



Support to Safe Motherhood Programme, Nepal

A part of Government of Nepal National Safe Motherhood Programme (NNSMP)

Maternal and Perinatal Death Review in Nepal

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ACRONYMS

AIDS	Acquired Immune Deficiency Syndrome
ANC	Antenatal Care
BEOC	Basic Essential Obstetric Care
BPKIHS	B.P. Koirala Institute of Health Science
CBS	Central Bureau of Statistics
CEOC	Comprehensive Essential Obstetric Care
DFID	Department for International Development
DoHS	Department of Health Services
ENND	Early Neonatal Death
FCHV	Female Community Health Volunteer
FHD	Family Health Division
FHI	Family Health International
GoN	Government of Nepal
GTZ	Gesellschaft Fur Technische Zusammenarbeit
HIV	Human Immunodeficiency Virus
HP	Health Post
IDU	Injecting Drug User
MDG	Millennium Development Goal
MH	Maternity Hospital
MIRA	Mother and Infant Research Activities
MMR	Maternal Mortality Ratio
MoHP	Ministry of Health and Population
MPDR	Maternal and Perinatal Death Review
MVA	Manual Vacuum Aspiration
NDHS	Nepal Demographic and Health Survey
NMPDRC	National Maternal and Perinatal Death Review Committee
PESON	Perinatal Societies of Nepal
PHCC	Primary Health Care Centre
PMR	Perinatal Mortality Rate
PPH	Post Partum Haemorrhage
SB	Still Birth
SBA	Skilled Birth Attendant
SHP	Sub-health Post
SMP	Safe Motherhood Programme
SSMP	Support to the Safe Motherhood Programme
TBA	Traditional Birth Attendant
TUTH	Tribhuvan University Teaching Hospital
UNICEF	United Nations Children's Fund

USAID	United States Agency for International Development
UTI	Urinary Tract Infection
WHO	World Health Organisation

EXECUTIVE SUMMARY

This rapid study was conducted to identify the challenges and opportunities of the existing death review process and suggest recommendations to help the process function efficiently and contribute to improvement of quality of care. Maternal deaths that occurred in last the 10 years (1997/98-2007/08) and perinatal deaths in the last two years (2005/06- 2006/07) at Paropakar Maternity and Women's Hospital (Maternity Hospital or MH, hereafter) were analysed. In addition, 32 key informants in four other major hospitals located within and outside Kathmandu Valley, and eight policy level individuals were interviewed to understand the bottlenecks and improve the maternal perinatal death review process system in the hospitals.

A total of 72 maternal deaths and 1,193 perinatal deaths (682 stillbirths and 511 neonatal deaths) occurred during the reference period at Maternity Hospital (MH). All the maternal and perinatal death information was transferred to the most recent version of maternal and perinatal death review form developed by Family Health Division (FHD) of the Department of Health services (DoHS) and MH in 2005. Extreme care was taken to protect the personal health information recorded in the medical charts and review forms. Informed consent was obtained from participants in key informant interviews. All the maternal and perinatal forms were collected and manual editing and coding carried out before entering them into the database. The computer software, dBase IV, was used for data entry. Range and consistency checks were performed before transferring data into SPSS for further analysis. The qualitative data from key informant interviews were analysed using standard content analysis procedures.

Key Findings

Maternal Deaths Review at Maternity Hospital

There were 72 maternal deaths at Maternity Hospital in the last 10 years. Although there is no clear pattern observed, findings suggest that the Maternal Mortality ratio (MMR) has been declining at Maternity Hospital over recent years, except for 1999/00, 2002/03 and 2006/07. There is no obvious explanation for these fluctuations.

The highest proportion of maternal deaths was in the age group 20-29 years and with multiparity. Over one in five maternal deaths (22%) were in the age group 15-19 years and about half of those died during their first pregnancy (49%). About half of the women belong to the hill *Janajati* groups. Most of the women who died were illiterate and housewives.

Utilisation of antenatal care (ANC) was low among the women who died. About two-fifths of them had not received ANC services during their most recent pregnancy. Of those women who had antenatal check-ups, the majority of them had at least one pregnancy related complication. About 40 percent of women were diagnosed with hypertension (17 out of 45) during ANC visits followed by proteinuria (24%) and anaemia (18%) respectively.

The use of the partograph was very low (7%) at Maternity Hospital. About half of the women had live births. One in five women had not delivered. Close to four-fifths of the women had caesarean sections, indicating the extent of complicated cases admitted in the hospital. Half of the women (50%) were in a critical state on admission. About 39 percent of the women died within one day of admission and 17 percent within 24-47 hours of admission.

Although information on intervention/procedures adopted during early pregnancy was not recorded for a significant proportion of women, available information showed that blood

transfusion was the most common intervention that was provided regardless of the stage of their pregnancy. For example, a quarter of the women had received blood transfusion during their previous pregnancy (25%) and antenatal period (24%) in index pregnancy. Similarly, about half of the women (49%) received blood transfusion during the postpartum period.

An overwhelming majority of women died due to direct causes (83%). The three main causes of death were postpartum haemorrhage (PPH, 32%), hypertensive disorders of pregnancy (25%) and abortion (13%). Pre-existing maternal diseases (such as severe anaemia, cardiac disease) and non-pregnancy-related infections (such as hepatitis, gastroenteritis) were the main two indirect causes of maternal death.

An analysis of three major causes of maternal death by selected socio-demographic characteristic revealed that of the 23 women who died from PPH, the majority were aged between 20 and 29 years, multi parity, with no education and from the Newar ethnic group. Similarly, 18 women who died due to hypertensive disorders were mainly aged between 15 and 19 years, living within Kathmandu valley, housewives with husbands who were daily wage earners and from hill *Janajati* ethnic groups. Of those, nine women who died from abortion were mainly in the age group of 20-24 years, multi parity, residing within Kathmandu valley, and housewives.

No clear trend of cause of death was observed over the 10 year period at Maternity Hospital. However, except for the year 2006/07, deaths due to postpartum haemorrhage have been decreasing since 2003/04. There was only one death because of abortion after 2003/04 which coincided with the beginning of legal abortion services in Nepal.

Septic shock was one of the major final causes of maternal death (27%), followed by cardiac failure (23%), hypovolaemic shock (19%) and multi-organ failure (11%). Data revealed that 18 women (25%) died within eight hours of admission to the hospital and of those, 9 died within 2 hours. Another 13 women (18%) died within 9 to 24 hours. The remaining 41 women died within one to nine days.

Altogether 162 avoidable factors were identified for the 72 maternal deaths. Medical service related factors accounted for 56 percent of these, over one third were related to shortage of expertise, training or education, or shortage of human resources. Shortage of essential drugs, blood transfusion, and essential equipments accounted for 17 per cent of the avoidable factors. Patient/family related factors accounted for 37 percent (60 out of 162) of the avoidable factors indicating the need for community/family level intervention.

Perinatal deaths review at Maternity Hospital

The study found that 1,193 perinatal deaths (57% stillbirths and 43% early neonatal deaths) had occurred in the last two years at the hospital. The Perinatal Mortality Rate (PMR) was estimated to be 33 per 1,000 pregnancies in the study period which is lower than the national figure (45 per 1000 pregnancies). Although it is difficult to compare the PMR between the study period (2005/06 - 2006/07) and previous years estimated by Maternity Hospital (before 2005/06) due to a difference in the definition used, the study indicates that the PMR at Maternity Hospital has slightly increased, particularly after 2003/04. The two main reasons for this could be an increase in referral of complicated cases and a caseload that has grown too high to manage effectively in the MH neonatal unit in recent years.

About one in seven early neonatal deaths and one in eight stillbirths were delivered by caesarean section. Perinatal deaths were common in pre-term and low birth weight babies. A large majority of stillbirths were macerated (61%) suggesting that most of the stillbirths had occurred during the antepartum period. Over one-third of stillbirths were intrauterine foetal death. More than half of the newborn babies who died at an early neonatal stage had an

APGAR score of 3 or less at one minute. Similarly, about one-third of the babies had APGAR score of 3 or less at five minutes indicating that these babies were asphyxiated and resuscitated at birth. Over one third of the neonatal deaths occurred on the first day after birth.

The study found that one in five neonatal deaths had occurred among women whose age at the birth was below 19 years. Primi gravida women and mothers from districts other than Kathmandu valley experienced more perinatal losses than others. Although two thirds of women who experienced perinatal deaths had sought antenatal care, only one in five of them had four or more ANC check-ups as recommended by the World Health Organisation. Although the partograph is a very useful tool for monitoring maternal and foetal condition and preventing asphyxia, it is rarely used at Maternity Hospital.

The study revealed that birth asphyxia was the main cause of early neonatal deaths (33%) followed by respiratory distress (25%) and infections (24%). Babies weighing 2,500 grammes and above were more likely to suffer from asphyxia than babies weighing less than 2,500 grammes at birth. Infection was more common among pre-term and low birth weight babies. Similarly, about 43 percent of pre-term babies with a maturity of 22-33 weeks died due to respiratory distress syndrome. Some of these could have been saved if mothers had come to the hospital earlier or with the administration of steroid at the time of admission.

The five main causes of stillbirths are intra-uterine asphyxia (34%), hypertensive disorder (14%), extreme premature birth (11%), congenital abnormalities (11%) and antepartum haemorrhage (8%). Further assessment of the causes of stillbirths revealed that two thirds of mothers whose babies died of congenital malformation had received antenatal care, but only 3 percent of them were diagnosed during antenatal period. Similarly, two thirds of mothers who delivered macerated babies had received antenatal care. This finding suggests that ANC and counselling services at Maternity Hospital are not adequate for timely detection of complications during pregnancy and providing adequate information.

The study found that intrapartum foetal monitoring after admission is not adequate at Maternity Hospital. For example, one in five babies whose foetal sound was normal during admission died because of intra-uterine asphyxia. Some of these babies could have been saved with better intrapartum foetal monitoring to detect signs of intra-uterine asphyxia, timely intervention and effective resuscitation of asphyxiated babies. Lack of human resources and inadequate attention are the two main reasons for inadequate monitoring in the hospital.

According to Wigglesworth's classification of cause of perinatal death, more than a third of all perinatal deaths fell in Group IV (36%), followed by Group I (32%), Group III (19%), Group II (7%) and Group V (6%).

Functioning of Maternal and Perinatal Death Review Process in five major hospitals

Despite efforts over 10 years to introduce facility based maternal and perinatal death review in Nepal, acceptance is not satisfactory. The reasons are complex and multifaceted, and include poor quality documentation, lack of time, interest, resources, or accountability and poor organisation of the health system.

Generally, key informants were aware of the maternal and perinatal death review process. Most mentioned that it is a process for finding out the causes of deaths and taking corrective actions against such deaths, which will, in future, prevent maternal and perinatal death at the institutional level.

All study hospitals, except BPKIHS, are using the maternal death review forms developed by the FHD/DoHS/MH. However, none of the study hospitals have continuously used the perinatal death review forms. It was learned that Patan and TUTH hospital used perinatal death review forms for two to three months at the beginning of the year 2005 but discontinued it. Maternity Hospital is using perinatal death review forms, but they were not regularly completed. However, all study hospitals have recorded some information on maternal and perinatal deaths in their own general patient medical charts or admission charts, death certificates or death books and discharge sheets. Completeness of maternal and perinatal forms was assessed only at Maternity Hospital, where it was seen that forms were poorly completed. In most cases, information was incomplete and inconsistent.

The study also found that maternal death review is operating in only three out of the five study hospitals. The review process varied widely between the hospitals. For example, Maternity Hospital discusses the case immediately after any maternal death occurs and it is reviewed by the concerned consultant, on-call consultant of the day, duty doctors and other concerned staff. Information is forwarded to the maternal death review committee within 24 hours of death with a case review form. Generally, such cases are presented within 72 hours of death in a bigger group of staff. Similarly, at TUTH, and Patan Hospital, maternal deaths are immediately reviewed in the morning session within the department. In contrast, BPKIHS and Lumbini Zonal Hospital did not have any formal death review process. Perinatal death review process also varied widely between the study hospitals.

It was also revealed that the maternal and perinatal death review committees have not been formed in some hospitals. It was observed that the national maternal and perinatal review committee is not active and not providing regular guidance and follow up to case review process.

Overall, key informant interviews suggested that the existing death review form is still too long. Although informants considered the case review forms to be comprehensive, they are not user friendly. Informants felt the classification of cause of maternal death is not very clear in the form and should be revised. The information in hospital admission and other recording forms does not match the case review forms, making it difficult for clinicians to complete them. The type and volume of information required in the forms also causes problems. Irregular supply of forms and lack of refresher training were also partly responsible for ineffective implementation of the maternal and perinatal death review system.

The study showed there is no adequate monitoring and coordination from the FHD. Until recently there has been no focal person at FHD or in the hospitals to keep the records, monitor, coordinate and analyse the information collected. Personnel at both FHD and the hospitals are not adequately trained in coding, editing, entry and analysis of the data. It was also found that none of the study hospitals have sent maternal or perinatal death forms to the FHD, as was envisaged for the review process. In addition, the MPDR was not considered a regular programme of FHD, but viewed as a project supported by a donor agency.

The present study did not find clear documentation or examples of decisions or actions taken based on the review of maternal and perinatal deaths in any of the study hospitals. However, key informants from Maternity Hospital claimed that some corrective measures had been taken, based on the maternal death review. According to them, actions taken included in-depth check-up of patients before admission, promotion of antenatal care, investigation of functioning of equipment and regular maintenance, continuous supply of oxygen, 24-hour lab facility, indoor ultrasound facility, provision of additional anaesthetist assistants and doctors in the operation theatre, and availability of emergency drugs in the

admission room. Key informants repeatedly said the use of magnesium sulphate to treat eclampsia was one of actions taken based on the death review.

Recommendations

Recommendations to Maternity Hospital

- In view of the many maternal deaths that occurred as a result of medical service related avoidable factors, Maternity Hospital should further emphasise and strengthen facilities such as a 24-hour laboratory facility and the use of standard management protocols for major diseases like PET/eclampsia, APH, PPH and sepsis. Provision should be made for immediate services of a physician and surgeon throughout the week.
- Immediate attendance, accurate and correct diagnosis and treatment should be carried out as soon as a woman arrives in the hospital. There should be coordination among the attending doctors, laboratory and blood bank staff for immediate investigations to diagnose the case and for further management. Timely intervention should be ensured both for the mother and foetus/ baby.
- Regular in-service training for health personnel on maternal and neonatal care should be organised. Orientation of management protocols should be imparted to all newly appointed doctors and nurses.
- There should be provision of adequate nursing staff, especially in maternal and neonatal intensive care units and the labour ward, in line with standard recommended patient staff ratio. Proper monitoring of patients should be emphasised.
- ANC and counselling services should be improved to detect complications and congenital anomalies as early as possible and to exclude any pre-existing maternal disease.
- Use of the partograph should be encouraged to ensure timely intervention for safety of the mother and newborn. Foetal monitoring during labour should be strengthened.
- Collected data should be computerised and analysed to inform policy decisions.
- Focal persons for maternal, perinatal death review should be identified. The focal persons should be responsible for ensuring the timely completion of the forms, completeness and consistency of information and coordinating the maternal and perinatal death reviews.
- In view of the high number of perinatal deaths and workload of staff at Maternity Hospital, in-depth review of all perinatal deaths, and specifically those weighing 2.5 kilogram or more, should be undertaken during the first week of every month using MPDR form.

Recommendation to other hospitals

- Regular refresher orientation should be organised. All relevant staff should be oriented in completion of the forms and senior doctors must review the completeness and consistency of information.
- A focal person should be identified for MPDR in the hospital. Additional training and support staff should be provided.

- The MPDR committee should be formed/reactivated. The head of the institution must be the Chairperson of the MPDR committee. The review committee should analyse and identify avoidable factors in maternal and perinatal deaths. The management or head of institution must implement the recommendations made by the review committee.
- Hospital admission and other record forms should be revised and further information required should be added.
- Data collected must be analysed and action taken based on the findings.
- Ways of providing incentives to those who complete the case review forms should be identified.

Recommendations to FHD

- Review/consultative meetings should be organised every six months at national level. Lessons learned should be shared and action taken.
- Regular monitoring of health facilities should be carried out by the FHD. Funds should be allocated for monitoring the review process. A focal person in FHD should be identified.
- Maternal and perinatal death review forms and the instruction manual should be reviewed and revised and there should be uniformity in the hospital admission and other recording and reporting forms to ensure they are all in line with the information required for the review forms. While revising case review forms, efforts should be made to ensure they as short as possible and user friendly, while remaining comprehensive. Special attention should be paid to revising the classification of causes of maternal deaths.
- The national level maternal and perinatal committee needs to be re-activated to ensure regular guidance and follow up of health facilities. The DoHS should issue a letter to the medical superintendents/directors of the hospitals to facilitate action for the formation or reactivation of hospital maternal and perinatal death review committees. The importance of maternal and perinatal death review at facility level should be emphasised in the letter.
- Orientation training should be provided to the staff of the Demography Section within FHD. Support staff should be provided for monitoring, data editing, coding, and entry into the computer. The feasibility of developing a web-based standardised data base system needs to be explored. Transferring of data electronically from district level facilities should be explored and implemented.
- Timely collecting and analysis of maternal and perinatal deaths should be carried out in FHD and feedback provided to concerned health facilities, including areas for improvement, as soon as possible.
- A guideline on roles and responsibility of the head of the institution should be developed by FHD. Such guidelines should also include information about reporting mechanism of death cases to FHD.

1. INTRODUCTION

1.1 Background

1.1.1 Maternal Mortality

Maternal mortality continues to be the major cause of death among women of reproductive age in many countries (Shah, et. al., 2007). The most recent estimates show that in 2005, around 536,000 women died of complications of pregnancy, childbearing and childbirth, and many millions more suffered disabilities (WHO, 2004; Shah et. al., 2007)). The maternal mortality ratio (MMR), defined as the number of maternal deaths per 100,000 live births, is the most commonly used measure to illustrate maternal mortality. It is also one of the measures used to monitor progress towards achievement of the Millennium Development Goal of improving maternal health (MDG 5). The global MMR was estimated at 400 per 100,000 live births in 2005. Women face this risk several times during their lives and the cumulative lifetime risk of maternal death can be as high as one in 16 in developing countries, compared with one in 2,800 in developed countries. By region, maternal mortality ratio and risk are highest in sub-Saharan Africa, followed by Asia, Latin America and the Caribbean and Oceania. While maternal deaths have decreased significantly in some countries, there is little or no change in many others, especially in Sub-Saharan Africa (WHO, 2006a).

More than 70 percent of maternal deaths are due to haemorrhage (25%), obstructed labour (8%), eclampsia (12%), sepsis (15%), or unsafe abortion (13%) (WHO, 2006a). Pregnancy and childbirth complications are aggravated by the prevalence of HIV/AIDS, malaria and tuberculosis. Maternal deaths from these causes have increased thus reversing the gains made in the past few decades. In addition to women dying from obstetric complications, many women also suffer from serious chronic disabilities resulting from pregnancy and childbirth. In developing countries, these obstetric complications and chronic disabilities are aggravated by a number of socio-cultural factors such as the low socio-economic status of women, lack of awareness and inadequate access to health services, nutritional problems before, during and after pregnancy, overwork and harmful care practices. These factors are often linked to women's low utilisation of available health services (Sharma et al., 2007)

Nepal is a small mountainous land-locked country bordering the People's Republic of China in the north and India in the east, south and west. The total area of the country is 147,181 square kilometres with a total population of about 28 million. The population has more than doubled in the last 35 years, resulting in a population density of 157 people per square kilometre (CBS, 2003). The country has a diversity of cultures, climates, traditions, and languages. There are wide discrepancies in health services in different regions. Life expectancy is one of the lowest in Asia at just 62 years. The literacy rate is 54% overall which masks an enormous gender gap. The contraceptive prevalence rate is about 44% with a high level of unmet need (NDHS, 2006).

