Perinatal Death Surveillance and Response: A Secondary Analysis of Nepal's Efforts

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ABSTRACT

This paper presents Nepal's experience regarding perinatal death surveillance and the country's response in reducing preventable perinatal deaths. In developing this paper, evidence of perinatal mortality in Nepal is brought from secondary sources, mainly the assessment report of Maternal and Perinatal Death Surveillance and Response (MPDSR) system. As of 2019, this initiative has been implemented in 77 hospitals across Nepal. Challenges and barriers in implementing the MPDSR system need to be brought to attention, as the system is being scaled up to 110 hospitals. Data from the Perinatal Death Review revealed that 72% of the maternal deaths occurred during the post-partum period, due to (i) post-partum haemorrhage, (ii) hypertensive disorder, (iii) pregnancy-related infections, and (iv) non-obstetric causes. In 70% of the cases such deaths could have been prevented. Majority of perinatal deaths, at 71%, were stillbirths, mainly due to low child weight of less than 2500 grams. In conclusion, there is urgent need for the national guidelines for MPDSR system to be amended, additional and continued training provision to the health workforce, improvement in the coordination and feedback mechanism, and strengthening of the information management system.

Key words: MPDSR system; Perinatal Death Review; Nepal; Perinatal Mortality; Stillbirth

INTRODUCTION

Evidence from both the developing and developed world confirms that perinatal mortality is preventable in most cases (Brouwere et al, 2010). In developing countries, where modern obstetric care is scarce, intra-partum or early postnatal deaths are frequent, with asphyxia alone causing seven deaths per 1000 births (WHO, 2006). On the other hand, in developed countries, due to modern obstetric practices, the proportion of deaths due to asphyxia is less than one per 1000 births. Stillbirths, which remain a hidden epidemic contributing to perinatal mortality, was ignored in the Millennium Development Goals (MDGs) era, despite having major health implications for mothers. Perhaps due to this, stillbirths were not counted in the routine data collection systems. Likewise, although Every New-born Action Plan (ENAP) recommends countries to have a separate target for stillbirths, there is none under the Sustainable Development Goals (SDGs).

Globally, the accurate burden of perinatal deaths is unknown and to address this data gap a time series estimate from 1995 for 193 countries was developed applying improved modelling approaches (Cousens et al, 2011). According to one count in 2011, despite a significant reduction, perinatal deaths remained high, accounting for an estimated 3.2 million stillbirths and 3.3 million neonatal deaths per year (Lawn, et al, 2011). In 2015, the global burden of stillbirths reduced to 2.6 million, with more than 7,178 deaths a day. Nearly all of these deaths occurred in low and middle-income countries. While half of all stillbirths occur in the intrapartum period, their occurrence varies from 10% in developed regions to 59% in South Asia (WHO, 2020). In 2016, over 2.6 million deaths, or roughly 46% of all under-five deaths occurred during the neonatal period or first 28 days of life. This translates to 7,000 new-born deaths per day (WHO,

2020). In Nepal alone, out of 5,316 perinatal deaths reported in the period from 2015 to 2017, approximately 78% were stillbirths (Subedi et al, 2019).

To eliminate preventable perinatal deaths, countries across the globe have implemented different initiatives. The success of the initiative lies in establishing a surveillance system, with the objective to measure incidence and plan appropriate action (Tayebwa et al, 2020). This surveillance system helps to track the number of deaths and provide information about immediate causes of death, contributing factors, and actions to prevent future preventable deaths. In this regard, the World Health Organization (WHO) and the United Nations' Children's Fund (UNICEF) recommend the institutionalization of MPDSR system (Tayebwa et al, 2020). The Nepal Ministry of Health and Population, with the Family Health Division taking the lead, started implementing hospital based Perinatal Death Review (PDR) in 2006. This initiative, by 2013, expanded to 42 hospitals. Building on PDR, in 2015, the MPDSR system was established, and until 2019, 77 hospitals in 11 districts had implemented this initiative, while there were plans of expanding it by 2020 to 110 hospitals across 20 districts (Subedi et al, 2019).

