal. These women were also examined for ocular signs of vitamin A deficiency. Among 241 lactating women, 16.2 percent reported experiencing night blindness at some time during the pregnancy that produced the infant they were now breast-feeding. Among 185 pregnant women, 8.1 percent reported being night-blind at the time of the interview. The odds of night blindness in the current pregnancy were six times greater for women who reported night blindness in their previous pregnancy. Night-blind women were more likely to come from households with lower socio-economic status. Teenage women and those over the age of 30 were at highest risk, particularly those of higher parity within these age groups. Vitamin A deficiency, for which night blindness is a marker, seems to be a problem in this population of pregnant and lactating women, with potential health consequences for women and their infants.

Katz J, West KP Jr, Khatri SK, Pradhan EK, LeClerq SC, Christian P, Wu LS, Adhikari RK, Shrestha SR, Sommer A: Maternal low-dose vitamin A or beta-carotene supplementation has no effect on fetal loss and early infant mortality: a randomized cluster trial in Nepal. *Am.J.Clin.Nutr.*2000;71:1570-6.

The effect of vitamin A supplementation on the survival of infants aged <6 mo is unclear. Because most infant deaths occur in the first few month of life, maternal supplementation may improve infant survival. The objective of the study was to assess the effect of maternal vitamin A or beta-carotene supplementation on fetal loss and survival of infants <6 mo of age. Married women of reproductive age in 270 wards of Sarlahi district, Nepal, were eligible to participate. Wards were randomly assigned to have women receive weekly doses of 7000 microg retinol equivalents as retinyl palmitate (vitamin A), 42 mg all-trans-beta-carotene, or placebo. Pregnancies were followed until miscarriage, stillbirth, maternal death, or live birth of one or more infants, who were followed through 24 wk of age. A total of 43559 women were enrolled; 15832 contributed 17373 pregnancies and 15987 live born infants to the trial. The rate of fetal loss was 92.0/1000 pregnancies in the placebo group, comparable with rates in the vitamin A and beta-carotene groups, which had relative risks of 1.06 (95% CI: 0.91, 1.25) and 1.03 (95% CI: 0.87, 1.19), respectively. The 24-wk mortality rate was 70.8/1000 live births in the placebo group, comparable with rates in the vitamin A and beta-carotene groups, which had relative risks of 1.05 (95% CI: 0.87, 1.25) and 1.03 (95% CI: 0.86, 1.22), respectively. The study concluded that small weekly doses of vitamin A or beta-carotene given to women before conception, during pregnancy, and through 24 wk postpartum did not improve fetal or early infant survival in Nepal

West KP Jr, Katz J, Khatri SK, LeClerq SC, Pradhan EK, Shrestha SR, Connor PB, Dali SM, Christian P, Pokhrel RP, Sommer A: Double blind, cluster randomised trial of low dose supplementation with vitamin A or beta carotene on mortality related to pregnancy in Nepal. The NNIPS-2 Study Group.

The objective of the study was to assess the impact on mortality related to pregnancy of supplementing women of reproductive age each week with a recommended dietary allowance of vitamin A, either preformed or as beta carotene. DESIGN: Double blind, cluster randomised, placebo controlled field trial. SETTING: Rural southeast central plains of Nepal (Sarlahi district). SUBJECTS: 44 646 married women, of whom 20 119 became pregnant 22 189 times. INTERVENTION: 270 wards randomised to 3 groups of 90 each for women to receive weekly a single oral supplement of placebo, vitamin A (7000 micrograms retinol equivalents) or beta carotene (42 mg, or 7000 micrograms retinol equivalents) for over 3 1/2 years. MAIN OUTCOME MEASURES: All cause mortality in women during pregnancy up to 12 weeks post partum (pregnancy related mortality) and mortality during pregnancy to 6 weeks postpartum, excluding deaths apparently related to injury (maternal mortality). RESULTS: Mortality related to pregnancy in the placebo, vitamin A, and beta carotene groups was 704, 426, and 361 deaths per 100 000 pregnancies, yielding relative risks (95% confidence intervals) of 0. 60 (0.37 to 0.97) and 0.51 (0.30 to 0.86). This represented reductions of 40% (P<0.04) and 49% (P<0.01) among those who received vitamin A and beta carotene. Combined, vitamin A or beta carotene lowered mortality by 44% (0.56 (0.37 to 0.84), P<0.005) and reduced the maternal mortality ratio from 645 to 385 deaths per 100 000 live births, or by 40% (P<0.02). Differences in cause of death could not be reliably distinguished between supplemented and placebo groups. CONCLUSION: Supplementation of women with either vitamin A or beta carotene at recommended dietary amounts during childbearing years can lower mortality related to pregnancy in rural, undernourished populations of south Asia.