The 2006 Nepal Demographic Health Survey revealed that 82% of all women still give birth at home and only 18% of births are attended by a skilled professional. This is a result of a range of socio-economic and cultural barriers to service use. Although the national total fertility rate has dropped from 4.1 children in 1996 to 3.1 in 2006, the fertility rate remains high in the mountain region (4.1 children) and among poor people (4.7 children among the lowest quintile) (NDHS, 2006). As a result of the high proportion of home deliveries, low use

of professional care at birth, low utilisation of antenatal care and inadequate availability of health services, many Nepali women continue to suffer from pregnancy related complications. For example, only 44% of women who gave birth in the five years before the survey received at least one antenatal care contact with a health professional. In rural areas, the rate was even lower, at 38%. Only 19% of women delivered their babies with the assistance of a skilled birth attendant (doctor, nurse or midwife) and 18% at a health facility, (NDHS, 2006). The percentage of births assisted by relatives and others has declined very little over the 10 year period before the survey (NDHS, 2006).

One of the most important indicators for maternal health is maternal mortality. The exact figure for the maternal mortality ratio in Nepal is not clear, although it is generally agreed that it has decreased. However, it is very clear that the MMR is still high (Table 1.1), which means the suffering of pregnant women in Nepal remains a reality. The leading immediate causes of maternal death in Nepal were found to be post-partum haemorrhage (46.3%), obstructed labour (16.3%), eclampsia (14.3%) sepsis, puerperal sepsis (11.8) and abortion (FHD/MoHP, 1998). Many of these are preventable with appropriate antenatal care, skilled attendance during delivery, and a well organised referral system to basic and/or comprehensive obstetric care (FHD/MoHP, 1998). Other attributed factors for high maternal mortality are the 'three delays' - delay in taking the decision to seek medical assistance, delay in accessing appropriate care and delay in receiving care at health centres.

Table 1.1 Maternal Mortality Ratios (MMR) in Nepal

Sources	MMR per 100,000 live births
Nepal Family Planning, Fertility and Health Survey, 1991	515
WHO/UNICEF estimate in 1996	826
Nepal Family Health Survey, 1996	539
UNICEF, 1990-2005, reported	540
UNICEF, 2000, adjusted	740
WHO, 2000 as reported in WHO Mortality Country Fact sheet, 2006	740
Nepal Family Health Survey, 2006	281

The Nepal Demographic and Health Survey, 2006, showed a remarkable decline in MMR, from 539 deaths per 100,000 live births for the period 1989-1995 to 281 deaths per 100,000 live births for the period 1999-2005 (NDHS, 2006). There are concerns that this MMR estimate does not reflect the reality of Nepal, in the light of the still very low use of Skilled Birth Attendants (SBA) and facility based birthing care. No individual piece of information is sufficient to tell the whole story of MMR, and thus information and data need to be triangulated where possible and further analysis and research undertaken to help fill the gaps. A number of studies are needed to help unpack what is happening with maternal mortality. The present study is an effort which aims to assess the maternal and perinatal death in one major hospital (Paropakar Maternity and Women's Hospital, Kathmandu), identify the challenges and opportunities of the existing death review process and suggest recommendations to help the process function efficiently so that findings contribute to improved quality of care.

1.1.2 Perinatal Mortality

Over 130 million babies are born every year, and more than 10 million infants die before their fifth birthday and almost 8 million before their first. Perinatal mortality tends to follow the same geographical pattern as maternal deaths. Approximately 98% of the 5.7 million perinatal deaths suffered globally occurred in developing countries. According to World Health Organisation (WHO), 2.7 million babies are born dead every year and another 3 million do not survive beyond the first week of life (WHO, 2006a). About one-third of

perinatal deaths in developing countries are related to intra-partum complications leading to birth asphyxia. Preterm birth, malformations and infections related to pregnancy and birth contribute to the remainder of the early neonatal deaths (WHO, 2006a). Neonatal deaths and stillbirths stem from poor maternal health, inadequate care during pregnancy, inappropriate management of complications during pregnancy and delivery, poor hygiene during delivery and the first critical hours after birth, and lack of newborn care. Several factors such as women's status in society, their nutritional status at the time of conception, early childbearing, too many closely spaced pregnancies and harmful practices such as inadequate cord care, letting the baby stay wet and cold, discarding colostrums and feeding other foods are deeply rooted in the cultural fabric of societies which interact in ways that are not always clearly understood (WHO, 2006b). Often the death of mothers is closely connected with newborn deaths as maternal mortality and morbidity have negative impact on the survival chances of the newborn.

In Nepal, the national perinatal mortality rate has slightly declined from 47 in 2001 to 45 per 1,000 pregnancies in 2006 (NDHS, 2006). Perinatal mortality is significantly higher among women who age at birth was under 20 years or 30-39 years. First pregnancies and pregnancies that occurred after an interval of less than 15 months are much more likely than pregnancies that occur after longer intervals to end in a perinatal loss. Rural women are more likely to experience perinatal losses than urban women. Educated mothers are less likely to experience perinatal losses than uneducated mothers (NDHS, 2006).

A very large number of maternal and perinatal deaths are avoidable. It was found that most deaths occur due to poor services provision as well as lack of access to and use of services. Socio-economic determinants such as poverty, social exclusion and low levels of education significantly contribute to death and disability. Although effective interventions to prevent mortality are known for many women and new born, appropriate care remains unavailable, unused, inaccessible, or of poor quality (WHO, 2006a).

Many countries have set under-five and maternal mortality reduction as their key development goal as suggested by international conference such as the World Summit for Children in 1990, the United Nations Millennium Declaration and the United Nations Special session on Children in 2002 (Bugalho et al., 1993). In preparing perinatal and maternal mortality-reduction strategies, it is important for countries to know the magnitude of perinatal and maternal mortality in order to assess needs and develop programmes that will reduce avoidable factors of death more quickly (WHO, 2006b).

1.2 National Safe Motherhood and Newborn Health Programme

The Government of Nepal (GoN) developed a national Safe Motherhood Plan of Action for the period 1994-1997. Since then, Safe Motherhood has been identified as a national priority in national health policy. This was further stressed by the Family Health Division (FHD) in the National Safe Motherhood Long Term Plan (2002-2017), revised in 2006. The long term goal of the 15-year plan envisages establishment of basic essential obstetric care (BEOC), comprehensive essential obstetric care (CEOC) services in all 75 districts, skilled attendance at all births and increased access to emergency funds and transport services. The GoN has committed to the MDG target of a reduction by three quarters in maternal mortality by the year 2015 (NDHS, 2006).

The FHD/Ministry of Health and Population selected 10 districts for the Safe Motherhood Programme (SMP), which was launched in three districts in 1997, as the first phase. After evaluation, six more districts were incorporated in the second phase by 2001. Around the time that the SMP was launched, a detailed maternal mortality and morbidity study was conducted in Nepal (FHD/MoH, 1998). The study revealed that the leading cause of hospital deaths was eclampsia followed by prolonged/obstructed labour/ruptured uterus and

postpartum haemorrhage respectively. Many delays were identified in treatment at the facility level, such as delays in obtaining blood products, institutional delays in treatment, and institutional delays in diagnosis. The Family Health Division implemented various initiatives to address these at institutional and population levels in partnership with national and internal agencies.

In conjunction with the Ministry of Health, agencies such as the Department of International Development of the United Kingdom (DFID), World Health Organisation (WHO), United Nations Children's Fund (UNICEF), US Agency for International Development (USAID), Germany's Gesellschaft Fur Technische Zusammenarbeit (GTZ) are working towards increasing access and higher quality services to improve maternal health in selected districts of the country. The Support to the Safe Motherhood Programme (SSMP), managed by Options UK, is designed to add momentum to these efforts by working at central policy and planning level to improve infrastructure development, increase the availability of B/CEOC services and local birthing centres and promote human resource development by upgrading the competencies of skilled birth attendants (SBAs). A safe delivery incentives programme¹ has been implemented since 2005 to increase the demand for maternity services complementing other initiatives to improve access to services (NDHS, 2006).

1.3 Facility-Based Maternal and Perinatal Death Review in Nepal

In Nepal, the maternal death review was initiated in Paropakar Maternity and Women's Hospital (Maternity Hospital, hereafter) in the early 1990s. In 1996-97, as a part of the National Maternal mortality and morbidity Study (1998), this process was implemented in three hospitals (Okhaldhunga Mission Hospital, Lumbini Zonal Hospital, Butwal and Seti Zonal Hospital, Kailali). The perinatal death review was initiated by the Perinatal Society of Nepal (PESON) in selected hospitals in Kathmandu Valley (FHD/DoHS/MH, 2005). The main aim of both the maternal and perinatal death reviews was to understand why women and perinates die, even after they reach a health facility. This process was expected to reveal factors that were avoidable, which may be related to facility management, service providers, patient party or others such as transport, distance, finance or perception of quality of care.

In the year 2002/ 2003, the DfID Nepal Safer Motherhood Project (NSMP) and UNICEF contracted the Nepal Society of Obstetrics and Gynaecology (NESOG) to conduct training for doctors and nurses in their supported districts on the use of maternal death audit forms, which were developed earlier with NSMP's support. Following the recommendations of the international consultant recruited by NSMP, Family Health Division requested the Management Division to make changes in the reporting forms of the HMIS to include indicators of EOC monitoring. NESOG conducted training for their project staff, the DHO/DPHO staff and the district hospital nurses and doctors on use of the revised HMIS forms and the maternal death audit forms. These trainings were organised in Rajbiraj, Nepalganj and Pokhara and covered all the staff of UNICEF and NSMP supported Safe Motherhood Programme districts. During this process, a system was also developed to send all the reports of EOC indicators and maternal death audit forms to FHD through the Management Division. The FHD Demography Section was made responsible for data entry and analysis of process indicators data.

In 2003, the Department of Health Services, with the support of WHO, decided to institutionalise a standard maternal and perinatal death review process to help improve the quality of maternal and newborn care services provided in hospitals. Standard maternal and perinatal death review tools and instruction manuals were reviewed and revised or developed, prior to institutionalising maternal and perinatal death reviews in selected

¹ Previously known as the Maternity Incentives Scheme

hospitals. As a result, National Maternal and Perinatal Death Review Committee (NMPDRC) was established under the leadership of the Director General of the Department of Health Services (DoHS) to oversee the implementation process. The director of FHD is the deputy chairperson and the director of Maternity Hospital, member secretary and coordinator of the committee (FHD/MH/WHO/SNL, 2006).

The first meeting of the NMPDRC decided to implement maternal and perinatal death reviews in six hospitals, as a first phase: three in Kathmandu Valley (Maternity, Patan and Tribhuvan University Teaching Hospital) and three in zonal level hospitals (Lumbini, Seti and Sagarmatha Hospital). These were selected as the larger tertiary and secondary referral level hospitals in the country with sufficient caseloads and reasonable record keeping facilities (FHD/MH/WHO/SNL, 2006).

The director of Maternity Hospital, member secretary of the national committee, was entrusted with the responsibility of coordinating and carrying forward this initiative. Two working groups were formed and assigned the task of developing standard maternal and perinatal death review forms with instruction manuals (FHD/MH/WHO/SNL, 2006). The tools were revised by Senior Demographer of the Demography Section, FHD. The instruction Manuals were written by the Senior Demographer with inputs from core working group members and WHO/SERO. The MPDR was then scaled up, so that by the end of 2006, 12 hospitals (three central-level hospitals, seven zonal hospitals and two medical colleges) were trained for the MPDR and provided with the instruction manual. It was envisaged that FHD would provide the overall coordination required among the relevant government institutions and the private sector hospitals at both central and district level. The data collected would be reviewed and analysed at FHD and feedback provided to the concerned health facilities so that corrective measures would be taken. A one-day meeting was organised in Kathmandu in December 2006 to review the experiences and lessons learnt on maternal and perinatal death reviews and to ensure that a systematic process was being maintained in the hospitals implementing the death review.

1.4 Study Objectives

The objectives of this study are to:

- improve the review process through assessment of its functioning, identifying problems/constraints in implementation and suggesting measures to correct them
- examine whether correct classification of the cause (direct, indirect or accidental) of maternal and perinatal death has been made
- identify the health service, facility management, patient related and community related avoidable factors which led to the deaths, and identify what measures were taken to correct them
- analyse the maternal and perinatal deaths to understand the reproductive and bio-social factors such as age, parity, ethnicity, religion, education, occupation, time of death (pregnancy, child birth or postpartum), etc.

1.5 Study Methodology

The study has two major components.

I. Retrospective review of maternal and perinatal deaths at the Maternity Hospital

A retrospective review of all maternal deaths in the last 10 years (1997/98-2007/08) and perinatal deaths in the last two years (2005/06- 2006/07) that occurred at Maternity Hospital was carried out, totalling 72 maternal deaths and 1,193 perinatal deaths (682 stillbirths and 511 neo-natal deaths). It was learned that no information related to the perinatal deaths was

transferred to the review form developed by the FHD/DoHS/MH. The study team therefore had to transfer information on perinatal deaths from medical charts into death review forms. Six medical officers abstracted perinatal death related medical charts, with close supervision of the core study team members. All maternal death related medical charts were reviewed by one of the core team members (Senior Obstetrician and Gynaecologist) and available relevant information was transferred to the most recent version of the maternal death review form developed by FHD/DoHS/MH. It was found that eight different versions of maternal death review forms were used at the Maternity Hospital in last 10 years.

In addition, selected background characteristics of the users of Maternity Hospital were also abstracted from the medical charts for the period of three months, randomly selected from the last three years (one month per year).

II. Key informant interviews

A total of 40 semi-structured interviews with key informants (32 hospital staff and eight policy makers) were carried out to understand the bottlenecks to improving the maternal perinatal death review system. The key informants were selected from three study hospitals within Kathmandu Valley (Maternity Hospital, Patan Hospital and Tribhuvan University Teaching Hospital) and two from outside Kathmandu valley (BPKIHS, Dharan and Lumbini Zonal Hospital, Butwal), selected in consultation with SSMP and FHD. Respondents for key informant interviews were from a range of staff involved in maternal and newborn care and policy makers. A list of key informants and semi-structured questionnaires is presented in annex 1 and annex 2 respectively.

Table 1.2 Distributions of Key Informants Interviewed

Name of health facility	Number of key informants
Maternity Hospital	13
BP Koirala Institute of Health Science (BPKIHS), Dharan	6
Lumbini Zonal Hospital, Butwal	6
TU Teaching Hospital	4
Patan Hospital	3
Policy makers	8
Total	40

1.6 Recruitment and Training of Researchers

A team of 6 medical officers from Maternity Hospital was involved in perinatal deaths medical chart review and abstraction. However, all maternal deaths were reviewed and abstracted by one core team member (Senior Obstetrician/gynaecologist).

A half day orientation was provided to the medical officers by the core team members. The orientation focused on the study objectives, methodology, research ethics, data quality assurance and reporting plan. The In-charge of the medical record section of Maternity Hospital was invited to explain the medical chart recording systems in the hospital. The most recent version of maternal and perinatal death review forms were used in the orientation and training.

1.7 Ethical Considerations

The primary methodology used in the study was abstraction of information from medical charts related to maternal and perinatal deaths. This entails no great risk to individuals, but there is a small risk with regard to confidentiality. Extreme care was therefore taken to

protect the personal information recorded in the medical charts and review forms. No personal identifying information was recorded on the instruments used to abstract the data. An informed consent was obtained from participants of key informant interviews. No individual data that could identify women and key informants were included in the report.

1.8 Data Management and Analysis

All the maternal and perinatal forms were collected and manual editing and coding carried out before entering into the database. As eight different versions of maternal deaths review forms were used in the last 10 years at Maternity Hospital, a combined database based on the recent most version of the review form was developed. The computer software dBase IV was used for data entry. Range and consistency checks were performed before transferring data into SPSS for further analysis. Data analysis was carried out using STATA computer software. Open ended questions both in maternal and perinatal review forms including case summary were typed in Microsoft Word and linked with their other information during analysis.

The qualitative data from key informant interviews were analysed by using standard content analysis procedures.

1.9 Organisation of the Report

The present report is organised into five chapters. The present chapter forms the introduction. Chapter two discusses maternal deaths at Maternity Hospital. Analysis of perinatal deaths at Maternity Hospital is presented in chapter three. Chapter four assesses the functioning of the maternal and perinatal death review process in the five study hospitals. Finally, a summary of conclusions and recommendations is presented in Chapter 5.

2. MATERNAL DEATHS AT MATERNITY HOSPITAL

This chapter presents the socio-demographic characteristics such as age, caste ethnicity, education status and occupations of 72 maternal deaths that occurred in the last 10 years at Maternity Hospital. Information on time of hospital admission, status at the time of admission, antenatal care (ANC), type of complication present during ANC, delivery status, pregnancy outcomes, procedures/interventions used during pregnancy, delivery and after-childbirth care are also discussed. Finally, the primary and main causes of deaths and avoidable factors are examined.

2.1 Trend in Maternal Deaths at Maternity Hospital

In total there were 72 maternal deaths at Maternity Hospital in the last 10 years. Table 2.1 presents the year distribution of maternal deaths. Although, there is no clear trend observed, there are indications that maternal deaths have decreased at Maternity Hospital, except for the years 1999/00, 2002/03 and 2006/07. There is no obvious explanation for the fluctuations, since maternal death is, to some extent, a random event, and Maternity Hospital is often the final referral centre for cases that have become almost hopeless.

Table 2.1 Trend in Maternal Mortality Ratio at Maternity Hospital

Year	Number of maternal deaths	Number of live births	MMR per 100,000 live births
1997/98	4	14649	27.31
1998/99	6	14319	41.90
1999/00	12	14504	82.74
2000/01	4	15921	25.12
2001/02	7	16431	42.60
2002/03	12	16167	74.23
2003/04	7	16721	41.86
2004/05	5	16601	30.12
2005/06	5	17350	28.82
2006/07	9	17784	50.61
2007 (first 6 months)	1	9446	10.58

2.2 Socio-Demographic Characteristics of Women

Table 2.2 presents all maternal deaths by age and parity of women, showing that the highest proportion of deaths, over half, were in the age group 20-29 years (38 of 72) and among those 15 were primi, 22 multi-parity and one grand parity. It is also important to note that over one in five of the maternal deaths (22%) were in the age group 15-19 years, in their first pregnancy. Overall, across all age groups slightly more of the deaths were among the primi group (33 out of 72) than multi-parity (28) or grand parity (11)

Table 2.2 Maternal Deaths by Age and Parity

Age group	Primi		Multi		Grand multi		Total	
	N	%	N	%	N	%	N	%
15-19	16	48.5	-	-	-	-	16	22.2
20-24	11	33.3	10	35.7	-	-	21	29.2
25-29	4	12.1	12	42.9	1	9.1	17	23.6
30-34	2	6.1	4	14.3	3	27.3	9	12.5
35+	-	-	2	7.1	7	63.6	9	12.5
Total	33	100.0	28	100.0	11	100.0	72	100.0

Table 2.3 presents the distribution of maternal deaths by the socioeconomic characteristic of the women. It should be noted that education and occupation of women and their husbands were not recorded for all cases in the review forms, and thus trends presented here should be interpreted with caution. About fourth fifths (39%) of mothers belong to hill *Janajati* groups (Sherpa, Lama, Rai, Magar, Tamang, Gurung, Limbu). This was followed by Brahmin/Chhetri (32%) and Newar (19%) respectively. An overwhelming majority of women who died (79%) were Hindu, in keeping with the general population distribution. Although Maternity Hospital is also a referral centre, over half the maternal deaths were from within the Kathmandu Valley.