Study Aim

The aim of this paper, after describing the details of the initiative, is to discuss the inputs and the implementation process of the MPDSR system. Given the short incubation period of the initiative, it is not possible to identify the outcomes. Therefore, deducing from an assessment of the initiative held in 2019, this study will attempt to identify and elaborate the short-term results. The focus will however be on the Perinatal Death Surveillance and Response part of the MPDSR system, i.e., the Maternal component of MPDSR system will not be considered. Finally, lessons learnt from the implementation and recommendations to improve the initiative will be discussed.

BACKGROUND

The perinatal period commences at 22 completed weeks (154 days) of gestation and ends at seven completed days after birth. A perinatal death is a foetal death (stillbirth) during the perinatal period, while any earlier instance is regarded as an abortion or miscarriage. The perinatal mortality rate is calculated as the number of perinatal deaths per 1,000 live births (WHO, 2016). While parameters like gestational age, birthweight, and foetal length are used to define stillbirths, the gestational age threshold is recommended as a single parameter. This is because the gestational age threshold is a better predictor of viability than birthweight and information about the gestational age is more likely to be available than birth weight for stillbirths (WHO, 2016). Stillbirths can be intrapartum, fresh stillbirth, or macerated (death occurring in womb). In the former's case, baby born dead without signs of skin disintegration or maceration is assumed to have died less than 12 hours prior to delivery. On the other hand, a baby born with signs of skin disintegration or maceration is assumed to have died more than 12 hours prior to delivery (Anzagra, 2014).

Neonatal mortality refers to deaths during the first 28 days of life. It can be early neonatal, if death occurred in first 7 days after birth, and late neonatal in case the newborn dies during the period from 7 days to 28 completed days. The former category, accounting for three quarters of neonatal deaths and many of those take place at health facilities, can be targeted by interventions around the time of birth (Oza, et al, 2014). Late neonatal deaths, on the other hand, mostly occur at home. Information on cause of deaths, occurring in community, may not be captured in facility-level records, but could be deduced from Civil Registration and Vital Statistics (CRVS), household surveys, and estimation models (WHO, 2016).

While perinatal and maternal health is linked, in the case of perinatal death birth weight is the core determinant (USAID, 2020). In Nepal, 71% of perinatal deaths were stillbirths and 73%, of which 73% had a child birth weight of less than 2500 grams (Subedi et al, 2019). As an underlying cause, under-nutrition is estimated to account for more than one-third of all deaths in children under five. Accordingly, any programme aiming to improve household, food security and nutrition information is likely to increase children's chances of growing to adulthood (FAO, 2020). Evidence suggests that stillbirths occur among women with the following socio-demographic characteristics: (i) 35 years or above, (ii) low socioeconomic status, (iii) poor nutritional status at the time of conception, (iv) cigarettes smokers during pregnancy, (v) those suffering from high blood pressure, diabetes or obesity, and (vi) who have had multiple pregnancies or suffered a previous pregnancy loss (CDC, 2020).

Perinatal deaths commonly occur when there is inadequate care during pregnancy, inappropriate management of pregnancy complications (e.g., preeclampsia and diabetes), absence of proper obstetric care or when there is obstructed labour and foetal malpresentation that predispose foetus to birth asphyxia and trauma (WHO, 2006). Factors such as early childbearing, short birth spacing, harmful practices such as inadequate cord care, letting baby stay wet and cold, discarding colostrum and feeding other foods at birth also contribute to perinatal deaths (WHO, 2006). Other major causes of perinatal mortality include neonatal pneumonia, prematurity, meningitis, encephalitis, as well as neonatal sepsis.

Most perinatal deaths occur soon after birth, while others occur just before the birth due to damage to the brain and other organs. In clinical settings, factors which contribute to perinatal deaths, include poor neonatal resuscitation skills, incorrect use of partographs and delay in performing caesarean sections (WHO, 2006). Three key clinical practices which could help

prevent perinatal deaths include: (i) three skills sessions of neonatal resuscitation, (ii)

introduction of continuous positive airway pressure for babies with respiratory distress, and (iii)

updates on the use of partographs (WHO, 2016).