Dreyfuss ML, Stoltzfus RJ, Shrestha JB, Pradhan EK, LeClerq SC, Khattry SK, Shrestha SR, Katz J, Albonico M, West KP Jr.: Hookworms, malaria and vitamin A deficiency contribute to anemia and iron deficiency among pregnant women in the plains of Nepal. *J.Nutr.*2000 Oct; 130 (10):2527-36

Anemia and iron deficiency during pregnancy are prevalent in developing countries, but their causes are not always known. We assessed the prevalence and severity of anemia and iron deficiency and their association with helminths, malaria and vitamin A deficiency in a community-based sample of 336 pregnant women in the plains of Nepal. Hemoglobin, erythrocyte protoporphyrin (EP) and serum ferritin were assessed in venous blood samples. Overall, 72.6% of women were anemic (hemoglobin < 110 g/L), 19.9% had moderate to severe anemia (hemoglobin < 90 g/L) and 80.6% had iron deficiency (EP > 70 micromol/mol heme or serum ferritin < 10 microg/L). Eighty-eight percent of cases of anemia were associated with iron deficiency. More than half of the women (54.2%) had a low serum retinol concentration (<1.05 micromol/L), 74.2% were infected with hookworms and 19.8% had *Plasmodium vivax* malaria parasitemia. Hemoglobin, EP and serum ferritin concentrations were significantly worse and the prevalence of anemia, elevated EP and low serum ferritin was increased with increasing intensity of hookworm infection. Hookworm infection intensity was the strongest predictor of iron status, especially of depleted iron stores. Low serum retinol was most strongly associated with mild anemia, whereas *P. vivax* malaria and hookworm infection intensity were stronger predictors of moderate to severe anemia. These findings reinforce the need for programs to consider reducing the prevalence of hookworm, malaria infection and vitamin A deficiency where indicated, in addition to providing iron supplements to effectively control anemia.

Stoltzfus RJ, Edward-Raj A, Dreyfuss ML, Albonico M, Montresor A, Dhoj Thapa M, West KP Jr, Chwaya HM, Savioli L, Tielsch J. Clinical pallor is useful to detect severe anemia in populations where anemia is prevalent and severe. *J.Nutr.*1999 Sep;129(9):1675-81

Clinical pallor is recommended as a simple way to detect severe anemia, but more data are needed on its accuracy and usefulness when assessed by nonphysicians in diverse settings. We measured hemoglobin and trained non-physician health workers to assess clinical pallor of the conjunctiva, palm and nail beds in five population samples in Nepal and Zanzibar, where severe anemia is common. In total, 5,760 individuals were examined, 3,072 of whom were anemic and 192 of whom had severe anemia (hemoglobin <70 g/L). The prevalence of pallor did not correspond to the prevalence of anemia or severe anemia in the groups studied. However, in all studies, pallor at each anatomical site was associated with a significantly lower hemoglobin concentration. The relative performance of different anatomical sites was not consistent among studies, and we recommend that multiple sites be assessed. Pallor at any of the three sites detected severe anemia with >84% specificity. However, the sensitivity varied from 81% in Nepalese postpartum women to 29% in Zanzibari preschoolers in 1996. Overall estimates for sensitivity and specificity were 50 and 92%, respectively. Although imperfect, use of pallor to screen and treat severe anemia by primary care providers is feasible and worthwhile where severe anemia is common. Usually, the majority of persons with severe anemia will be detected at practically no cost. Many people who are not severely anemic will also receive treatment, but the costs of this error are low compared to the benefits

Stoltzfus RJ, Dreyfuss ML, Chwaya HM, Albonico M. Hookworm control as a strategy to prevent iron deficiency. *Nutr.Rev.*1997 Jun; 55(6): 223-32.