There was no record of the educational status of 44 (61%) of the women, making it difficult to interpret the results. However, available information indicates that most of the women who died were illiterate and most of them were housewives.

Table 2.3 Maternal Deaths by selected Socio Economic Characteristics

Caste/ethnicity	N	%
Brahmin/Chhetri	23	31.9
Hill Janajati	28	38.9
Newar	14	19.4
Dalit	5	6.9
Muslim	2	2.8
Place of residence		
Urban	36	50.0
Rural	36	50.0
Permanent residence		
Within Kathmandu valley	41	56.9
Adjoining district of Kathmandu	17	23.6
Other districts of Nepal	13	18.1
India	1	1.4
Religion		
Hindu	57	79.2
Buddhist	11	15.3
Muslim	2	2.8
Not recorded	2	2.8

	N	%
Educational level of women		
Illiterate	20	27.8
Literate	4	5.6
Grade 1-5	2	2.8
Grade 6-10	1	1.4
11+	1	1.4
Not recorded	44	61.1
Educational level of husband		
Illiterate	13	18.1
Literate	8	11.1
Grade 1-5	3	4.2
Grade 6-10	6	8.3
11+	2	2.8
Not recorded	40	55.6
Occupation of women		
Housewife	31	43.1
Agriculture	13	18.1
Daily wage earner	7	9.7
Business	4	5.6
Service	4	5.6
Don't know	13	18.1
Occupation of husband		
Daily wage earner	23	31.9
Agriculture	14	19.4
Service	13	18.1
Business	9	12.5
Student	2	2.8
Don't know	11	15.3
Total	72	100.0

No apparent relation was observed between selected socio-demographic characteristics of women who died and users of Maternity Hospital, although some characteristics were similar between the two groups. For example, ethnicity, place of residence, and religion among users of Maternity Hospital were more or less similar to that of the women who died (Table 2.4).

Table 2.4 Selected Socio-Demographic Characteristics users of Maternity Hospital
(3 Months Sample Data obtained from last 3 years)

	N	%
Age group		
15-19	690	13.4
20-24	2424	46.9
25-29	1159	22.4
30-34	473	9.2
35+	420	8.1
Caste/ethnicity		
Brahmin/Chhetri	2524	48.9
Hill/Janajati	1164	22.5
Newar	1057	20.5
Dalit	329	6.4
Muslim	92	1.8
Residence		
Urban	2529	49.0
Rural	2637	51.0
Permanent resident		
Within Kathmandu Valley	1725	33.4
Adjoining districts of Kathmandu	1510	29.2
Other districts	1768	34.2
India	163	3.2
Religion		
Hindu	3208	62.1
Buddhist	1866	36.1
Muslim	92	1.8
Total	5166	100.0

2.3 Maternal Factors

Maternal factors such as antenatal care visits, complications during pregnancy, delivery status and its complications, outcomes of delivery and interventions administered during ANC, intrapartum and post-partum are assessed.

2.3.1 Antenatal care

Antenatal care is an important component of maternal health and covers a range of issues, including nutrition, education, tetanus vaccine and services for monitoring of potential complications. The set of antenatal care interventions can contribute directly or indirectly to reducing maternal deaths. World Health Organisation recommends at least four antenatal check ups with trained health personnel (doctor, nurse or midwife) during a normal pregnancy. It is evident from Table 2.5 that 27 of the 72 women (38%) did not receive any antenatal care during their most recent pregnancy. Among those who had ANC, over half (51%) visited a hospital and three quarters had received tetanus vaccine. Over three quarters of the women (78%) had received counselling on nutrition, iron supplementation, place of delivery and danger signs in pregnancy (Table 2.5).

Table 2.5 Maternal Deaths by Antenatal Care

	N	%
Whether or not ANC sought		
Yes	45	62.5
No	27	37.5
Total	72	100.0
Type of place visited for ANC		
Hospital	23	51.1
Private clinic	7	15.6
HP/SHP	3	6.7
At the community level	3	6.7
PHCC	1	2.2
Not recorded	8	17.8
Frequency of ANC visits		
1 to 3 times	26	57.8
4 times or more	9	20.0
Not recorded	10	22.2
TT immunisation received		
Yes	34	75.6
No	4	8.9
Not recorded	7	15.6
Counselling received		
Yes	35	77.8
No	6	13.3
Not recorded	4	8.9
Total	45	100.0
If yes, aspects on which counselling received (n=35)		
Nutrition	26	74.3
Place of delivery	27	77.1
Iron tablets	35	100.0
Advise on danger signs in pregnancy	27	74.3
Advise on referral	22	62.9

Of those women who had antenatal check ups, over 62% (28 of 45) had at least one pregnancy related complication. About 40% were diagnosed with hypertension (17 out of 45) during ANC visits followed by proteinuria (24%) and anaemia (18%) respectively (Table 2.6). Two out of the 45 women were diagnosed with heart disease during antenatal check ups.

Table 2.6 Maternal deaths by type complications present during ANC visits (N=45)

Type of complications	Yes	No	DK	Not recorded	Total
Hypertension	37.8	35.6	13.3	13.3	100.0
Proteinuria	24.4	40.0	17.8	17.8	100.0
Abnormal lie/presentation	6.7	53.3	15.6	24.4	100.0
Anaemia	17.8	51.1	13.3	17.8	100.0
Previous C/Section	6.7	57.8	13.3	22.2	100.0
Malaria	-	60.0	15.6	24.4	100.0
UTI	2.2	57.8	15.6	24.4	100.0
Infective hepatitis	-	60.0	15.6	24.4	100.0
Heart diseases	4.4	55.6	15.6	24.4	100.0
Diabetes	2.2	57.8	15.6	24.4	100.0
Others	13.2	-	-	-	100.0

2.3.2 Status during admission

Information on pregnancy status and condition on admission, time of admission and any referral were also noted during this review. It was found that two thirds of the mothers (67%) who died were admitted to the hospital during the antepartum period, 11 (15%) arrived during the postpartum period and eight (11.1%) women arrived at the hospital either experiencing complications of abortion or ectopic pregnancy. Roughly one in five women (13 out of 72) admitted were referred by another health facility.

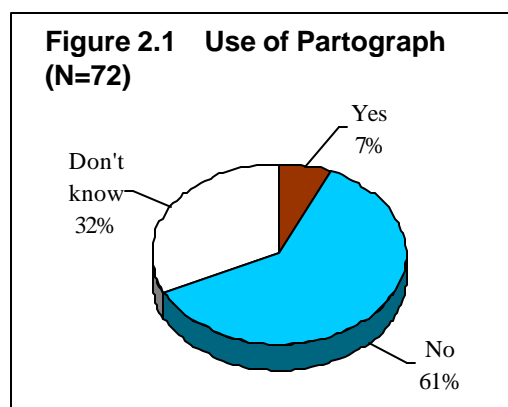
Half of the women were at a critical stage when they were admitted to the hospital. About 39% of the women died within one day of admission and 17% died within 24 to 47 hours of admission (Table 2.7).

Table 2.7 Maternal deaths by pregnancy status and condition on admission, days spent in hospital

Pregnancy status on admission	N	%
Antepartum	48	66.7
Postpartum	11	15.3
Aborting/ectopic	8	11.1
Intrapartum	4	5.6
Not recorded	1	1.4
Condition on admission		
Stable	36	50.0
Critically ill	36	50.0
Referred by		
Self	46	63.9
Hospital	7	9.7
HP/SHP	5	6.9
Relative/Neighbour	2	2.8
Clinic	1	1.4
Not recorded	11	15.3
Number of hours spent in hospital		
Less than 24 hours	28	38.9
24-47 hours	12	16.7
2-3 days	13	18.1
3 days and above	19	26.4
Total	72	100.0

2.3.3 Delivery, Puerperium and Outcomes of Pregnancy

The partograph is a tool to assess the progress of labour and identify when intervention is necessary. Studies have shown that using the partograph can be highly effective in reducing complications from prolonged labour for the mother (postpartum haemorrhage, sepsis, uterine rupture and its sequelae) and for the newborn (death, anoxia, infections, etc). Results showed that use of the partograph was very rare at Maternity Hospital. Labour had occurred for more than half of the women (58%), but the partograph was used on only 5 out of 42 women (7%).



About half of the women (47%) had a live birth. One in five women had not delivered. It is surprising to note that information on pregnancy outcome was not recorded for about a quarter of the women. Close to four fifths of the women had a caesarean section, for delivery indicating the extent of complicated cases admitted in the hospital (Table 2.8).

Table 2.8 Maternal deaths by delivery status and mode of delivery

	N	%
Labour occurred		
Yes	42	58.3
No	17	23.6
Not known due to abortion (no any evidence in clinical notes)	9	12.5
Not known due to home delivery/expulsion (no any evidence in clinical notes)	4	5.6
Total	72	100.0
Mode of delivery		
Caesarean section	24	38.1
Spontaneous	21	33.3
Undelivered	14	22.2
Others (Breech delivery, laparotomy for ruptured uterus, assisted vaginal delivery)	3	4.8
Not recorded/don't know	1	1.6
Total	63*	100.0
Outcomes of pregnancy		
Live birth	34	47.2
Still birth	12	16.7
Abortion	9	12.5
Undelivered	14	19.4
Not recorded	3	4.2
Complication during delivery		
Yes	36	50.0
No	36	50.0
Total	72	100.0

* Nine women died due to complications of abortion.

Half of the women (36 out of 72) had experienced at least one complication during delivery. Of women with complication during delivery, about two thirds had haemorrhage (72%) followed by shock (42%). It is surprising to find that four out of 36 women (11%) had anaesthesia complications (Figure 2.2).

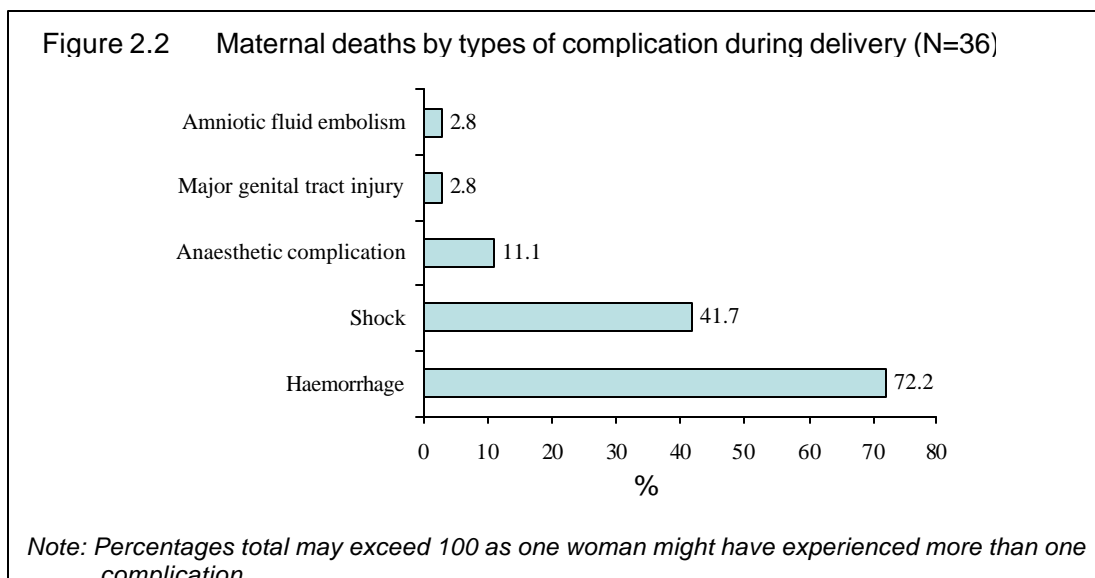


Table 2.9 shows the percentage distribution of women by types of adverse events in puerperium. As the table shows, over half the women (54%) had experienced at least one adverse event during puerperium. It should be mentioned that information on adverse events in puerperium was not recorded in the medical charts for about quarter of women.

About a third of women (31) had puerperal sepsis during puerperium followed by anaemia (28%), secondary postpartum haemorrhage (18%) and eclampsia (10%) respectively. Other adverse events during puerperium included complications of operative delivery, primary PPH, breast abscess, renal failure etc (Table 2.9).

Table 2.9 Maternal deaths by type of adverse events in puerperium

Presence of any adverse events in puerperium		
Yes	39	54.2
No	6	8.3
Don't know	10	13.9
Not recorded	17	23.6
Total	72	100.0
Types of adverse events in puerperium*		
Puerperal sepsis	12	30.8
Anaemia	11	28.2
Secondary postpartum haemorrhage	7	17.9
Eclampsia	4	10.3
Complications of operative delivery	3	7.7
Primary PPH	2	5.1
Breast abscess	1	2.6
DIC and renal failure	1	2.6
Persistent tachycardia and tachypnoea	1	2.6
Went in hepatic coma	1	2.6
Gastric perforation due to peptic ulcer disease	1	2.6
Unconscious	1	2.6

Total	39	*
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* Percentages total may exceed 100 as one woman may have experienced more than one complication.

2.4 Interventions

This section examines type of intervention that was provided to women during their early pregnancy, antenatal and postpartum period. Although information on procedures adopted during the early pregnancy was not recorded for a significant proportion of women, available information showed that blood transfusion was the most common intervention provided, regardless of the stage of their pregnancy. For example, a quarter of women had received blood transfusion during their previous pregnancy (25%) and antenatal period (24%) in index pregnancy. Similarly, about half of the women (49%) received blood transfusion during the postpartum period. Over a third of the women had to have a caesarean section.

Table 2.10 Women who received interventions during different stages of pregnancy (N=72)

	Number of women who had received intervention	% of women who had received interventions
Procedure followed during early pregnancy (N=72)		
MVA (evacuation)	4	5.6
Laparotomy	2	2.8
Hysterectomy	2	2.8
Blood transfusion	18	25.0
Interventions administered during antenatal period N=72)		
Blood transfusion	17	23.6
Treatment of anaemia	6	8.3
Intervention administered during intra-partum period (N=72)		
Caesarean Section	25	34.7
Hysterectomy	3	4.2
Blood transfusion	15	20.8
Intervention administered during postpartum period (N=72)		
Exploration	5	6.9
Laparotomy	5	6.9
Hysterectomy	6	8.3
Blood transfusion	35	48.6
Manual removal of placenta	2	2.8

2.5 Primary Cause of Maternal Death

The causes of maternal deaths may be either direct, such as obstetric complications of pregnancy, delivery and the puerperium, or indirect, such as pre-existing diseases or diseases developed during the pregnancy that are made worse by pregnancy. It is acknowledged that some clinicians may have different opinions on classification of the causes of maternal deaths presented in this section. However, the classification presented in this analysis was based on the instruction manual for maternal and perinatal death review developed by the FHD. In the manual, the primary (underlying) and final causes of maternal deaths are broadly categorised into 12 and 13 groups respectively (FHD/DoHS/MH, 2005).

Table 2.11 shows the primary cause of maternal deaths at the Maternity Hospital in the last 10 years, indicating that 60 out of the 72 women (83%) died due to direct causes and the

remaining 12 (17%) died because of indirect causes. The three main causes of death were postpartum haemorrhage (32%), hypertensive disorders of pregnancy (25%) and abortion (13%). Pre-existing maternal diseases (such as severe anaemia, cardiac disease) and non-pregnancy-related infections (such as hepatitis, gastroenteritis) were the two main indirect causes of maternal death.

Table 2.11 Type of primary cause of maternal deaths

Primary cause	Direct Causes		Indirect Causes		Total	
	N	%	N	%	N	%
Postpartum haemorrhage	23	38.3	-	-	23	31.9
Hypertensive disorders of pregnancy	18	30.0	-	-	18	25.0
Abortion	9	15.0	-	-	9	12.5
Pre-existing maternal disease (severe anaemia, cardiac diseases etc)	-	-	6	50.0	6	9.7
Non-pregnancy-related infections (Hepatitis, Gastroenteritis)	-	-	5	41.7	5	6.9
Pregnancy related sepsis (puerperal sepsis)	5	8.3	-	-	5	6.9
Embolism (amniotic fluid embolus)	3	5.0	-	-	3	4.2
Anaesthetic complications	2	3.3	-	-	2	2.8
Unknown	-	-	1	8.3	1	1.4
Total	60	100.0	12	100.0	72	100.0

Table 2.12 presents three main causes of primary death by selected socio-demographic characteristics. Among the 23 women who died from PPH, the majority were aged between 20 and 29, multi parity, with no education and from Newar ethnic groups. Among the 18 women who died due to hypertensive disorders the majority were aged between 15 and 19 years (7 out of 18), living within Kathmandu valley, housewives with husbands who were daily wage earners and from hill *Janajati* ethnic groups. The nine women who died from abortion were mainly in the age group 20-24 years, multi parity, residing in within Kathmandu valley, and housewives.

Analysis of maternal deaths by year showed no clear pattern of cause of death over the 10 years. However, data indicates that death due to postpartum haemorrhage has been decreasing since 2003/04 except for the year 2006/07. It is encouraging to find that there was only one death due to abortion after 2003/04 (Table 2.13), which corresponds with the initiation of comprehensive abortion services at Maternity Hospital in 2004.