Perinatal deaths in SDGs era: a case of Nepal

MDG target 4-A aims at reducing, by two-thirds the under-five mortality rate, between 1990 and

2015. Nepal achieved targets under MDG-4 by reducing Infant Mortality Rate (IMR) of 108 per

1,000 live births in 1990 to 33 per 1,000 live births in 2014. Similarly, Nepal was successful in

reducing the Under 5 years Mortality Rate (U5MR) from 162 per 1,000 live births in 1990 to 38

per 1,000 live births in 2014 (Government of Nepal, National Planning Commission, 2016). But

neonatal mortality, accounting for 72% of IMR and 61% of U5MR in 2011, remains a challenge.

To combat this, Nepal introduced a National New-born Care Package (Malla et al, 2011;

Government of Nepal, National Planning Commission, 2016).

SDG 3.2 aims at "ending preventable deaths of new-borns and children under 5 years of

age by 2030". Nepal's target is to reduce the overall new-born and U5 mortality rates, from 23

and 38 per 1000 live births in 2015, to 10 and 22 per 1000 live births respectively by 2030

(Government of Nepal, National Planning Commission, June 2017). The Every New-born Action

Plan (ENAP), a global initiative launched in 2014, provides a road map of strategic actions for

ending the preventable new-born mortality and stillbirth and thus contributing to reducing

maternal mortality and morbidity. Nepal, guided by the Universal Health Coverage approach

which is adopted as a National Health Policy (2014), and within the broader National Health

Sector Strategy (NHSS, 2015-20), developed Nepal ENAP with the goal of "no preventable

deaths of new-borns or stillbirths by 2035". To achieve this goal, the interventions across a

continuum of quality care addressing reproductive, maternal, new-born, child and adolescent

health are planned. The proposed plan recognizes that new-borns' survival and health is linked with the well-being and survival of mothers before conception, during pregnancy and around the time of birth (Government of Nepal, Ministry of Health, 2016).

Addressing the high burden of perinatal deaths

Ending preventable perinatal deaths is an international public health agenda. The United Nations Secretary-General, in September 2010, launched a Global Strategy for Women's and Children's Health (Partnership for Maternal, New-born and Child Health, 2010). Following that, in December 2010 a Commission on Information and Accountability for Women's and Children's Health (CoIA) was established. The CoIA developed a framework for ensuring the provision of resources for women's and children's health and also a system to measure results. This framework, with accountability at its centre, identifies a core set of indicators for measuring results and resources, proposes an action plan to improve health information systems, and explores opportunities for improving access to information through technology (WHO, 2010).

To end preventable perinatal deaths, it is vital to establish a system capable of tracking the number of deaths, providing information about immediate causes, contributing factors, and suggesting actions to prevent future deaths. However, in countries with poorly resourced health systems, such a system is absent or at best deficient. Therefore, to accurately capture preventable perinatal deaths, a system of vital registration and medical records needs to be established. Secondly, WHO application of ICD-10 to perinatal deaths: ICD-perinatal mortality (ICD-PM) need to be used for elucidating why babies die and what actions we can take to reduce preventable deaths (Allanson et al, 2016). Likewise, perinatal death audit is a strategy for measuring, assessing, and managing perinatal mortality. This is a powerful tool, which, by contributing to improving quality of health care, can reduce perinatal deaths in health facilities

by 30% (Pattison et al., 2009). This initiative, in addition to identifying poor outcomes (perinatal deaths), looks for failures in the health system structures and clinical care processes. To this model, question of access to and utilisation of healthcare have been added, as the auditing structure and process alone in lower middle-income countries' (LMIC) context have limited value (Buchmann 2014).

SECONDARY ANALYSIS

Ethics and permissions

The assessment of MPDSR system was commissioned by WHO Nepal with the purpose of analysing the reported maternal and perinatal deaths, identifying issues and gaps in the MPDSR system, and making recommendations for improving MPDSR strategies. The assessment, conducted from October 1, 2018 to March 31, 2019, used quantitative and qualitative data collected from Key Informant Interviews (KIIs), Focus Group Discussions (FGDs) and district level workshops. Also, a national level workshop, with KIIs participating, was held. Secondary data from MPDSR reporting system of last three fiscal years, 2015/16, 2016/17 and 2017/18 was analysed. The approval for use of the MPDSR data for this study was obtained from Family Welfare Division and WHO Nepal.