The hookworms *Necator americanus* and *Ancylostoma duodenale* infect approximately 1 billion people worldwide. The prevalence of hookworm infection increases with age in children, typically reaching a plateau in late adolescence, whereas the intensity of infection may continue to increase throughout adulthood. Hookworms cause intestinal blood loss in amounts proportional to the number of adult worms in the gut. The relationship between hookworm infection intensity and hemoglobin concentration is evident in epidemiologic studies, but may be apparent only above a threshold worm burden that is related to the iron stores of the population. Current hookworm control efforts are focused on reducing infection load and transmission potential through periodic anthelmintic chemotherapy. Several controlled trials have demonstrated a positive impact of anthelmintic treatment on hemoglobin levels, with best results obtained in settings where iron intakes were also increased. Evidence suggests that anthelmintic programs will have modest impacts on iron deficiency anemia in the short term, with greater impacts on more severe anemia. Hookworms are an important cause of anemia in women, who are often overlooked by current helminth control programs. Current WHO recommendations for use of anthelmintics in schoolchildren and women

are reviewed. There is a need to clarify whether hookworms are an important etiology of iron deficiency anemia in preschool children.

Ongoing research to test an intervention programme:

Improving essential newborn care in rural communities in Nepal

This is an operations study based in Makwanpur district. It is collaboration between Mother and Infant research Activities (MIRA), the Ministry of Health of Nepal and the Institute of Child Health, London (ICH). The purpose of the study is to improve essential newborn care in the home and at health facilities through sustainable interventions. It includes an evaluation of preventive and referral services in reducing neonatal mortality.

The aim of the study is to develop and evaluate a range of sustainable interventions to improve essential newborn care (ENC) in Makwanpur district. The ENC is based on the simple principles of basic resuscitation, avoidance of hypothermia, improvements in hygiene, early breast-feeding and protecting mother-infant bonding. It also promotes antenatal care and the treatment or referral of high risk or unwell infants. A key question will be whether mothers in resource poor communities can practice ENC more effectively. Network of women who are interested in tackling ENC will be encouraged to identify, prioritise and plan for improvement. Facilitators will help with the process and with local strategies to tackle the issues.

The intervention will be evaluated in randomized controlled trial. This will estimate its impact on neonatal mortality. 24 VDCs will be matched into 12 pairs. One VDC in each pair will receive the intervention from the beginning of the study and the other VDC will receive it after two years. The study is working with the District Public Health Office to develop appropriate ENC training modules for health workers. The availability of safe delivery kits and essential supplies will be examined, discussed and strengthened.

The specific aims of the study include:

- Increased awareness of ENC and ways of approaching it in the community.
- Increased number of deliveries attended by a trained person in a clean environment.
- Improved knowledge and skill of health workers.
- Improved availability and use of antenatal care, safe delivery kits and referral systems.
- New knowledge about the effectiveness of this sort of intervention on neonatal mortality.
- New knowledge about the effectiveness of this sort of intervention on health status.
- Janakpur: Antenatal supplementation and neonatal outcome:

Gaps:

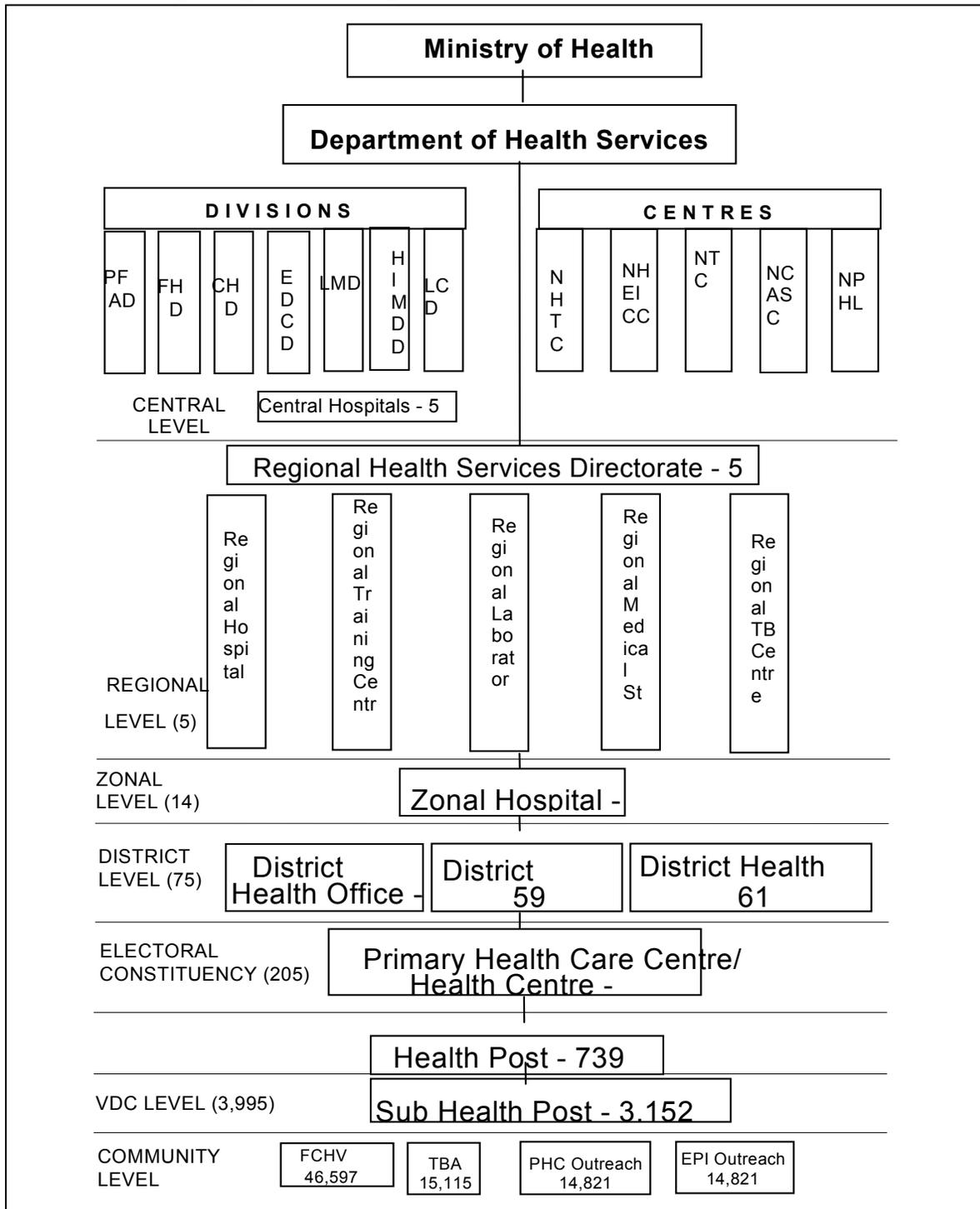
A quick review of the publications based on research related to newborn health revealed that most of the studies were based in the hospitals, naturally confined to the population of women who had come to the hospital for the services. A few community based, prospective studies have looked into the impact of maternal supplementation with Vitamin A and other micronutrients on infant health. However, the studies conducted so far definitely are helpful to describe the morbidity pattern in the newborn period and causes of mortality. The hospital based studies on hypothermia, hypoglycaemia, birth asphyxia and low birth weight have been very useful and might help in improving the facility based services.

The literature search reveals that the following areas have not been extensively studied in Nepal so far. Most of the hospital based studies have looked into the ways in which the hospital environment can be made more efficient so that newborn health could be promoted. However, in our context where hospital or facility based deliveries are exception rather than the rule, the usefulness of such studies becomes limited.

The following areas need more extensive study:

- Home care practices regarding the preparation of pregnant women before delivery and for the process of delivery.
- Families' and community's perceptions about the health services
- Evaluation of the intervention programs for neonatal and maternal care at the community level
- Neonatal Morbidities in the communities, health-seeking behavior, mechanisms for dealing with neonatal or maternal morbidity.
- Information management systems regarding the neonatal health.
- Community level health workers' competence in early detection and management of neonatal morbidities: training and deployment of such workers.

Annex 3: Organogram of Department of Health Services



Acronyms

PFAD	Planning and Foreign Aid Division	NHEICC	National Health Education, Information and Communication Centre
FHD	Family Health Division	NTC	National Tuberculosis Centre
CHD	Child Health Division	NCASC	National Centre for AIDS and STD Control
EDCC	Epidemiology and Disease Control Division	NPHL	National Public Health Laboratory
LMD	Logistics Management Division	FCHV	Female Community Health Volunteer
HIMDD	Health Institution & Manpower Development Division	TBA	Traditional Birth Attendant
LCD	Leprosy Control Division	PHC	Primary Health Care
NHTC	National Health Training Centre	EPI	Expanded Programme on Immunisation