Table 2.12 Primary Causes of Maternal Death by Selected Socio-Demographic Characteristics

	PPH		Hypertensive disorder of pregnancy		Abortion		Total	
	N	%	N	%	N	%	N	%
Age								
15-19	3	13.0	7	38.9	-	-	10	20.0
20-24	6	26.1	5	27.8	4	44.4	15	30.0
25-29	6	26.1	4	22.2	2	22.2	12	24.0
30-34	5	21.7	1	5.6	1	11.1	7	14.0
35 and over	3	13.0	1	5.6	2	22.2	6	12.0
Parity								
Primi	9	39.1	9	50.0	1	11.1	19	38.0
Multi	8	34.8	9	50.0	6	66.7	23	46.0
Grand multi	6	26.1			2	22.2	8	16.0
Caste/ethnicity								

Brahmin/Chhetri	3	13.0	6	33.3	4	44.4	13	26.0
Newar	9	39.1	1	5.6	2	22.2	12	24.0
Hill Janajati	8	34.8	9	50.0	3	33.3	20	40.0
Dalit	2	8.7	1	5.6	-	-	3	6.0
Muslim	1	4.3	1	5.6	-	-	2	4.0
Residence								
Urban	11	47.8	12	66.7	4	44.4	27	54.0
Rural	12	52.2	6	33.3	5	55.6	23	46.0
Permanent residence								
Within Kathmandu Valley	13	56.5	10	55.6	5	55.6	28	56.0
Adjoining districts of Kathmandu	6	26.1	3	16.7	2	22.2	11	22.0
Other districts of Nepal	4	17.4	4	22.2	2	22.2	10	20.0
India	-	-	1	5.6	-	-	1	2.0
Women's education								
Illiterate	8	34.8	3	16.7	2	22.2	13	26.0
Literate/No schooling	1	4.3	-	-	2	22.2	3	6.0
Grade 1 to 5	1	4.3	-	-	-	-	1	2.0
Grade 6 to 10	-	-	1	5.6	-	-	1	2.0
Grade and over	1	4.3	-	-	-	-	1	2.0
Don't know	12	52.2	14	77.8	5	55.6	31	62.0
Husband's education								
Illiterate	6	26.1	2	11.1	1	11.1	9	18.0
Literate/No schooling	2	8.7	2	11.1	1	11.1	5	10.0
Grade 1 to 5	1	4.3	-	-	2	22.2	3	6.0
Grade 6 to 10	2	8.7	2	11.1	1	11.1	5	10.0
Grade 11 and over	1	4.3	-	-	-	-	1	2.0
Don't know	11	47.8	12	66.7	4	44.4	27	54.0
Women's occupation								
House maker	7	30.4	7	38.9	4	44.4	18	36.0
Agriculture	7	30.4	2	11.1	2	22.2	11	22.0
Daily wage earner	5	21.7	-	-	1	11.1	6	12.0
Business	-	-	2	11.1	1	11.1	3	6.0
Service	1	4.3	1	5.6	-	-	2	4.0
Don't know	3	13.0	6	33.3	1	11.1	10	20.0
Husband's occupation								
Agriculture	5	21.7	2	11.1	2	22.2	9	18.0
Daily wage earner	8	34.8	7	38.9	2	22.2	17	34.0
Business	3	13.0	2	11.1	-	-	5	10.0
Service	2	8.7	1	5.6	5	55.6	8	16.0
Student	-	-	2	11.1	-	-	2	4.0
Don't know	5	21.7	4	22.2	-	-	9	18.0
Total	23	100.0	18	100.0	9	100.0	50	100.0

Table 2.13 Year-wise Number of Maternal Deaths by Primary Cause

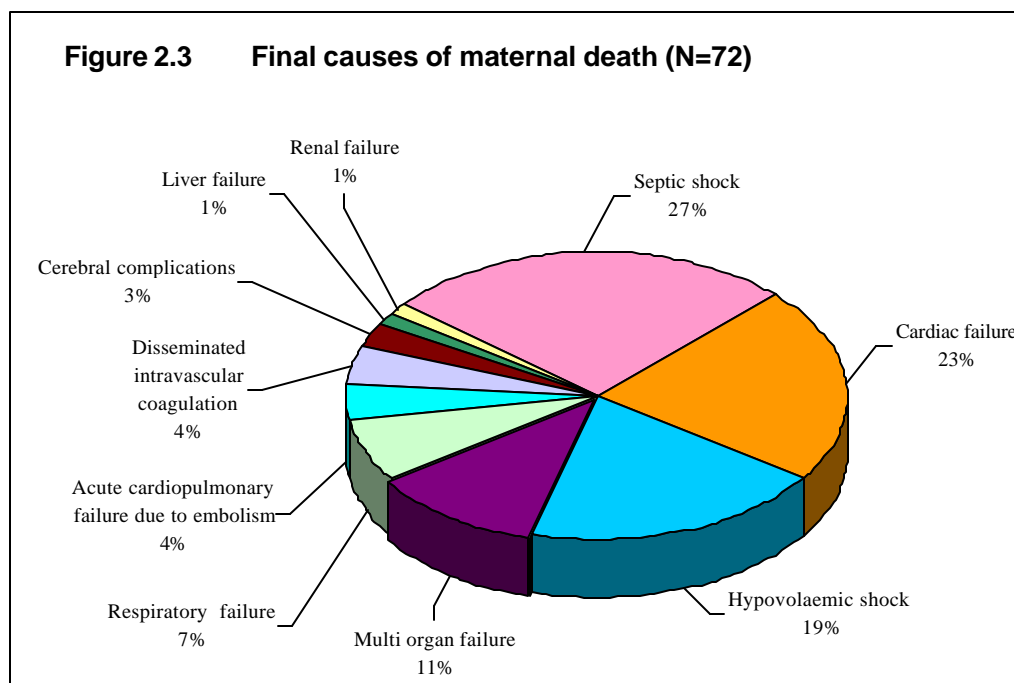
Year-wise distribution	Direct Causes						Indirect Causes			Total
	PPH	Hypertensive disorder of pregnancy	Abortion	Embolism	Aesthetic complication	Pregnancy related sepsis	Non pregnancy related infection	Pre existing maternal disease	Unknown	
1997/98	1	1	1	-	-	-	-	1	-	4
1998/99	2	1	2	-	1	-	-	-	-	6
1999/00	3	4	2	1	-	-	-	1	1	12
2000/01	2	-	-	1	-	1	-	-	-	4
2001/02	3	3	1	-	-	-	-	-	-	7
2002/03	4	2	1	1	-	-	2	2	-	12
2003/04	2	2	1	1	-	1	-	1	-	7

2004/05	1	-	-	-	-	2	2	-	-	5
2005/06	1	1	-	-	1	1	-	1	-	5
2006/07	3	4	1	-	-	-	1	-	-	9
2007	1	-	-	-	-	-	-	-	-	1
Total	23	18	9	3	2	5	5	6	1	72

2.6 Final causes of deaths

The final causes of maternal deaths were classified according to the instructional manual for maternal and perinatal death review developed by FHD/DoHS/MH in 2005. This broadly categorises the final causes of death into 14 groups (hypovolaemic shock, septic shock, respiratory failure, cardiac failure, acute cardiopulmonary failure due to embolism, renal failure, liver failure, cerebral complications, metabolic, disseminated intravascular coagulation, multi-organ failure, immune system failure, unknown and other).

Figure 2.3 shows the final causes of maternal death. Out of the 72 women, the largest group (26%) died due to septic shock, 23% because of cardiac failure and 19% due to hypovolaemic shock. Other final causes included multi-organ failure (8 women), respiratory failure (5 women), acute cardiopulmonary failure due to embolism (3 women), disseminated intravascular coagulation (3 women), cerebral complications (2 women), liver failure (1 woman) and renal failure (1 woman).



2.7 Time Interval between admission to Hospital and Death

As previously noted, 35 out of 72 women (49%) were in stable condition on admission. The remaining 37 were critically ill when they reached the hospital. This indicates that survival for half of the women required emergency response with high quality care. Table 2.14 presents the time interval between hospital admission and death, showing that 18 women died within eight hours of admission (25%) and of those, nine died within two hours. Of these 18

women, six died due to postpartum haemorrhage, three each because of hypertensive disorder and non-pregnancy related infections, two each due to abortion and pre-existing diseases and one each from anaesthetic complication and pregnancy related sepsis. Another 13 women (18%) died within nine to 24 hours. The remaining 41 women died within one to nine days (Table 2.14).

Table 2.14 Time interval between hospital admission and death by cause of death (primary)

Interval hours in hospital between admission and death	Direct causes						Indirect causes			Total	
	PPH	Hypertensive disorder of pregnancy	Abortion	Embolism	Anaesthetic complication	Pregnancy related sepsis	Non-pregnancy-related infections	Pre existing maternal disease	Unknown	N	%
Up to 2 hours	4	2	1	-	-	-	1	1	-	9	12.5
3-4 hours	-	-	-	-	1	1	2	-	-	4	5.6
5-8 hours	2	1	1	-	-	-	-	1	-	5	6.9
9-16 hours	3	3	1	-	-	2	1	-	-	10	13.9
17-24 hours	-	2	1	-	-	-	-	-	-	3	4.2
25- 48 hours	8	4	3	3	-	-	-	2	-	20	27.8
3-4 days	3	4	1	-	1	-	-	1	-	10	13.9
5-9 days	3	2	1	-	-	2	1	1	1	11	15.3
Total	23	18	9	3	2	5	5	6	1	72	100.0

2.8 Avoidable Factors

Avoidable factors are assessed on the basis of the following 11 indicators collected from the case review form developed by FHD/DoHS/MH.

- Delay in woman/family seeking care
- Refusal of treatment on admission
- Lack of transport from home to health facility
- Lack of fund
- Lack of transport between health facilities
- No communication with the referring health facility
- Shortage of skilled human resources
- Shortage of expertise, training or education
- Shortage of blood transfusion
- Shortage of essential drug
- Shortage of equipment
- Others

The presence of above indicators was assessed by the clinicians at the time of reviewing medical charts, with 'Yes', 'No' or 'Don't know' recorded on the case review form. In most cases, there was more than one avoidable factor. Altogether 162 avoidable factors were reported for the 72 maternal deaths. Medical service related factors accounted for 56% of the factors (90 out of 162). It is surprising to find that over one third of avoidable factors (54 out of 162) were related to shortage of expertise, training or education or shortage of human resources. Shortage of essential drugs, blood transfusion, and essential equipment accounted for 27 of 162 (16.7%) avoidable factors (Table 2.15). Due to the nature of data

recorded in the case reform and clinical notes, it was unfortunately not possible identify the type of training and equipment shortage connected with these deaths.

Table 2.15 Avoidable Factor in Maternal Deaths (N=72)

Types of avoidable factors	Number of factors	%
Patient/Family related factor (37.0%)		
Delay in women/family seeking care	54	33.3
Lack of fund	4	2.5
Refusal for treatment on admission	2	1.2
Transportation related factor (5.6%)		
Lack of transport form home to health facility	5	3.1
Lack of transport between health facilities	4	2.5
Medical service related factors (55.6%)		
Shortage of expertise, training or education	34	21.0
Shortage of skilled human resources	20	12.3
Shortage of essential drug	12	7.4
Shortage of blood transfusion	10	6.2
No communication with the referring health facility	9	5.6
Shortage of essential equipment	5	3.1
Others (Lack of monitoring the patient in ward, delay in starting drug etc) (1.8%)	3	1.8
Total number of factors present	162	100

This finding stresses the need for continuous refresher training and education for doctors and nurses and ensuring the availability of skilled human resources around the clock. Continuous supply of essential drugs and blood is also critical. A few deaths were due to lack of monitoring of the patients in the ward. Patient/ family related factors accounted for 37% (60 out of 162) of the avoidable factors, indicating the need for community/ family level intervention.

Avoidable factors were further assessed by selected socio-economic characteristics. As shown in Table 2.16, delay in women/ families seeking care was more common among hill *Janajatis* and the illiterate. It is surprising to note that living within Kathmandu valley has no impact on seeking care in time.

Table 2.16 Number of Avoidable Factors by Selected Socio-Demographic Characteristics

Types of factors	Caste/ethnicity					Women's education						Husband's education						Permanent residence			Total	
	Brahmin/ Chhetri	Newar	Hill Janajati	Dalit	Muslim	Illiterate	Literate	Grade 1-5	Grade 6-10	11+	NR	Illiterate	Literate	Grade 1-5	Grade 6-10	11+	NR	Within Kathmandu Valley	Adjoining districts of Kathmandu	Other districts of Nepal		India
Patient/Family Related factor																						
Delay in women/family seeking care	19	6	22	5	2	14	2	1	1	-	36	9	7	2	3		33	26	17	10	1	54
Refusal for treatment on admission	1	-	1	-	-	-	-	-	1	-	1	1			1			1		1	-	2
Lack of fund	-	1	2	1		1	-	-	-	-	3	1					3	2	2		-	4
Transportation Related Factor																						
Lack of transport form home to health facility	1		3	1		4	-	-	-	-	1	3	1	-	-	-	1	1	4	-	-	5
Lack of transport between health facilities	-	1	2	1		3	-	-	-	-	1	3	-	-	-	-	1	-	4	-	-	4
Medical service factors																						
No communication with the referring health facility	4	1	3	1	-	6	2	-	-	-	1	4	1	1	1	1	1	3	5	1	-	9
Shortage of skilled human resources	7	4	6	2	1	5	3	-	-	1	11	4	2	1	4	1	8	13	5	1	1	20
Shortage of expertise, training or education	12	7	12	2	1	8	2	1	1	1	21	5	3	2	5	1	18	20	9	4	1	34
Shortage of blood transfusion	4	1	3	-	2	5	1	-	-	-	4	2	2		2	-	4	2	4	3	1	10
Shortage of essential drug	4	1	4	3		1	1	-	-	-	10	2	-	-	1	-	9	6	5	1	-	12
Shortage of essential equipment	2	1	1	-	1	1	-	-	-	-	4	1	-	-	-	-	4	2	1	1	1	5
Others	3	-	-	-	-	-	-	-	-	-	3	-	-	-	-	-	3	3	-	-	-	3

2.9 Cause Specific Results

2.9.1 Direct Deaths

Postpartum haemorrhage (23)

1. Twenty three women died due to postpartum haemorrhage. Nine were primigravida and the ages ranged from 18– 28 years. Four women were of gravida 2 and aged between 25 and 31 years. Four women were of gravida 3 and aged between 22 and 32 years. One of gravida 4 was aged 30 years and two of gravida 5 were aged between 22 and 40 years. Three women were of gravida 6 and aged between 30 and 40. Fourteen out of 23 women had received ANC check ups. Among them, only two had visited received four or more check ups.
2. Five out of the 23 delivered at home. One woman was brought with retained placenta and on the way to the operation theatre (five hours after admission) she suddenly had difficulty in breathing, cyanosed and died. She received antibiotics, was intubated and ventilated. Resuscitation was also attempted.
3. Four women had a ruptured uterus (one had not delivered). Eight women had uterine atony and two had uterine tear.
4. Ten out of the 23 women had caesarean section.
5. Total abdominal hysterectomy was carried out for eight women, two of whom had ruptured uterus and remaining six had atony of uterus.
6. One out of the four women with a ruptured uterus on admission was aged 32 years, gravida 5, at 41 weeks of the pregnancy and leaking vaginally. Labour was induced 24 hours after admission, following which she had a normal delivery and live baby. Two and half hours later, a doctor attended the woman for PPH. There was extensive lateral tear of the cervix extending up the whole uterine wall. Haemaccel and two units of blood were transfused and dopamine and adrenalin were injected. She died.

A second woman of primi gravida, aged 24 years, admitted at the second stage of labour with obstructed labour and ruptured uterus, was referred from Khadbari Hospital (Sankhuwashava District). She was given haemaccel, oxygen and antibiotics. She became restless, collapsed, and expired less than two hours after admission.

Another woman 40 years old, gravida 5, at 32 weeks of pregnancy was admitted with a ruptured uterus. Laparotomy was carried out one hour after admission. She had a high temperature (103⁰F). After consultation with a physician, broad spectrum antibiotics were given. She was kept in a ventilator. In spite of all efforts her condition did not improve and she expired.

Another woman, 34 years old, of gravida 6, was admitted in a very serious condition with pulse not palpable and blood pressure not recordable. Laparotomy was carried out to repair the uterus. Re-laparotomy and total abdominal hysterectomy were then carried for internal bleeding and tearing was seen on both lateral borders of the uterus extending up to fornix. Eight pints of blood were transfused and she was kept in ventilator with all required treatment, but died after nine hours.

7. There were 39 avoidable factors associated with the 23 deaths due to PPH.
 - Delay in arrival at hospital: 9 cases
 - Inappropriate institutional management: 4 cases

- Delay in management: 8 cases
- Lack of standard management of protocol for PET : twice
- Delay in blood transfusion: 4 cases
- Delay in physician consultation: twice
- Patient not seen by consultant on time: once
- Inadequate blood supply: twice
- Lack of monitoring in jaundice room: once
- Lack of proper monitoring in MICU in MICU unit: twice
- Late referral: twice
- Lack of monitoring in ward: once
- Lack of monitoring in labour room: once

Hypertensive disorders of pregnancy (18)

1. There were 18 deaths from hypertensive disorders of pregnancy. Among these, 10 women died from complications of severe PET and eight from eclampsia. Eleven were admitted conscious, six were unconscious and one was semi-conscious. Twelve women died during postpartum period and six before delivery.
2. Age and parity were as follows: nine were primi gravida, of which seven were between 17 and 19 years, one was aged 20 and another 22 years. Seven were second gravida, para one. Two women were third gravida, para 2 and aged between 27 and 30 years.
3. Seventeen of the 18 women had received antenatal checkups. However, details about their ANC visits were known for only 12 of them. Only four had received four or more check ups.
4. Twelve out of 18 women died after delivery. One of these had delivered at a health post and the remaining 11 at the hospital. Nine had a live birth and the remaining three had still births. Two of the women had twins.
5. The average time from admission to death for the 12 women who died after delivery was 66.3 hours and for remaining six who died during pregnancy it was eight hours.
6. These women received various treatments including antibiotics, ventilator support, blood transfusion and emergency LSCS at the hospital.
7. There were 38 avoidable factors in the 18 deaths:
 - Delay in coming to hospital: 14 cases
 - No standard protocol for severe PET: 6 cases
 - No standard protocol for management of eclampsia: 4 cases
 - Delay in management: 3 cases
 - Delay in consultation with physician: twice
 - Inadequate skilled health personnel: twice
 - Inadequate management: twice
 - Shortage of blood on time: once
 - Non-compliance for admission : once
 - Problem following intubation: once

- Delay in management in admission room: once
- No consultation with tropical physician following dog bite: once

Abortion (9)

1. There were nine deaths from abortion. Of them, six women died due to septic abortion, two died due to complications from trophoblastic disease (with severe anaemia) and the remaining one died from incomplete abortion with heart disease. A woman of primigravida, aged 21 years; one woman with gravida 4, aged 28 years; one woman with gravida 9, aged 45 years; 3 women with gravida 2, aged between 21 and 32 years and remaining 3 women with gravida 3, aged between 23 and 40 years. Four out of six women who died due to septic abortion gave a history of interference, with two having locally inserted abortifacients, a foreign body in the vagina, and two consumed oral medicines.
2. Information on contraceptive use was not available.
3. Three women had expelled the foetus. Evacuation of uterus was carried out for three women. One woman had Manual Vacuum Aspiration (MVA). Evacuation procedure was not performed for one woman who had consumed oral medicine. Another woman had inserted a foreign body (by a "quack"), the foetus was expelled and laparotomy was carried out. The woman was unconscious and gasping. It was agreed to refer her to Bir Hospital intensive care unit, but during her transfer by ambulance she had sudden respiratory cardiac arrest and expired. The third woman had exploratory laparotomy for peritonitis due to uterine perforation.
4. Blood transfusion, antibiotics and evacuation were the usual treatments provided at the hospital.
5. The average time from admission to death was 38 hours.
6. Avoidable factors were present in most of the cases. Although patients arrived late at the hospital in critically ill condition, 11 avoidable factors were allocated to institutional delays.
 - Delay in arrival: 6 cases
 - Delays in management: 3 cases
 - Delay in blood transfusion: 3 cases
 - Inadequate equipment: twice
 - Delay in diagnosis: once
 - Delay in consultation with surgeon: once
 - Delay in consultation with physician: once

Pregnancy related sepsis (5)

1. There were five deaths from pregnancy related sepsis. Two were primi and aged 17 and 20 years. One each were gravida 3, 4 and 6, aged 25, 40 and 42 years respectively. Out of the five, three delivered at the hospital and one at the health post and one at home.
2. Two women, referred from Bharatpur and TUTH hospitals, were admitted with diagnosis of puerperal pyrexia. They were treated with antibiotics but without timely consultation with a physician, USG was not carried out. They were overcome with shock and cyanosed and died.