The Maternal and Perinatal Death Surveillance and Response System

Nepal implemented the Maternal and Perinatal Death Surveillance and Response (MPDSR) system to prevent maternal and perinatal deaths. It comprises the surveillance cycle of identification, quantification, notification, and review of maternal and perinatal deaths as a continuum to help in interpreting the information and recommending actions to prevent future deaths (WHO, 2020). The MPDSR system evolved incrementally. Initially, Maternal Death

Review (MDR) was introduced in Paropakar Maternity and Women's Hospital in 1990. This initiative comprised review of maternal deaths occurring in the hospital. Later, in 2003, the Perinatal Death Review, which documents medical cause of each death (stillbirths and perinatal) and the contributing systemic failures, in aim of identifying solutions and taking appropriate actions, was added to the initiative. This system eventually developed into the Maternal and Perinatal Death Review (MPDR). By 2006, the MPDR was implemented in 6 hospitals, and by 2013 a total of 42 hospitals had adopted the initiative (Family Health Division, Department of Health Services, Ministry of Health and Population, 2018). In 2017, this number grew to 65 hospitals. Trainings were conducted to strengthen and redesign the MPDR to the Maternal Perinatal Death Surveillance and Response (MPDSR) system in the hospitals that started reporting maternal and perinatal death reviews.

The MPDSR is not a solution *per se*. Instead, it is a system which improves the quality of care by collecting, collating, and analysing data, and linking the defined solutions to identified problems, and ensuring accountability for changes to improve quality of care. PDR is thus a tool to monitor and improve quality of care at hospital and facility level. An initial review of the perinatal deaths occurring in hospitals is conducted, and a prescribed form is filled in within 72 hours of death. The information is gathered from the case file, mother, or key informant, and physical examination of baby. The MPDSR committee, established in a hospital as a part of MPDSR system, meets monthly to review the findings of the initial review to identify the cause(s) of death. Following that, to address the causes and respond to the situation in which perinatal death occurred, solutions are identified, and to avoid any future occurrence(s) a plan of action is prepared.

Data regarding perinatal deaths in hospital and associated recommendations are consolidated monthly. The hospital implements the recommendations within its capacity, while actions requiring additional and or multisectoral support are sent to District Public Officers and Health Officers (DPHO). A web-based system is used for uploading monthly summarized perinatal deaths. DPHOs can access hospital data within the district. The data entered at hospitals, aggregated at central level, are reviewed, and can be disaggregated and analysed locally.

Nepal's Progress in implementing the Perinatal Death Review

As part of the MPDSR system Nepal implemented Perinatal Death Review (PDR) for monitoring and surveillance of perinatal deaths. Although implemented in a limited number of hospitals (77 hospitals), and out of these only 28 hospitals are reporting data, some progress has been made year-on-year in respect of different elements of PDR (Family Health Division, Department of Health Services, Ministry of Health and Population, 2018). **Table 1** summarizes Nepal's progress on implementing the Perinatal Death Review, from 2015-16 to 2016-17. The table provides data mainly on three elements: (i) number of deaths disaggregated into types; (ii) actions by provider level and hospital staff for collecting data regarding cause(s) of death; and (iii) administrative action for avoiding such occurrences in future. In the case of stillbirths, in 2015-16, 13% were fresh, indicating death had occurred less than 12 hours prior to delivery, while majority (at 87%) were macerated, with death occurring less than 12 hours prior to delivery. However, there is some improvement in case of early neonatal deaths, which decreased from 24% in 2015-16 to 21% in 2016-17.