3. A woman of third gravida, aged 25 years and 30 weeks pregnant in the early stages of labour, was admitted with a high temperature. She was treated with various antibiotics. Suddenly, she cyanosed and had shortness of breath. She was transferred to MICU. An urgent chest X-ray, and ECG were carried out. She was injected with hydrocortisone, IPPV and dopamine. She became unconscious and was placed in a ventilator. Despite all efforts, she died.
4. Another woman, aged 20 years of primi gravida, was admitted in labour with leaking liquor for three days. She was given oral antibiotics. Caesarean section was carried out and she was shifted to the post operative ward. Antibiotics were given during the operation. An hour after the operation she was shifted to MICU and given higher doses of antibiotics and oxygen. Laparotomy was done on suspicion of internal haemorrhage but she died.
5. A 42 year old woman with six children had delivered at a health post five days previously with a still birth. She was admitted to the hospital gasping for breath (severe anaemia with septic shock). She was given two pints of blood, intubated, injected with dopamine and lasix. After consulting a physician, eight cycles of peritoneal dialysis were carried out, she was injected with atropine and adrenaline IV and kept in ventilator. Despite all these efforts she died.
7. Another woman aged 40 years with three children was admitted with a hand prolapse and foul smelling discharge for three days. Under general anaesthetic, assisted vaginal delivery was done with macerated foetus, but she died.
8. There were nine avoidable factors
 - Late referral: once.
 - Institutional inappropriate management: once.
 - Delay in blood transfusion: twice.
 - Delay in management: once.
 - No proper monitoring in the ward: once.
 - Delay in arrival: twice
 - Problem with transport: once

Amniotic fluid embolism (3)

1. There were three deaths from amniotic fluid embolism. All three women were primi gravida and were aged between 19 and 32 years. Two died without delivering and one had a breech delivery with fresh still birth.
2. One woman died due to massive amniotic fluid embolism with intra uterine death in the second stage of labour. She was admitted without labour pain with premature rupture of membrane while transferring to the labour room.
3. Two of the three deaths were unavoidable. One avoidable factor was delay in management of the breech delivery. Early caesarean section could have saved the life of this mother.

Anaesthetic complication (2)

1. There were two deaths due to anaesthetic complications. One was a primi gravida of 21 years and another was gravida 3, aged 23 years. One woman died without delivering. Caesarean section for a hand prolapsed case was planned, but she died suddenly of

cardiac arrest on the operation theatre table, probably due to an abnormal reaction to the injection of scoline she was given.

2. The other woman died following spinal anaesthesia before incision for caesarean section planned for prolonged labour and failed induction.
3. Three avoidable factors were identified in the two deaths. Two were related to patient/family - the women came too late to the hospital and had received no ANC check up. The other was associated with inappropriate institutional management (lack of thorough investigation before operation)

2.9.2 Indirect Deaths

Pre existing maternal disease (6)

1. There were six maternal deaths due to pre-existing maternal diseases (such as severe anaemia, cardiac disease). Three women were primi gravida, aged between 17 and 22 years. Two were gravida 3, aged 25 and 26 years respectively and one was gravida 4, aged 37 years.
2. Three out of the six died without delivering and among the remaining three, one delivered at home and two had caesarean sections at the hospital.
3. Four out of the six died due to severe anaemia (Hb 3 gm% - 6.5 gm%), one due to heart disease and the other due to chest infection. The woman who died of heart disease was given antibiotics, such as injected lasix, ampicillin, gentamycin etc. Oxygen was also provided. The physician consulted by telephone but did not attend her in hospital. Investigation of the heart problem was not done in time and despite treatment in the MICU, she expired. The woman who died from a chest infection also received various treatments, including antibiotics and blood in the MICU.
4. The woman who delivered at home received two pints of blood transfusion but she had a reaction. She was treated but collapsed and died in the ward six days after admission.
5. There were 13 avoidable factors identified with these deaths:
 - Patient delay in arrival in the hospital: 3 cases.
 - Consultant attended late: once
 - No consultation with physician: once
 - Lack of management protocol for heart disease: once
 - Inadequate investigation: once
 - Delay in physician consultation: twice
 - Lack of monitoring of patient in ward: 3 cases
 - Delay in blood transfusion: once

Non-pregnancy related infection (5)

1. There were five deaths due to non-pregnancy related infection. Four were primi gravida women aged between 18-33 years. The other was gravida 3 and 21 years of age.
2. Four out of the five women died due to hepatic coma and one due to hypovolemic shock at 34 weeks of pregnancy with severe gastroenteritis. She died without delivering.
3. One woman with deep jaundice delivered vaginally and had a vulval hematoma repaired. A physician was consulted eight days after admission. The woman became unconscious due to hepato renal failure.

4. Another woman with deep jaundice was admitted in a critically ill condition. She expired on the same day. No investigation was carried out.
5. One woman admitted with deep jaundice was referred to Teku hospital for management of the hepatitis, then referred back to Maternity Hospital after delivery, with heavy PV bleeding. In spite of management in MICU, she expired.
6. One woman was admitted with pre-term labour with deep jaundice. She became unconscious and delivered a fresh still birth. The hospital attempted to refer her to another hospital but a bed was not available and she was sent back. She expired after three days.
7. There were nine avoidable factors associated with non-pregnancy related infections:
 - Patient delay in admission: 3 cases
 - Institutional delay in management once
 - Institutional delay in referral: once
 - Inappropriate institutional management: once
 - Delay in blood transfusion: once
 - No specific diagnosis from referral hospital: once

Unknown (1)

1. One 18 year old woman, primi gravida, at 41 weeks of pregnancy with cord presentation was admitted to the hospital. LSCS was done and a live baby delivered. Two pints of blood were transfused one day before discharge. The day after discharge, she was admitted again with difficulty in breathing and unconscious. Despite resuscitation efforts, she died.
2. One avoidable factor that was considered to be present in this death was inappropriate institutional treatment or management.

3. PERINATAL DEATHS AT MATERNITY HOSPITAL

Perinatal mortality, which includes both deaths in the first week of life and foetal deaths (stillbirths) is an important indicator of maternal care and of maternal health and nutrition. It also reflects the quality of obstetric and paediatric care available in a country. The perinatal mortality indicator plays an important role in providing the information needed to improve the health status of pregnant women, new mothers and newborns, allowing decision makers to identify problems, track temporal and geographical trends and disparities and assess changes in public health policy and practice (WHO, 2006b).

This chapter discusses findings from perinatal deaths that occurred in the last two years at Maternity Hospital. Trends in socio-demographic characteristics of mothers, their antenatal care practices, duration of pregnancy and maturity are discussed. Information about condition at admission, monitoring after admission, complications during labour, delivery status and condition of baby or foetus are examined. Finally, cause of death and avoidable factors are assessed.

3.1 Trends in perinatal mortality rate

Table 3.1 shows the perinatal mortality rate (PMR) recorded in the last 10 years at Maternity Hospital, which has fluctuated between around 31 and 37 deaths per 1,000 live births, with no very clear trend. The rise from 31 in 2003/04 to 37 in 2004/05 and then to 39 in 2006/07 (not shown) is of concern. Two main reasons for this could be an increase in referral of complicated cases and overloading of cases in the neonatal unit in recent years.

Table 3.1 Trend in perinatal death at Maternity Hospital in the last 8 years (1997/98- 2004/05)

Year	Total number of births	Still birth	Neonatal death	Perinatal deaths	PMR per 1,000 births ²
1997/98	15004	355	202	557	37.1
1998/99	14660	341	202	543	37.0
1999/00	14821	317	195	512	34.5
2000/01	16291	370	202	572	35.1
2001/02	16757	326	203	529	31.6
2002/03	16531	364	194	558	33.7
2003/04	17041	320	210	530	31.1
2004/05	16948	347	280	627	37.0

During the study period (2005/06 - 2006/07), there were 36,109 total births. Of them, there were 1,193 perinatal deaths (682 stillbirths and 511 early neonatal deaths). The perinatal mortality rate (according to WHO definition) was estimated to be 33 per 1,000 pregnancies.

² It was learned that above data obtained from the Maternity Hospital excludes stillbirths less than 28 weeks of gestation and weighing less than 1,000 grams and does not exclude neonatal deaths above 7 days of age. So, it does not reflect the actual PMR of the hospital. In the present analysis WHO definition of PMR has been used and it is defined as the number of stillbirths plus neonatal deaths (both from 22 weeks of gestation and weighing 500 grams and above) within 7 days of life, divided by the total number of live births multiplied by 1,000. Therefore, numbers presented after this section do not match this table.

3.2 Socio-demographic characteristics of mother

Of the total 1,193 mothers who had stillbirths (SB) and early neonatal death (ENND), the majority were between 20 and 24 years of age and about 15 percent were below 20 years. About one in five early neonatal deaths occurred among adolescent mothers. This was their first pregnancy for about half of the mothers who had ENND (49%),.

Nearly two fifths of perinatal deaths were among Brahmin/Chhetri, and about a third occurred among the *Janajati* ethnic community. More than half (55%) of mothers who had perinatal deaths were from districts other than Kathmandu valley.

The education status of 87 percent of the mothers (also fathers) was not obtainable as there was no information recorded in the medical chart of the hospital. The occupation of about two thirds of mothers could not be determined as this was not recorded in the medical charts, but 20% were housewives (the majority of the one third that was recorded).

Table 3.2 Percentage distribution of mother by selected socio-demographic characteristics

Socio-demographic characteristics	SB	ENND	Total
Age (in years)			
15-19	11.4	19.2	14.8
20-24	41.9	44.0	42.8
25-29	25.7	19.0	22.8
30-34	12.5	10.2	11.5
35+	8.2	5.9	7.2
Not recorded	0.3	1.8	0.9
Parity			
Primi	42.4	49.5	45.4
Multi	38.1	29.9	34.6
Grand multi	17.4	18.2	17.8
NR	2.1	2.3	2.2
Caste/ethnicity			
Brahmin/Chhetri	37.2	39.9	38.4
Newar	15.1	18.8	16.7
Janajati (Hill)	29.9	29.5	29.8
Janajati (Terai)	2.3	2.9	2.6
Terai middle caste	1.5	2.5	1.9
Dalit	4.0	2.5	3.4
Muslim	1.6	1.8	1.7
Not recorded	8.4	2.0	5.6
Please of residence			
District within the Kathmandu valley	41.2	34.6	38.4
Adjoining district of Kathmandu valley	27.9	28.2	28.0
Other districts	23.5	30.5	26.5
India	0.7	0.4	0.6
Not recorded	6.7	6.3	6.5
Mother's education			
Illiterate	6.3	3.9	5.3
Literate no schooling	2.9	1.0	2.1
Grade 1-5	1.0	2.3	1.6
Grade 6-10	0.1	3.9	1.8
11 and over	0.6	4.5	2.3
Not recorded	89.0	84.3	87.0
Mother's occupation			
Housewife	20.7	20.5	20.6

Agriculture	1.8	10.0	5.3
Daily wage earner	0.6	6.7	3.2
Business	0.3	6.3	2.8
Service	0.7	10.6	4.9
Student	0.1	0.8	0.4
Not recorded	75.8	45.2	62.7
Total	100.0	100.0	100.0
N	682	511	1193

3.3 Maternal Factors

Neonatal deaths and stillbirths stem from poor maternal health, inadequate care during pregnancy, inappropriate management of complications during pregnancy and delivery, poor hygiene during delivery and the first critical hours after birth, and lack of proper newborn care. Some of the factors are deeply rooted in the cultural fabric of societies, which interact in ways that are not always clearly understood (WHO, 2006b). These include women's status in society, their nutritional status at the time of conception, the practice of early childbearing and too many closely spaced pregnancies, harmful practices such as inadequate cord care, bathing the baby too soon, discarding the colostrum and feeding other foods. This section examines some of these factors.

3.3.1 Antenatal care

Two thirds of mothers (793) who experienced perinatal deaths had received antenatal care, of whom 69% visited hospitals. Very few had sought ANC services from health/sub health posts, private clinics or community providers (TBA and FCHV). However, only 21% had four or more ANC check ups, as recommended by WHO. Only about half of the mothers were known to have received TT immunisation. The immunisation status of most of the other half could not be determined as it was not recorded in the review forms (Table 3.3).

Table 3.3 Percentage distribution of mother by their ANC care seeking behaviour

	SB	ENND	Total
Whether or not ANC sought			
Yes	66.0	67.1	66.5
No	25.4	16.8	21.7
Don't know	8.7	16.0	11.8
Total	100.0	100.0	100.0
N	682	511	1193
Place visited for ANC services			
Hospital	70.0	67.1	68.7
HP/SHP	5.8	8.2	6.8
Private clinic	5.6	4.1	4.9
At the community level	2.9	1.7	2.4
PHCC	0.2	1.2	0.6
Not recorded	15.6	17.8	16.5
Total	100.0	100.0	100.0
N	450	343	793
Frequency of antenatal care visits			
1 to 3	42.0	39.7	41.0
4 times or more	19.1	22.4	20.6
Not recorded	38.9	37.9	38.5
TT immunization received			
Yes	43.8	48.7	45.9
No	6.7	2.6	4.9
Not recorded	49.6	48.7	49.2

Total N	100.0 450	100.0 343	100.0 793
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Abnormal conditions were detected in only a few cases during ANC check ups. In more than half of the cases, abnormal conditions were either not observed or not recorded in the case review forms (Table 3.4). Similarly, ANC counselling on issues such as place of delivery, iron tablets, danger sign in pregnancy and referral was not recorded in the forms in more than three quarters of the total cases.

Table 3.4 Percentage distribution of mother by type abnormal conditions detected during ANC visits (N=793)

Abnormal conditions detected	Yes	No	DK	NR	Total	N
Hypertension	5.5	38.5	35.6	20.4	100.0	793
Proteinuria	2.8	39.8	35.7	21.7	100.0	793
Abnormal lie/presentation	3.4	38.7	35.7	22.2	100.0	793
Anaemia	1.3	41.6	35.7	21.4	100.0	793
Previous C/Section	1.1	40.6	35.4	22.8	100.0	793
Malaria	0.5	42.1	35.7	21.7	100.0	793
UTI	0.1	42.7	35.6	21.6	100.0	793
Infective hepatitis	0.4	42.6	35.6	21.4	100.0	793
Heart diseases	-	42.6	35.7	21.7	100.0	793
Diabetes	0.1	34.6	35.7	29.6	100.0	793
Others (APH, Chest infection, HIV +ve, Depressive illness, Placenta praevia)	2.9	-	-	-	-	793

Surprisingly, foetal heart sound was either not monitored or not recorded for over half of perinatal death cases. Use of the partograph is very rare.

Table 3.5 Percentage distribution of perinatal deaths by monitoring status

Foetal heart sound heard at admission	SB	ENND	Total
Whether foetal heart monitoring done after admission			
Yes	19.2	63.2	38.1
No	2.8	21.3	10.7
Not recorded	78.0	15.5	51.2
Total	100.0	100.0	100.0
N	682	511	1193
Use of partograph			
Yes	1.0	4.9	2.7
No	36.4	95.1	61.5
NA	62.6	-	35.8
Total	100.0	100.0	100.0
N	682	511	1193

3.4 Complications of labour and delivery details

In one in six ENND cases (17%) and 60 percent of SB cases, the mode of delivery was normal. Over half of the ENND cases (57%) were pre-term births. A substantial proportion of ENND (16%) and SB (13%) cases were delivered by caesarean section. In one in five cases of perinatal death, amniotic fluid was meconium stained and 62 percent meconium was thick, suggesting that these babies had undergone intrapartum asphyxia. Out of the total stillbirths, the majority (61%) were macerated and about 38% were fresh (Table 3.6).

Table 3.6 Percentage distribution of perinatal deaths by mode of delivery, liquor status and type of stillbirth

Mode of delivery	SB	ENND	Total
Normal delivery	59.8	17.4	41.7
Premature delivery	17.0	56.8	34.0
Caesarean	12.6	15.7	13.9
Breech delivery	5.4	3.9	4.8
Vacuum	2.2	4.3	3.1
Others	2.0	2.0	2.0
NR	0.9	-	0.5
Total	100.0	100.0	100.0
N	682	511	1193
Liquor			
Clear	16.1	45.8	28.8
Meconium stained	20.1	19.8	19.9
Blood stained	2.1	1.0	1.6
Foul smelling	0.9	0.2	0.6
Not recorded	60.9	33.3	49.0
Total	100.0	100.0	100.0
N	682	511	1193
If meconium stained			
Light	8.8	22.8	14.7
Medium	5.1	10.9	7.6
Thick	68.6	53.5	62.2
Not recorded	17.5	12.9	15.5
Total	100.0	100.0	100.0
N	137	101	238
Type of still Birth			
Fresh	37.5	-	-
Macerated	60.7	-	-
NR	1.8	-	-
N	682		

3.5 Condition of baby/foetus at birth

Among the perinatal deaths, over half of perinates (about 50% of stillbirths and 64% of ENND) were pre-term (less than 37 weeks gestation) and about seven percent were extreme pre-term births (less than 28 weeks gestation) indicating high vulnerability. About two thirds of births (about 60% of stillbirths and 71% of ENND) were low birth weight (less than 2500 grams) and one in eight of these was extremely low birth weight (Table 3.7).

Table 3.7 Percentage distribution of perinatal death according to completed duration of pregnancy and weight of baby/foetus at the time of birth

	SB		ENND		Total	
	N	%	N	%	N	%
Completed gestational age/maturity (in weeks)						
22-27	30	4.4	33	6.5	63	5.3
28-31	108	15.8	152	29.7	260	21.8
32-33	74	10.9	77	15.1	151	12.7
34-36	127	18.6	64	12.5	191	16.0
37-41	242	35.5	162	31.7	404	33.9
42 and above	35	5.1	22	4.3	57	4.8
NR	66	9.7	1	.2	67	5.6
Total	682	100.0	511	100.0	1193	
Weight of baby/foetus in grams						
500-970	67	9.8	31	6.1	98	8.2
1000-1450	94	13.8	124	24.3	218	18.3
1500-1975	133	19.5	138	27.0	271	22.7
2000-2450	118	17.3	71	13.9	189	15.8
2500+	257	37.7	147	28.8	404	33.9
NR	13	1.9	-	1.1	13	1.0
Total	682	100.0	511	100.0	1193	100.0

The APGAR is a scoring system used to evaluate newborns at one minute and five minutes after delivery. Data showed that more than half of newborn babies, who had early neonatal death, had an APGAR score of three or less at one minute and about one third of the babies had an APGAR score of three or less at five minutes indicating that these babies were asphyxiated and resuscitated at birth (Table 3.8).

Over than one-third of the babies died on the first day of life, 37 per cent within four hours of birth.

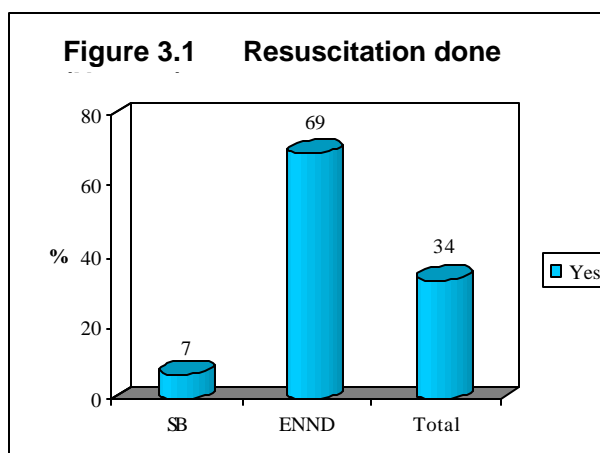
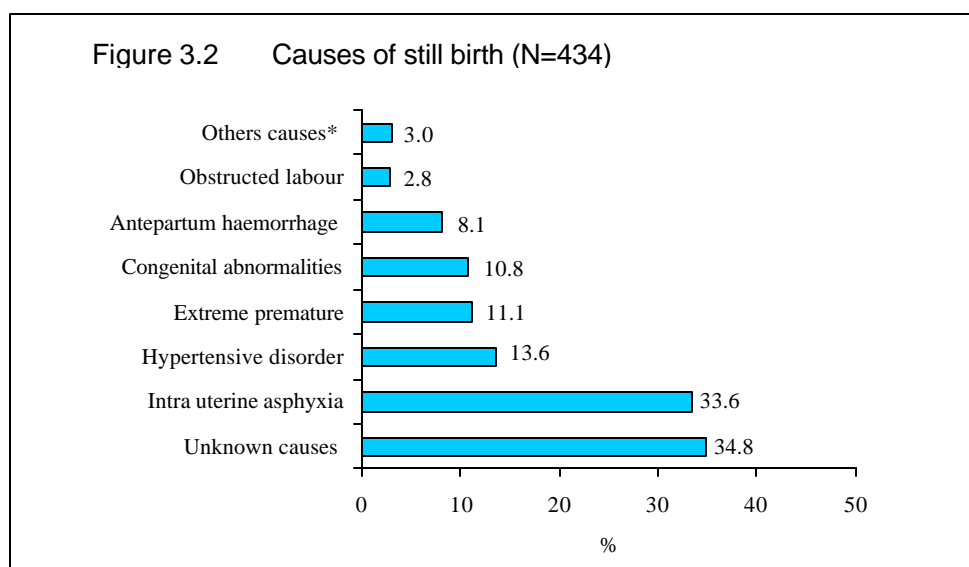


Table 3.8 APGAR score

	SB	ENND	Total
APGAR score at 1 minute			
0-3	96.9	56.9	79.8
4-6	0.3	35.2	15.3
7 and more	0.1	2.9	1.3
Not recorded	2.6	4.9	3.6
APGAR score at 5 minute			
0-3	96.9	36.4	71.0
4-6	0.4	36.4	15.8
7 and more	0.1	21.5	9.3
NR	2.5	5.7	3.9
Total	100.0	100.0	100.0
N	682	511	1193

3.6 Causes of stillbirth

Causes of stillbirths were recorded only for about two thirds of the cases (434 out of 682). Data suggest that intra uterine asphyxia was the main cause of stillbirth (34%). This was followed by hypertensive disorder (14%), extreme premature birth and congenital abnormalities (11%) and antepartum haemorrhage (8%). In over a third of the cases, causes of stillbirth could not be determined.



**Medical cause, cord prolapse, RH incompatibility*

Causes of stillbirths were further assessed by selected characteristics of the mother and other indicators, as shown in Table 3.9. Two main results need to be stressed. First, two thirds of mothers (66%) whose babies died of congenital malformation, had received antenatal care. But only three percent were diagnosed during the antenatal period (one out of 31 women). Early safe termination of pregnancy after detecting major congenital anomalies by ultrasonic examination during the early antenatal period would have reduced the risk to these mothers. Second, one in five babies whose foetal sound was normal during admission died because of intra uterine asphyxia.

Table 3.9 Causes of stillbirths by selected characteristics of mother and other indicators

	Hypertensive disorder of pregnancy	Congenital anomaly	Unknown	APH	Extreme premature	Intra uterine asphyxia	Obstructed labour	Others cause	Total
Age									
15-19	11.9	10.6	8.6	8.6	12.5	8.2	25.0	15.4	10.4
20-24	32.2	51.1	36.4	22.9	47.9	39.0	41.7	30.8	39.2
25-29	32.2	25.5	29.1	34.3	18.8	28.8	16.7	30.8	26.7
30-34	16.9	2.1	13.9	22.9	12.5	13.7	8.3	15.4	13.8
35+	6.8	10.6	11.3	11.4	8.3	10.3	8.3	7.7	9.7
NR	-	-	0.7	-	-	-	-	-	0.2
Caste/ethnicity									

Brahmin/Chhetri	32.2	42.6	43.7	31.4	41.7	32.2	33.3	23.1	37.3
Newar	20.3	8.5	13.2	14.3	10.4	17.8	25.0	23.1	15.0
Janajati (Hill)	28.8	31.9	19.9	40.0	33.3	37.7	33.3	38.5	30.0
Janajati (Terai)	1.7	2.1	2.6	-	2.1	2.1	-	-	2.3
Terai middle caste	3.4	2.1	1.3	-	4.2	-	-	7.7	1.8
Dalit	8.5	2.1	6.0	-	6.3	4.1	-	-	4.6
Muslim	-	2.1	4.0	8.6	-	0.7	-	-	1.6
NR	5.1	8.5	9.3	5.7	2.1	5.5	8.3	7.7	7.4
Residence									
Rural	16.9	17.0	15.2	20.0	27.1	17.8	8.3	15.4	17.5
Urban	35.6	29.8	39.1	37.1	37.5	37.0	41.7	46.2	36.6
NR	47.5	53.2	45.7	42.9	35.4	45.2	50.0	38.5	45.9
Foetal heart sound heard at admission									
Yes	20.3	31.9	3.3	11.4	14.6	20.5	16.7	15.4	16.1
No	72.9	66.0	92.1	80.0	81.3	75.3	75.0	76.9	78.3
NR	6.8	2.1	4.6	8.6	4.2	4.1	8.3	7.7	5.5
Received ANC									
Yes	78.0	66.0	64.2	57.1	56.3	65.1	58.3	61.5	65.4
No	18.6	25.5	29.8	40.0	33.3	28.8	8.3	30.8	27.2
Don't know	3.4	8.5	6.0	2.9	10.4	6.2	33.3	7.7	7.4
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
N	59	47	151	35	48	146	12	13	434

Results of assessment of the relationship between ANC visits and type of stillbirth suggest that two thirds of mothers who delivered macerated babies had received antenatal care, indicating inadequate counselling and/or monitoring during check ups.

3.7 Final cause of early neonatal death

Birth asphyxia was the most common final cause of early neonatal death (33%). A quarter of deaths (25%) were due to respiratory distress (RDS) followed by infections (24%). Babies weighing 2,500 grams and above are more likely to experience asphyxia compared to babies weighing less than 2,500 grams at birth. In contrast, RDS is more common among babies weighing less than 2,500 grams than in weighing 2,500 grams or more at birth.

There are only five main categories of cause of death in the death review forms. Hence, more detail on causes of death was not available, for example, different causes of respiratory distress were not mentioned. Infection was more common among pre-term and low birth weight babies. Mortality due to infections needs to be tackled by more effective infection control measures in the neonatal unit, post natal wards, operation theatre, labour room and admission room. This requires sufficient staffing, knowledge and motivation to maintain an aseptic environment in the neonatal unit.

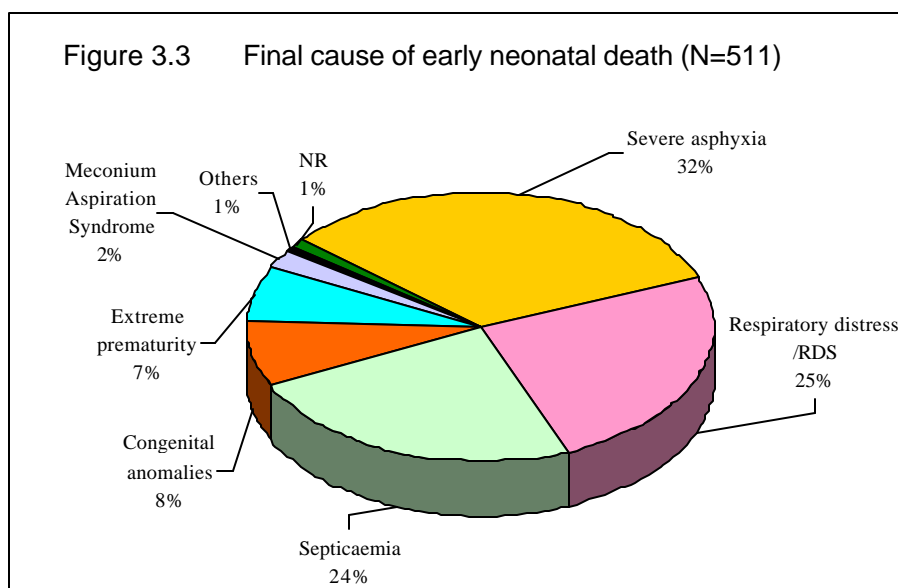


Table 3.10 Percentage distribution final cause of early neonatal death according to the weight of baby

Final cause of death	Babies less than 2500 grammes		Babies 2500 grammes and over		Total	
	N	%	N	%	N	%
Severe asphyxia	89	24.5	79	53.7	168	32.9
Respiratory distress syndrome	117	32.1	11	7.5	128	25.0
Septicaemia	90	24.7	32	21.8	122	23.9
Congenital anomalies	23	6.3	16	10.9	39	7.6
Extreme prematurity	34	9.3	0	0.0	34	6.7
Meconium Aspiration Syndrome	6	1.6	5	3.4	11	2.2
Others(hypothermia, internal bleeding, aspiration pneumonia)	3	0.8	1	0.7	4	0.8
NR	2	0.5	3	2.0	5	1.0
Total	364	100	147	100	511	100

In more than a quarter of babies (27%) who had normal heart sound at the time of admission, the cause of death was asphyxia (134 out of 505). Some of these babies could have been saved, with better intrapartum foetal monitoring to detect signs of intrauterine asphyxia, timely intervention and effective resuscitation.

Two thirds of mothers (66%), whose babies died of congenital malformation during the early neonatal period, had received antenatal care (25 out of 38). But only eight percent (2 out of 25) were diagnosed during the antenatal period. Early termination of the pregnancy after detection of major congenital anomalies by ultrasonic examination during the antenatal period could have reduced the risk to these mothers.

Respiratory distress syndrome was further assessed by maturity of the babies. Neonates born below 34 weeks of maturity are prone to develop respiratory distress syndrome due to lung immaturity and can die without antenatal administration of steroids to the mother. Treatment of this condition requires surfactant therapy and tertiary level neonatal care, which

is costly and not easily available. Data shows that about 43 percent (98 out of 230) of pre-term babies with maturity of 22-33 weeks died due to respiratory distress syndrome. Some of these could have been saved if mothers had come to the hospital earlier or with the administration of steroid at the time of admission.

3.8 Wigglesworth's classification on cause of perinatal death

Perinatal deaths are also categorised according to Wigglesworth's classification. Descriptions of this classification are presented in annex 3. Table 3.11 shows cause of death according to Wigglesworth's classification. As can be seen from the table, about a third of all perinatal deaths were in **Group I**. More deaths in this group indicates lack of antenatal check up or insufficient care during antenatal period. Providing antenatal care to more pregnant women and improving the quality of antenatal care, including counselling on high risk pregnancy would reduce perinatal deaths in this group.

In total, seven percent of perinatal deaths were in **Group II**. Identification of anomalies early in pregnancy and taking appropriate action, management of anomalies in utero or soon after, although not very easy in developing countries like Nepal, can reduce perinatal death in this group. Folic acid and other micronutrients supplementation to pregnant women and genetic counselling to appropriate groups could also reduce mortality in this group.

One in five perinatal deaths was in **Group III**. Most of the deaths in this group were due to respiratory distress and infection. Mortality in this group could be reduced by measures such as provision of tertiary level neonatal care by sufficient well trained staff, use of surfactant therapy and blood gas analyser to treat RDS, improving other neonatal care facilities and the skill and knowledge of health workers in the care of newborns, motivation of health workers, use of steroids for inevitable pre-term delivery cases to reduce RDS, effective infection control measures and use of appropriate antibiotic according to the laboratory report, prevention of premature births by better antenatal care and improving health and nutritional status of women.

More than a third of perinatal deaths (36%) were in **Group IV**. Reducing perinatal deaths in this group requires better care and monitoring during labour. Use of the partograph during labour is strongly recommended. Improving the skill and training of health workers in neonatal resuscitation would have an impact on reducing deaths due to asphyxia.

About six percent of perinatal deaths fall into **Group V**. Again, improving neonatal care facilities and skill and knowledge of health workers in the care of newborns, motivation of health workers, early recognition and management of specific conditions of newborns would help to reduce early neonatal mortality (Table 3.11).

Table 3.11 Cause of death according to Wigglesworth's classification

Wigglesworth's classification	SB		ENND		Total	
	N	%	N	%	N	%
Group I	385	56.5	-	-	385	32.3
Group II	50	7.3	36	7.0	86	7.2
Group III	-	-	227	44.4	227	19.0
Group IV	247	36.2	182	35.6	429	36.0
Group V	-	-	66	12.9	66	5.5
Total	682	100.0	511	100.0	1193	100

4. FUNCTIONING OF MATERNAL AND PERINATAL DEATH REVIEW PROCESS

This chapter assesses the maternal and perinatal death review process in selected hospitals in Nepal, presenting the findings from semi-structured interviews with key informants. As mentioned in chapter 2, 40 key semi-structured interviews were conducted with a range of hospital staff (selected from B.P. Koirala Institute of Health Sciences, Dharan, Lumbini zonal hospital, Butwal, Patan hospital, Lalitpur and the Tribhuvan University Teaching Hospital) and individuals associated with policy development to review the challenges and opportunities for the existing death review process and suggest recommendations to help the process function efficiently so that findings contribute to improved quality of care.

4.1 Awareness about death review

Generally, key informants were aware of the maternal and perinatal death audit. Most knew that it is a process of finding out the causes of deaths and taking corrective actions to prevent future maternal and perinatal deaths in institutions. A considerable number of key informants also stated that it is a process for enquiring how the patient was treated in the hospital and establishing the maternal and perinatal death rates. Only a few informants said that it also helps to improve the record keeping system of the hospital and quality of care. For example, two key informants said:

“Maternal and perinatal death audit means to find out at what stage the patient arrived at hospital and how the patient was treated at the hospital and find out the gaps.”

- Lumbini Zonal Hospital, Butwal

“Maternal and perinatal death audit means to find out the cause of death, to find out the avoidable factors of death and how to improve or reduce death rate.

- BPKIHS, Dharan

4.2 Extent of use and completeness of maternal and perinatal deaths review form

All study hospitals, except BPKIHS, are using the maternal death review form developed by FHD in 2005. However, none of the study hospitals have continuously used the perinatal death review form. It was learned that Patan and the TUTH hospital used the perinatal death review form for two to three months at the beginning of 2005 but discontinued it. Maternity Hospital is using perinatal death review form suggested by the FHD, but it was not regularly completed. However, all study hospitals have recorded some information on maternal and perinatal deaths in their own general patient medical charts or admission charts, death certificate or death book and discharge sheet. Maternity Hospital has its own separate baby admission and perinatal death review chart for the special care baby unit. Similarly, TUTH has its own two-page perinatal death review form with a general admission chart.

“Yes, the hospital has its separate baby admission chart and death review form for special baby care unit.”

- Maternity Hospital, Kathmandu

“We maintain the perinatal death information in the register.... Yes, TUTH has its own perinatal death review form which is quite comprehensive.”

- TUTH, Kathmandu

“Our hospital has its own patient medical chart which, I think, is not adequate. Therefore, information about primary and secondary causes is lacking. It is comprehensive for the hospital's use but inadequate for review.”

-BPKIHS, Dharan

“Yes, the hospital has its own patient medical chart and death book. It is comprehensive but information is not complete according to the forms developed by the FHD.”

-Maternity Hospital, Kathmandu

Table 4.1 Extent of use of maternal and perinatal death form developed by the FHD/MH

Indicators	BPKIHS	Lumbini Zonal Hospital	Maternity Hospital	TUTH	Patan Hospital
Use of maternal death review form	No	Yes	Yes	Yes	Yes
Use of perinatal death review form	No	No	Yes, some extent	No	Yes, some extent
Existence of mortality review committee	No	No	Yes	No	No
Analysis of forms/reporting to FHD	No	No	No	No	No

In this study, completeness of maternal and perinatal forms was assessed only at Maternity Hospital, where it was observed that forms were poorly completed. In most cases, information was incomplete and inconsistent. This could be for several reasons. First, the maternal death review form has been changed frequently, and it was found that eight different types of form, ranging from two pages to twelve pages, were used at the Maternity Hospital in last the 10 years. Second, information required for review forms did not match the hospital's patient medical chart or admission chart and it is not practical to obtain such information from a patient's family after the patient has died. Thirdly, the form was considered too lengthy and required lot of time to complete, especially in view of the inadequate human resources in the hospitals. Therefore it was not considered a priority. There was also no focal person responsible for the monitoring the completion of review forms. The following excerpts from key informant interviews are some examples of reasons for not using forms or having incomplete information.

“Maternal and perinatal death forms are not used in this hospital. We have not even printed it yet. It may be due the fact that we have not prioritised or stressed on such forms.”

-BPKIHS, Dharan

“The forms of FHD (perinatal death review form) are time consuming and exhausting.”

-TUTH, Kathmandu

“It's too long. In a hospital like this, we cannot give 15 minutes.”

-Patan Hospital

“There are inadequate human resources in my department, I am alone. There is no single medical officer in my unit. Nurses can't fill out this form. I can't give time to fill this form.”

-Lumbini Zonal Hospital, Butwal

Key informant interviews also revealed that only Maternity Hospital had a Maternal Mortality Review Committee as envisaged in the death review process suggested by FHD. Although

TUTH and Patan hospital do not have a formal review committee, it was learned that concerned staff of the obstetric and gynaecology and paediatric department review the death cases regularly. For example, informants from BPKIH and Patan hospital said:

"We do not have mortality committee and review system. We sometimes discuss about such cases."

-BPKIHS, Dharan

"Every death is discussed in the morning session and the whole department is present. The whole department is a committee; we do not have a specific mortality committee. We do not report to the director."

- Patan Hospital, Lalitpur

4.3 Impression on maternal and perinatal death review form

Overall, key informants agreed that the existing death review form is still too long. Although informants considered case review forms to be comprehensive, they are not user friendly. According to key informants, case forms contain detailed information which include the primary, contributory and final causes of death. There is limited space for medical information related to the patient's background. For example, participants from Maternity Hospital said:

"It's lengthy. Review form should be summarised and developed in two pages. It is comprehensive but not user friendly. It's difficult to give complete background information."

- Maternity Hospital, Kathmandu

"MH is using this form. However, this is too lengthy and not very user friendly"

- Maternity Hospital, Kathmandu

In contrast, some informants thought that, although the form is long, it is good to have detailed information about the death, and it is shorter than the previous form. For example, one informant said:

"It's too long. But it does not harm. Detailed information is not bad. It is shorter than the earlier one."