Table 1: Nepal's progress on implementing Perinatal Death Review, from 2015-16 to 2016-17

	Variables	2015/16	2016/17
Deaths disaggregated by type			
1	Total perinatal deaths (PD)	2,619	2,697
2	Total stillbirths	1,991	2,136
3	Total fresh stillbirths	268 (13%)	254 (12%)
4	Total macerated stillbirths	1,723 (87%)	1,882 (88%)
5	Total early neonatal deaths ($\leq$ 7 days)	628 (24% of total PDs)	561 (21% of total PDs)
Action taken by hospital/medical staff			
6	No. of PDR summary form filled	93 out of 564 (17%)	185 out of 423 (44%)
7	No. of PDR summary form approved	56 (60% of PDR summary forms filled)	129 (70% of PDR summary forms filled)
8	No. of monthly PDR conducted	227 out of 564 (40%)	214 out of 423 (51%)
Actions taken by administration			
9	No. of actions recommended about perinatal deaths	124	180
10	No. of actions implemented about perinatal deaths	96 (79% of recommended)	130 (72% of recommended)

Note: This data has been retrieved with permission from Family Health Division, Ministry of Health and Population, Nepal

DISCUSSION

Though Nepal has achieved targets under MDG-4 by reducing IMR and U5MR, the data reveals

that neonatal mortality remains a challenge and an unfinished agenda of MDG era. There is

overall limited progress in improving new-born outcomes in Nepal. The rate of stillbirths, which

became a little worse, highlights that though the cases were identified, causes of delay are not

adequately addressed. Though there is some improvement in case of early neonatal deaths, yet,

from the available data it is hard to discern as to what type of delay was responsible for the

outcome.

From our findings of Nepal's efforts to reduce perinatal death we find that delay is an important factor influencing the success. Three types of delays in getting adequate care include: (i) delay in the decision to seek care; (ii) delay in reaching care provider; and (iii) delay in receiving adequate care (Chavane, et. al, 2018). Such a distinction, based on the modifiable factors, may be helpful in guiding interventions for improving the outcome. While from the available data it is not possible to precisely define as to what level of system failure caused the perinatal death and stillbirth, the outcome can be classified in terms of the levels of system failure. The three levels are: (i) family level; (ii) administrative level; and (iii) provider level (Allanson, et al, 2015). But, given the number of hospitals reporting as against those implementing PDSR, it is a long way to ensuring the accurate information, and to implement appropriate strategies for reducing preventable new-born deaths.

In conclusion, due to limited improvement shown by initial implementation phase of Perinatal Death Review Nepal's target to improve new-born outcomes have therefore been carried over to SDG 3.2. The country now aims to reduce the overall new-born and U5 mortality rate from 23 and 38 per 1000 live births in 2015, to 10 and 22 per 1000 live births respectively by 2030 (Government of Nepal, National Planning Commission, June 2017).

CONCLUDING RECOMMENDATIONS

Nepal, in its efforts towards achieving SDG 3.2, introduced the MPDSR system. In this study, the PDSR system, implemented in 77 hospital of 11 districts, was assessed together with the MDSR system. Data confirmed that delay in getting adequate care underlay the scale of perinatal deaths. But interventions under the initiative also made little difference, and it was hard to discern as to what type of delay was responsible for perinatal deaths. Furthermore, given the

number of hospitals that have been reporting, as against those implementing PDSR, it is difficult

to ensure accurate information, or to implement appropriate strategies for reducing preventable

new-born deaths. While it is essential to expand the initiative to more hospitals, it is also

pertinent that lessons from assessment should be deduced and measures taken to improve the

initiative for contributing to reducing perinatal mortality. These key lessons include: amendment

of the national guidelines for MPDSR system, additional and continued training provision to the

health workforce, improvement in the coordination and feedback mechanism, and strengthening

of the information management system.

Conflict of Interest Statement
There is no conflict of interest to declare.

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Ethics and permissions
The approval for use of the MPDSR data for this study was obtained from Family Welfare
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Data sharing and availability statement
Data is available from the corresponding author based on request.

Author Contributions Statement
PP collected data and did the initial draft. MKAH oversaw data collection and reviewed draft,
ensuring that the information gaps are filled. ET finalized the draft and submitted for publication.

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