- Maternity Hospital, Kathmandu

Overall, key informants believed that classification of cause of maternal death is not very clear in the form. For example, two informants from Maternity Hospital and one from BPKIHS said:

"To be very frank, I do not understand the classification of cause of death in the form. It is still not clear to me. Clarity is not there.....There should be one cause of death and it should be classified as Direct, Indirect and accidental".

- Maternity Hospital, Kathmandu

"Cause of death is confusing in the form. That part should be improved."

-Maternity Hospital, Kathmandu

"There are certain confusing parts in both maternal and perinatal forms. Primary, contributory and final causes of deaths are confusing. Those confusing parts should be modified."

- BPKIHS, Dharan

4.4 Maternal and perinatal death case review process

Maternal death review is only carried out three out the five study hospitals and the review process varied widely between the hospitals. For example, Maternity Hospital discusses immediately after any maternal death occurs and it is reviewed by the concerned consultant, on call consultant of the day, duty doctors and other concerned staff. Information is forwarded to the maternal death review committee within 24 hours of death with a case review form. Generally, such cases are presented within 72 hours of death in a bigger group of staff. However, key informant interview revealed that there were some instances where case review forms were not completed within 24 hours and presentation was made after 72 hours. There is no review committee for perinatal death. It was learned that neonatal deaths are discussed only in the special baby care unit and presentation is made once a month.

At TUTH, maternal and perinatal deaths are immediately reviewed in the morning session within the department. A joint presentation between Obs/Gynae and paediatric departments is organised once a month. Similarly, Patan hospital reviews maternal and perinatal deaths in the morning session within the department. Moreover, maternal deaths are presented quarterly and perinatal deaths every month to a bigger group of staff.

In contrast, BPKIHS and Lumbini Zonal Hospital did not have any formal death review process; nor did they have any a committee for this purpose. It was found that BPKIHS sometimes reviews special death cases only. Lumbini Zonal Hospital completes case review forms and informally discusses maternal deaths between concerned doctors only.

4.5 Monitoring and reporting

It was learned from FHD that the national maternal and perinatal death review was initiated two years ago with support from the WHO country office. Under this initiative, staff of 12 hospitals received orientation training. Only one meeting was organised at the national level to share experiences of death review. It was also found that none of the study hospitals have sent/reported maternal or perinatal death forms to FHD, as was envisaged in the review process. For example, a key informant said:

"None of these hospitals have sent/reported maternal or perinatal death review form to the FHD. Very recently, only three zonal hospitals (Seti, Koshi and Bheri) began to send forms to the FHD".

-Family Health Division

It was found that no specific regular monitoring was done by the FHD or other concerned organisation after initiating death review. For example, one informant said:

"No specific monitoring was carried out by FHD after initiating the death review. It was the responsibility of the concerned hospitals"

-Family Health Division

4.6 Key informants opinion on lesson learned from maternal and perinatal review

The main objective of facility-based maternal and perinatal death review is to identify factors that, if they had been addressed, might have prevented death. This study did not find clear documentation or examples of decisions or actions taken based on the review of maternal and perinatal death in any of the study hospitals. However, key informants from Maternity Hospital claimed that some corrective measures had been taken based on the maternal death review. According to them, actions taken included in-depth check ups of patient before admission, promotion of antenatal care, investigation of functioning of equipment and

regular maintenance, continuous supply of oxygen, 24-hour lab facility, indoor ultrasound facility, provision of additional anaesthetist's assistants and doctors in the operation theatre, and availability of emergency drugs in the admission room. Key informants repeatedly said that the use of magnesium sulphate to treat eclampsia was one of the actions taken based on the death review. A key informant remembers an event of maternal death which was probably due to not providing magnesium sulphate on time.

"A severe PET patient with abdominal pain and high blood pressure with 180/110 was admitted in the hospital. A consultant was on call duty. She arrived in the evening. She checked the patient along with a duty registrar and went to see another patient with severe bleeding. But she forgot to prescribe magnesium sulphate to the first patient while she checked her. After saving the life of the second patient, the consultant did caesarean to the first patient with twins. The patient was kept in MICU. Everything was all right. After sometime, the patient suddenly suffered from eclamptic fit and died. She had not inhaled anaesthesia as well. The consultant realised later on that, if magnesium sulphate has been provided on time, probably the life of the patient could have been saved".

-Maternity Hospital, Kathmandu

In contrast, one key informant thought that no corrective measures were taken based on death review. For example she said:

"Maternal death review is done at Maternity Hospital but none of the recommendations made were implemented in the past. The recommendation was only on the wall. Maternity Hospital is currently conducting death review as a 'ritual' and not as an action"

-Maternity Hospital, Kathmandu

At TUTH, the maternal and perinatal death reviews are being conducted not to take any corrective measure, but as a part of the teaching curriculum. The TUTH teaches students based on death reviews. For example, one informant from TUTH said:

"At TUTH, resident students are on duty 24 hours. Once, a resident student provided fortwin to a jaundice patient and the patient died.....Fortwin, should not be given to a jaundice patient. In this way, we learned a lesson from the review and corrected students so that they will not repeat it in the future. "

-TUTH, Kathmandu

At Patan hospital, the study could not find any documentation of corrective measures taken based on the review. However, a key informant mentioned that the numbers of nursing staff and doctors were increased for proper monitoring of the patient in the nursery unit based on the death review.

Only one example of a corrective measure taken was found based on the review of perinatal deaths at Maternity Hospital. Maternity Hospital has stopped bottle feeding and promoted breast feeding based on the perinatal death review. For example, one informant said:

"When I used to work at Maternity Hospital there was a system of reviewing deaths. We used to keep a good record. Before 1995 there were 20-22 perinatal deaths in summer and 8-10 in winter. We reviewed the cases and tried to find out why when all the treatment, health providers and equipment were the same the death rate was high in summer. Then we found the cause was diarrhoea. Because of that, we promoted breast-feeding and completely stopped bottle-feeding. Then after there was the same range of deaths in winter and summer."

- MIRA, Kathmandu

4.7 Challenges

Facility based maternal and perinatal death review is a powerful tool in getting the individual stories of suffering and distress behind the numbers and the real underlying reasons why women and newborns die. The harsh geographic terrain, limited access to health facilities and low socio-economic status of women in Nepal makes it for women to access facility based care, which is essential for saving lives. The MPDR in Nepal is an initiative that can help to achieve this mission. However, there are challenges for its effective implementation.

In some hospitals, the lack of a maternal and perinatal death review committee and lack of commitment and concern on the issue hindered effective implementation of the review process. Lack of accountability and interest, lack of action on recommendations made from the review and heavy workload of health professionals are other major challenges. There is no provision for incentives for those who give their time to complete review forms.

Inconsistency between hospital admission and other recording forms and the MPDR forms poses another difficulty. Clarity about the causes of maternal death in the review form and lack of orientation of concerned health staff also cause problems in correct classification and completion of the forms. The type and volume of information required in the forms makes it difficult for clinicians. Irregular supply of forms and lack of refresher training were also partly responsible for ineffective implementation of the case review system.

There is no focal person at FHD or in the hospital to keep the records, monitor, coordinate and analyse the information collected. Partly because of this, no database is maintained at FHD. Only one meeting was organised in 2006 and lessons learned were shared among doctors from seven hospitals where the MPDR system was implemented.

Personnel at both the FHD and the hospitals are not adequately trained in coding, editing, entry and analysis of data. Very recently, the Demographic Section of FHD was assigned to monitor this process, but the unit lacks support staff and training for effectively covering this responsibility. In addition, the MPDR was not considered as a regular programme of the FHD. Rather, it was taken as a project supported by the donor agency.

Frequent changes in leadership, such as the directorship of the FHD and director/head of the hospitals, pose a challenge because every new leader comes with his/her own area of priority for the programme. Regular monitoring by the FHD is clearly lacking and willingness and priority of the leadership could play a vital role in this matter. It is learned that the present Director of FHD has given priority to case review process and has already planned a number of activities for the next year.

5. SUMMARY CONCLUSIONS AND RECOMMENDATIONS

This rapid study was conducted to identify the challenges and opportunities of the existing death review process and suggest recommendations to help the process function efficiently and contribute to improving the quality of care. Maternal deaths that occurred in the last 10 years and perinatal deaths in last two years at Maternity Hospital were analysed. In addition, 32 key informant interviews were conducted in four other major hospitals located within and outside Kathmandu Valley. Some policy level individuals were also interviewed.

The study found that there were 72 maternal deaths at Maternity Hospital in the last 10 years (1997/98 to 2006/07). Data indicates that the maternal mortality ratio in this hospital has been decreasing over the 10 year period except for the year 2006/07. As expected, an overwhelming majority of women died due to direct cause of death (83%). The three main causes of direct deaths were postpartum haemorrhage, hypertensive disorders of pregnancy and abortion which corroborated with other developing countries (Khan et al., 2006). Pre-existing maternal diseases and non-pregnancy-related infections were two main indirect causes of deaths.

There is no clear trend by cause of death over the 10 year period. However, except for the year 2006/07, death due to postpartum haemorrhage has been decreasing since 2003/04. There was only one death because of abortion after 2003/04, which coincided with the beginning of legal abortion services in Nepal – a very positive indicator for the effectiveness of this reform. Although, the highest proportion of maternal deaths were in the age group of 20-29 and with multi parity, over one in five maternal deaths were aged between 15 and 19 years. About two-fifths of women belonged to the Hill Janajati ethnic community. Over half of maternal deaths were from within Kathmandu Valley.

Only about one in five women who died in the hospital were referred by other health facilities. The utilisation of ANC services was poor among the women who died. Among those women who had an ANC check up, the majority were diagnosed with at least one pregnancy related complication. During ANC check ups, about 38 percent of women were diagnosed with hypertension followed by proteinuria (24%) and anaemia (18%). Most of the women who died in hospital were admitted during antepartum period. Use of the partograph was very rare.

Altogether 162 avoidable factors were identified for 72 maternal deaths. Medical service related factors accounted for 56 percent of the avoidable factors. Over one third of avoidable factors were related to shortage of expertise, training or education or shortage of human resources. Shortage of essential drugs, blood transfusion, and essential equipments accounted for 17 per cent of avoidable factors. Although Maternity Hospital has already implemented 24-hour laboratory facilities, blood supply and standard management protocols for major diseases like PET/eclampsia, APH, PPH and sepsis, problems still persist. Delay in arrival in the hospital was the main patient or family related avoidable factor.

The study found that 1,193 perinatal deaths (57% stillbirths and 43% early neonatal deaths) had occurred in the last two years in this hospital. The PMR rate was estimated to be 33 per 1,000 pregnancies in the study period, which is lower than the national figure of 45 per 1,000 pregnancies (NDHS, 2006). Although it is difficult to compare the PMR between the study period (2005/06- 2006/07) and previous years estimated by the Maternity Hospital (before 2005/06) due to a difference in the definition used, the study indicates that the PMR at Maternity Hospital has slightly increased particularly in the year 2004/05. One of the main reasons for this increase could be the high caseload and increase in referral of complicated cases at Maternity Hospital. About one in seven early neonatal deaths and one in eight

stillbirths were delivered by caesarean section. Perinatal deaths were common in pre-term and low birth weight babies. A large majority of stillbirths were macerated (61%), suggesting that most of the stillbirths had occurred during the antepartum period. Over one third of stillbirths were intrauterine foetal death.

The study found that one in five neonatal deaths had occurred among women whose age at birth was below 19 years. Primi gravida women and mothers from districts other than Kathmandu valley experienced more perinatal losses than others. Although two thirds of women who experienced perinatal deaths had sought antenatal care, only one in five of them had ANC check ups four times or more. Although partograph is a very useful tool to monitor maternal and foetal condition and to prevent asphyxia, it is rarely used at Maternity Hospital.

The study revealed that birth asphyxia was the main cause of early neonatal deaths followed by respiratory distress and infections respectively. Babies weighing 2,500 grams and above suffered more from asphyxia than babies weighing less than 2,500 grams at birth. Infection was more common among pre-term and low birth weight babies. Death due to hospital acquired infection could have been reduced with more effective recommended infection control measures. About 43 percent of pre-term babies with maturity of 22-33 weeks died due to respiratory distress syndrome. Some of these could have been reduced if mothers had come to the hospital earlier or with the administration of steroid at the time of admission.

The five main causes of stillbirths are intra uterine asphyxia, IUFD, hypertensive disorder, extreme premature birth and congenial abnormalities. Further assessment of the causes of stillbirths revealed that two thirds of mothers whose babies died of congenital malformation had received antenatal care, but only three percent of them were diagnosed during antenatal period. Similarly, two thirds of mothers who delivered a macerated baby had received antenatal care. This finding suggests that ANC and counselling services are not adequate for timely detection of complications during pregnancy and providing adequate information.

The study found that intrapartum foetal monitoring after admission is not adequate at Maternity Hospital. For example, one in five babies whose foetal sound was normal during admission died because of intra uterine asphyxia. Some of these babies could have been saved with better intrapartum foetal monitoring to detect signs of intrauterine asphyxia, timely intervention and effective resuscitation of asphyxiated babies. Lack of human resources and adequate attention are two main reasons for inadequate monitoring in the hospital.

Despite efforts to introduce facility based maternal and perinatal death review in Nepal for over 10 years, acceptance is not satisfactory. The reasons are complex and multifaceted, and include poor quality documentation, lack of time, interest, resources, or accountability and poor organisation of the health system.

The study found that maternal and perinatal death review forms are either poorly completed or not completed at all in the study hospital. There are several reasons for not completing the case review forms or for poor quality documentation. Incomplete patient charts was a cause of poor quality documentation. The capacity of health professionals is overstretched, resulting in a reluctance to add to their already heavy workloads. It was not uncommon to hear from clinicians. I am so busy I have no time to fill in these forms, nurses cannot fill in this information etc. No provision of incentives (especially for perinatal death) for those who do take the time to complete case review forms is also a factor.

There is little awareness of and no priority given to the case review process among institutional heads in the facilities. For example, one of the clinicians in one hospital mentioned that even after repeated reminders about the review, she did not receive the required forms. Newly appointed doctors were not trained by the hospital to complete the review forms. It was also found that there is little faith among clinicians that the review process actually makes any difference. It was found that recommendations made from the death review were not implemented, which created distrust in the system.

The study found that maternal death review is operating in only three out of the five study hospitals and the process varied considerably among them. Some do not even have a maternal and perinatal death review committee. It was also found that the national maternal and perinatal review committee is not active and not providing regular guidance and follow up to case review process.

The study found that information regarding hospital admission and other recording forms does not match that of case review forms thus posing difficulties to clinicians in completing forms. The classification of causes of maternal deaths in the review form is not user friendly and not clear to clinicians, making it difficult to correctly classify and complete the forms. Key informants also thought that the case review form is lengthy and time consuming.

The study showed that there is no adequate monitoring and coordination from FHD. There is no focal person at FHD or the hospitals to keep the records or monitor, coordinate and analyse the information collected. Partly because of this, no database is maintained either in FHD or in the study facilities. No in-depth analysis has been carried out and the lessons learned have not been shared. Also, no feedback was provided to the concerned hospitals as envisaged in the review process. Personnel, both in FHD and the hospitals, are not adequately trained in coding, editing, entry and analysis of the data. In addition, the MPDR was not considered a regular programme of FHD, rather it was taken as a project supported by a donor agency.

Recommendations

The following recommendations have emerged from the study.

Recommendations to FHD

- Learning lessons and acting on the results is the whole purpose of facility based maternal and perinatal death review. The information collected must be used to help improve maternal health outcomes and empower health professionals to examine their current practices or those of the facility in which they work. Therefore, review/consultative meetings should be organised every six months at national level and lessons learned should be shared and action taken. While conducting review meetings, policy level decision makers such as the Director General of DoHS and the Director of FHD should be present.
- Regular monitoring of health facilities should be carried out by FHD. Funds should be allocated for monitoring the review process. A focal person in FHD should be identified, such as the Demographer.
- The study found that information regarding hospital admission and other recording forms does not match that in the case review forms, thus posing difficulties to clinicians in filling out forms. Therefore, maternal and perinatal death review forms and instruction manual should be reviewed and revised and there should be uniformity in the hospital admission and other recording and reporting forms so that they are in line with the information required for the review forms. In revising the case

review form, efforts should be made to make it shorter, comprehensive and user friendly. Special attention should be paid to revising the classification of causes of maternal deaths.

- National level maternal and perinatal committee needs to be re-activated and regular guidance and regular follow up of health facilities should be carried out. The DoHS should issue a letter to the medical superintendents/directors of the hospitals to facilitate action for the formation or reactivation of hospital maternal and perinatal death review committees. The importance of maternal and perinatal death review at facility level should be emphasised in the letter.
- Timely supply of review forms and instruction manual should be ensured.
- Orientation training should be provided to the staff in the Demography Section within the FHD. Support staff should be provided for monitoring, data editing, coding, and entry into the computer.
- The feasibility of developing a web-based standardised database system needs to be explored. Transferring of data electronically from district level facilities should be explored and implemented.
- Timely collecting and analysis of maternal and perinatal deaths should be carried out in FHD and feedback, including areas of improvement, should be provided to concerned health facilities as soon as possible.
- A guideline on roles and responsibilities of the head of the institution should be developed by FHD. Such guidelines should also include information about the mechanism for reporting death cases to FHD.
- Orientation/refresher training should be organised at regular intervals.

Recommendations to the hospitals

- The MPDR forms are not completed in time because of inadequate human resources, lack of commitment and concern about the issue and poor institutional accountability. There was also a high turnover of doctors and nurses in the institution which affected the review process. Regular refresher orientation should be organised and the hospital management should create favourable environment for this. All relevant staff should be oriented in completion of the forms and senior doctors must review the completeness and consistency in information before presenting them to the review committee.
- Adequate human resources should be recruited/requested according to the client caseload in the health facility for quality care.
- A focal person for MPDR should be identified. Additional training and support staff should be provided for the focal person. The focal person should take responsibility for ensuring the timely completion of the forms, completeness and consistency in information and coordinating the maternal and perinatal death reviews.
- The MPDR committee should be formed/reactivated. The head of the institution must be the Chairperson of the MPDR committee. The review committee should analyse and identify the avoidable factors. The management or head of institutions must implement the recommendations made by the review committee.

- Hospital admission and other record forms should be revised and information that is required should be added in the MPDR forms.
- Collected data must be analysed and action taken based on the findings.
- Ways should be identified for providing incentives to those who complete the case review forms properly.

Recommendations to Maternity Hospital

- A ten year maternal death analysis of Maternity Hospital showed that many deaths occurred due to medical service related avoidable factors. Although Maternity Hospital has already implemented measures to address some of these avoidable factors, such as a 24-hour laboratory facility and the use of standard management protocols for major diseases like PET/eclampsia, APH, PPH and sepsis, implementation should be more strongly emphasised and improved.
- Immediate attendance, correct timely diagnosis and treatment should be carried out as soon as a woman arrives in the hospital. There should be coordination among the attending doctors, laboratory and blood bank staff for immediate investigations to diagnose the case and for further management. Timely intervention should be ensured both for the mother and foetus/ baby.
- In order to reduce maternal deaths associated with the medical services related avoidable factors, the hospital management should ensure provision of immediate services of a physician and surgeon through out the week. The seniors should regularly supervise junior doctors.
- Regular in service training for health personnel should be organised on maternal and neonatal care. Orientation of management protocol should be imparted to all the newly appointed doctors and nurses.
- Provision of adequate numbers of nursing staff especially in maternal and neonatal intensive care units and the labour ward is essential, in line with standard recommended patient staff ratio. Proper monitoring of the patient should be emphasised.
- ANC and counselling services should be improved to detect complications in time, detection of congenital anomalies at an early stage, exclude any pre-existing maternal disease and to provide adequate information about care during pregnancy.
- Use of the partograph should be encouraged so that timely intervention can be achieved for the safety of the mother and the newborn. Proper foetal monitoring during labour should be strengthened.
- Data collected should be computerised and analysed. Maternity Hospital has collected a large amount of data (for example, users of Maternity Hospital) but not always analysed it systematically or used it for policy decisions.
- Focal persons for maternal, stillbirth and neonatal death review in the Hospital should be identified. The focal persons should be responsible for ensuring the timely completion of the forms, completeness and consistency of information and coordinating the maternal and perinatal death reviews.

- In view of the high number of perinatal deaths and workload of staff at Maternity Hospital, in-depth review of all perinatal deaths during the first week of every month and all perinatal deaths weighing 2,500 grams or more (using MPDR form) should be conducted .

REFERENCES

- Bughalho A, Bergstrom, S.(1993). Value of perinatal audit in obstetric care in the developing world: a ten year experiences of the Maputo model. *Gynaecologic and Obstetric Investigation*, 36(4): 239-243
- CBS (2003). CBS (2002). *Population census 2001: Preliminary results*. Central Bureau of Statistics. Kathmandu, Nepal
- Family Health Division/Ministry of Health (1998). Maternal Mortality and Morbidity Study. Family Health Division, Kathmandu, Nepal
- FHD/DoHS/MH (2005). Instruction manual for Maternal and Perinatal Death Review 2005. Family Health Division/DoHS, Teku and Maternity Hospital, Thapathali, Kathmandu
- FHD/MH/WHO/SNL (2006). Facility-Based Maternal and Perinatal Death Reviews in Nepal: Informal Consultation on Maternal Death Reviews: Unpublished report
- Khan KS, Wojdyla D., Say Lale, Gulmezoglu MA, Look PV (2006). WHO analysis of causes of maternal death: a systematic review. *Lancet*367: 1066-74
- National Centre for Health Statistics (1967). Infant and perinatal mortality in Denmark (Vital and Health Statistics, Analytical Studies, Series 3, No.9). Washington, DC, United States Department of Health, Education and Welfare.
- National Centre for Health Statistics (1968). Infant and perinatal mortality in England and Wales (Vital and Health Statistics, Analytical Studies, Series 3, No.12). Washington, DC, United States Department of Health, Education and Welfare
- National Centre for Health Statistics. Infant loss in the Netherlands (1968). (Vital and Health Statistics, Analytical Studies, Series 3, No. 11. Washington, DC, United States Department of Health, Education and Welfare.
- NDHS (2006). Nepal Demographic and Health Survey, 2006. Kathmandu, Nepal. Ministry of Health and Population, New Era, and Macro International Inc.
- Sharma KS, Sawangdee Y., and Sirirassamee B (2007). Access to health: Women's status and utilisation of maternal health services in Nepal. *Journal of Bio-Social Sciences* 1-22 doi: 10.1017/Soo21932007001952.
- Shah, I and Say L (2007). Maternal Mortality and Maternity care from 1990 to 2005: Uneven but Important Gains. *Reproductive Health Matters*, 15 (30): 17-27
- UNDP (2004). Human Development Report. New York: United Nations
- World Health Organisation (2006a). Making a difference in countries: Strategic Approach to Improving Maternal and Newborn Survival and Health, Geneva, Switzerland
- World Health Organisation (2006b). Neonatal and perinatal mortality: country, regional and global estimates. Geneva, Switzerland

ANNEX 1: LIST OF KEY INFORMANTS

Health staff

1. Prof. (Dr.) Dibyashree Malla, Hon. Chief Consultant, Maternity Hospital
2. Dr. Lata Bajracharya, Deputy Director, Maternity Hospital
3. Dr. Sudha Thapa, Chief Consultant, Maternity Hospital
4. Dr. Sushila Shrestha, Chief Consultant, Maternity Hospital
5. Dr. Rupesh Timilsina, Medical Officer, Maternity Hospital
6. Dr. Kalpana Subedi, Consultant Paediatrician, Maternity Hospital
7. Dr. Pramod Khanal, Medical Officer, Baby Unit In-charge, Maternity Hospital
8. Dr. Pushpa Chaudhary, Chief Consultant, Maternity Hospital
9. Ms. Sajana Ranjit, Matron, Maternity Hospital
10. Ms. Bidya Maharjan, Staff Nurse, Maternity Hospital
11. Ms. Reeta Bohara, Admission Room In-charge, Maternity Hospital
12. Ms. Sumitra Sagar Shrestha, Labour Room In-charge, Maternity Hospital
13. Ms. Punya Prabha Lamsal, Baby Unit In-charge, Maternity Hospital
14. Prof. (Dr.) Jyoti Sharma, Head of Department, TUTH
15. Dr. Bekha Laxmi Manandhar, Lecturer, TUT H
16. Dr. Laxman Shrestha, Associate Professor, TUTH
17. Ms. Parwati Siwakoti, Sister Maternity ward In-charge, TUTH
18. Dr. Imran Ansari, Paediatrician, Patan Hospital
19. Dr. Bimala Malla, Consultant Señor Specialist, Patan Hospital
20. Dr. Laxmi Thapa, Gyne and obs, Patan Hospital
21. Dr. Meera Thapa Upadhya, Senior Gyne, Lumbini Zonal Hospital
22. Dr. Binod Man Shrestha, Consultant Paediatrician, Lumbini Zonal Hospital
23. Ms. Prabha Gyawali, Matron Sister In charge, Lumbini Zonal Hospital
24. Ms. Subita Sainju, Maternity Ward In-charge, Lumbini Zonal Hospital
25. Dr. Yam Bahadur Oli, For Medical Superintendent, Lumbini Zonal Hospital
26. Dr. Sridhar Acharya, Consultant Gynae, Lumbini Zonal Hospital
27. Dr. Arbinda Kumar Sinha, Assistant Hospital Director, BPKIHS
28. Dr. Dhruva Upreti, Additional Professor Acting Head of Department, BPKIHS
29. Dr. Gauri Shankar Shah, Associate Professor Paediatrician, BPKIHS
30. Mr. Sunil Parajuli, Medical Record Assistant, BPKIHS
31. Ms. Ramand Chaudhary, Senior Officer, BPKIHS
32. Ms. Dev Kumari Shrestha, Nursing Officer, BPKIHS

Policy level informants

33. Dr. Silu Aryal, Family Health Division
34. Mr. Muneshwar Mool, Former Chief of HMIS, Family Health Division
35. Dr. Sharad Sharma, Demographer, Family Health Division
36. Dr. Vijaya Manandhar, National Operation Officer, WHO
37. Prof. (Dr.) Dharma S. Manandhar, Executive Director, MIRA

38. Mr. Ajit Pradhan, Monitoring and Evaluation Advisor, SSMP
39. Dr. Indira Basnet, Country Program Manager, Ipas
40. Prof. (Dr.) Sudha Sharma, Director, Maternity Hospital

ANNEX 2: DRAFT GUIDELINE FOR SEMI-STRUCTURED INTERVIEW WITH KEY INFORMANTS

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Analyzing Maternal and Perinatal Death Review System in the Maternity Hospital

Semi-structured Interview Questionnaire

CREHPA/FHD/SSMP
September 2007

Namaste ! My name is I am from an organization called CREHPA, a not-for-profit health related research organization based in Kathmandu. It undertakes research and evaluation studies on population, health including reproductive and sexual health.

At present CREHPA is conducting a study entitled "Analysing maternal and perinatal death review system in the five hospitals" to learn the causes and circumstances surrounding, maternal and perinatal death which occurs in the health facility. It particularly emphasized to improve the review process through the assessment of functioning of the review of process to trace the path of the woman who died, through the health care system and within the facility; to identify the avoidable and remediable factors that can be changed to improve maternal and perinatal care in the future.

In this regards, we are contacting about 50 key persons like you representing from different hospitals, Ministry of Health and Population and from other concerned organizations. We assure you that all your information from the questions you answer will be kept confidential.

Your participation in this study is completely voluntary. You have the right to refuse to participate. If you choose to talk with us, there may be some things you do not want to discuss about, or some questions you do not want to answer, you are free not to answer the questions.

Do you want to participate?

Yes.....1
No.....2

May I begin with the interview now?

Yes1 (Proceed with the interview)
No2 (Thank and terminate the interview)

SECTION A: IDENTIFICATION

A.1	Name of the hospital
A.2	Name of the respondent:
A.3	Designation:.....
A.4	Department:.....
A.5	Name of the interviewer
A.6	Date of interview

SECTION B: BACKGROUND INFORMATION

Q.N.	Questions	Codes
B.1	How long have you been working at this hospital?	
B.2	What is your medical degree?	
B.3	What department do you work in?	
B.4	What is your work title	
B.5	What is your primary job responsibility	
B.6	Do you know how many maternal deaths (or perinatal death) occurred last year in this hospital? <i>(Please try to get trend over the years if available)</i> # of maternal death in a year	
	## of perinatal death in a month/year.....	
B.7	Are you involved in maternal or perinatal death review process?	

SECTION C: DEATH RECORD REVIEW PROCESS

Q.N.	Questions	Codes
C.1	Do you know what the maternal and perinatal death audit is?	
C.2	What would you say are the 3 most important reasons for undertaking an death audit?	
C.3	How do you keep/maintain the records of maternal or perinatal death?	
C.4	Does the hospital have its own medical chart to record information about maternal and perinatal death? What is your impression on the medical chart of the hospital in terms of comprehensiveness and user friendly?	
C.5	Generally, how (procedure) do you review maternal or perinatal death in this hospital? <i>(Please probe about whether or not mortality review committee formed, who participate in the review meeting, whether or not it is reported to Director/medical superintendent, what was discussed, where case was forwarded, whether or not any feedback received)</i>	

	<p><u>Maternal</u> </p> <p><u>Perinatal</u> </p>	
C.6	<p>What is your role in respect to the death reviews? </p>	
C.7	<p>To what extent do you use maternal (or Perinatal) death review form developed by DoHS? If not used, why? </p>	
C.8	<p>Have you received any orientation training to fill the form developed by DoHS? </p>	
C.9	<p>What is your impression about the maternal/perinatal death form of DoHS? Could you please tell me any difficulties you experienced in filling up these forms?</p> <p><u>Maternal</u> </p> <p><u>Perinatal</u> </p>	
C.10	<p>What do you suggest to overcome these problems? </p>	
C.11	<p>Whether you or this facility have ever used/ analyzed maternal and perinatal death review form? If yes, what you have done? If not why? </p>	
C.12	<p>Whether you or any of your colleagues has shared the lesson learned from such analysis/review of maternal or perinatal death? How/where do you/your colleagues have shared such lessons learned? (prompt to capture actual examples of lessons learned) </p>	
C.13	<p>Do you think any improvement is needed in the perinatal/maternal form? If yes, what are they and why such improvements are required? </p>	

SECTION D: REASONS FOR MATERNAL OR PERINATAL DEATH

Q.N.	Questions	Codes
D.1	<p>What types of causes are identified for maternal or perinatal death occurred in this hospital?</p> <p><u>Maternal</u> Primary cause</p> <p>..... Contributory cause</p> <p>..... Final cause</p> <p>..... <u>Perinatal</u> Primary.....</p> <p>..... Final </p>	
D.2	<p>In your opinion, what are the major causes of maternal or perinatal deaths at this hospital?</p> <p><u>Maternal</u> </p> <p><u>Perinatal</u> </p>	
D.3	<p>From your experience what are the main contributory factors in these deaths?</p> <p><u>Before the woman arrives at the hospital</u></p> <p><u>Maternal</u> </p> <p><u>Perinatal</u> </p> <p><u>Once she has arrived (i.e hospital level factors)</u></p> <p><u>Maternal</u> </p> <p><u>Perinatal</u> </p>	
D.4	<p>Does the hospital have taken any corrective measures to prevent such incidents in the future? If yes, what measures have been taken? Do you have any example of corrective measures that have been taken? Could you explain about it? (<i>try and capture actual examples of where corrective measures have been taken – probe them</i>)</p> <p>.....</p>	
D.5	<p>If no, what are the limitations for not to initiate any corrective measures?</p> <p>.....</p>	

SECTION E: HUMAN & PHYSICAL RESOURCES AT THE HOSPITAL

Q.N.	Questions	Codes																																
E.1	Whether this hospital has BEOC/CEOC?																																	
E.2	How do you rate the following services in this hospital? <table style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th></th> <th style="text-align: center;"><u>Adequate</u></th> <th style="text-align: center;"><u>Satisfactory</u></th> <th style="text-align: center;"><u>Not adequate</u></th> </tr> </thead> <tbody> <tr> <td>Number of qualified staff</td> <td style="text-align: center;">1</td> <td style="text-align: center;">2</td> <td style="text-align: center;">3</td> </tr> <tr> <td>Supply/availability of blood</td> <td style="text-align: center;">1</td> <td style="text-align: center;">2</td> <td style="text-align: center;">3</td> </tr> <tr> <td>Supply/availability of essential drugs</td> <td style="text-align: center;">1</td> <td style="text-align: center;">2</td> <td style="text-align: center;">3</td> </tr> <tr> <td>State of operation theatre</td> <td style="text-align: center;">1</td> <td style="text-align: center;">2</td> <td style="text-align: center;">3</td> </tr> <tr> <td>Supply/availability/state of essential equipment (# beds, hand basins etc)</td> <td style="text-align: center;">1</td> <td style="text-align: center;">2</td> <td style="text-align: center;">3</td> </tr> <tr> <td>Continues supply of electricity</td> <td style="text-align: center;">1</td> <td style="text-align: center;">2</td> <td style="text-align: center;">3</td> </tr> <tr> <td>Continues supply of water</td> <td style="text-align: center;">1</td> <td style="text-align: center;">2</td> <td style="text-align: center;">3</td> </tr> </tbody> </table>		<u>Adequate</u>	<u>Satisfactory</u>	<u>Not adequate</u>	Number of qualified staff	1	2	3	Supply/availability of blood	1	2	3	Supply/availability of essential drugs	1	2	3	State of operation theatre	1	2	3	Supply/availability/state of essential equipment (# beds, hand basins etc)	1	2	3	Continues supply of electricity	1	2	3	Continues supply of water	1	2	3	
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E.3	Whether this hospital has NICU or neonatal unit? If yes, how do you rate the following services in this Unit? <table style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th></th> <th style="text-align: center;"><u>Adequate</u></th> <th style="text-align: center;"><u>Satisfactory</u></th> <th style="text-align: center;"><u>Not adequate</u></th> </tr> </thead> <tbody> <tr> <td>Number of staff</td> <td style="text-align: center;">1</td> <td style="text-align: center;">2</td> <td style="text-align: center;">3</td> </tr> <tr> <td>Number of trained staff</td> <td style="text-align: center;">1</td> <td style="text-align: center;">2</td> <td style="text-align: center;">3</td> </tr> <tr> <td>Supply/availability of essential drugs</td> <td style="text-align: center;">1</td> <td style="text-align: center;">2</td> <td style="text-align: center;">3</td> </tr> <tr> <td>Supply/Maintenance of essential equipment</td> <td></td> <td style="text-align: center;">1</td> <td style="text-align: center;">2 3</td> </tr> <tr> <td>Continues supply of electricity</td> <td style="text-align: center;">1</td> <td style="text-align: center;">2</td> <td style="text-align: center;">3</td> </tr> <tr> <td>Continues supply of water</td> <td style="text-align: center;">1</td> <td style="text-align: center;">2</td> <td style="text-align: center;">3</td> </tr> <tr> <td>Continues supply of oxygen</td> <td style="text-align: center;">1</td> <td style="text-align: center;">2</td> <td style="text-align: center;">3</td> </tr> </tbody> </table>		<u>Adequate</u>	<u>Satisfactory</u>	<u>Not adequate</u>	Number of staff	1	2	3	Number of trained staff	1	2	3	Supply/availability of essential drugs	1	2	3	Supply/Maintenance of essential equipment		1	2 3	Continues supply of electricity	1	2	3	Continues supply of water	1	2	3	Continues supply of oxygen	1	2	3	
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E.4	Is this Hospital a Baby Friendly Hospital? Why?																																	
E.5	How many Doctors and Nurses working in Labor Room and OT are trained in Neonatal Resuscitation?																																	
E.6	What are all the precautions used to prevent infection at the hospital?																																	

SECTION F: FUTURE IMPROVEMENT

Q.N.	Questions	Codes
F.1	In your opinion, what should be done at this hospital to identify the avoidable factors of maternal/perinatal death and take action on them?	
F.1	What are the major problems/bottlenecks of maternal and perinatal death review at this hospital?	
F.2	In your opinion, what should be done to improve the maternal and perinatal death review system at this hospital?	

Thank you so much for your valuable time and contribution you made in this important study. Is there any thing else you want to add or you think we should know?

.....

ANNEX 3: DESCRIPTIONS OF WIGGLESWORTH'S CLASSIFICATION

Group I: Consists of normally formed **macerated stillbirth**. Death before the onset of labour i.e. any macerated stillbirth will be included in this group except the one with severe congenital anomaly.

Group II: Includes **congenital malformations** (still or neonatal deaths)

Group III: Includes conditions associated with **immaturity**. First week deaths of less than 37 weeks gestation period or birth weight of <1000 grams where cause of death is not stated or does not fall into any category are included in this group.

Group IV: All asphyxial conditions developing in labour. All first week deaths due to birth trauma and **birth asphyxia** in 37 or more weeks of gestation or birth weight of 1000 gramme or more. Death within 4 hours of birth is also included in this group. Antepartum deaths due to antepartum haemorrhage and all intrapartum stillbirths except those due to specific condition or congenital malformations are included in this group.

Group V: Includes **specific conditions** to the neonate than 37 of more weeks of gestation e.g. infection, blood group incompatibilities, hypothermia, meconium aspiration etc. and any specific condition which is not included in other groups.

ANNEX 4: THE STUDY TEAM

Core Team

Dr. Mahesh Puri	<i>Team Leader</i>
Dr. Kasturi Malla	<i>Consultant, Senior Obstetrician and Gynaecologist</i>
Dr. Dhan Raj Aryal	<i>Consultant, Senior Paediatrician</i>
Ms. Moni Shrestha	<i>Research Officer</i>

Maternity Hospital

Dr. Pramod Khanal	<i>Research Assistant</i>
Dr. Rupesh Timilsina	<i>Research Assistant</i>
Dr. Karma Bhurtel	<i>Research Assistant</i>
Dr. Manila Shrestha	<i>Research Assistant</i>
Dr. Swasti Sharma	<i>Research Assistant</i>
Dr. Amin Shrestha	<i>Research Assistant</i>

Project Support Unit

Ms. Sabina Tamang	<i>Administration and Finance</i>
Ms. Luna Shakya	<i>Administration and Finance</i>
Mr. Shekhar Devkota	<i>Data Management Officer</i>
Mr. Abel Singh	<i>Copy Editor</i>
Ms. Radhika Singh	<i>Word Processor</i>