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CAUSES OF NEONATAL MORTALITY: A COMMUNITY BASED STUDY USING VERBAL AUTOPSY TOOL

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ABSTRACT

Introduction: Neonatal mortality is increasingly important because the proportion of under-five deaths that occur during the neonatal period is increasing as under-five mortality declines. Because declines in the neonatal mortality rate are slower the share of neonatal deaths among under-five deaths increased from about 36 percent in 1990 to about 43 percent in 2011. There is a need to identify and address the causes of neonatal mortality to achieve the MDG of 31 under five deaths per 1000 live births per year.

Objective: To ascertain the causes of neonatal mortality in the area covered by CHC Natwara (Shahpura Block) of Jabalpur district using verbal autopsy method.

Materials and Methods: Neonatal deaths registered during the period of 1st April 2005 to 31st March 2006 at CHC Natwara of District Jabalpur of MP were studied. Total 69 neonatal deaths were studied using standard verbal autopsy questionnaire. Causes of deaths were ascertained from the filled in VA questionnaire taking the help of a pediatrician.

Results: Mother was main respondent in 50.72% cases followed by father (23.1%). Sepsis was the most important cause of death particularly in the late neonatal period. Birth asphyxia, pneumonia and RDS were the other important causes of death contributing predominantly to the early neonatal deaths. The most important predisposing cause of death was LBW/prematurity.

Conclusion: Most of the deaths are directly or indirectly related to infection and nutrition and are therefore amenable to prevention.

Keywords: Early neonatal deaths, Perinatal deaths, stillbirths, verbal autopsy

INTRODUCTION

Under-five mortality is one of the most important indicator of a nation's health particularly child's health. The world has made substantial progress, reducing the under-five mortality rate by 41 percent, from 87 (85, 89)[1] deaths per 1,000 live births in 1990 to 51 (51, 55) in 2011. Correspondingly, the global number of under-five deaths has dropped from nearly 12 million in 1990 to 6.9 million in 2011.

Because declines in the neonatal mortality rate are slower than those for older children, worldwide, the share of neonatal deaths among under-five deaths increased from about 36 percent in 1990 to about 43 percent in 2011.

More than half the under-five deaths in East Asia and Pacific, Latin America and the Caribbean and Southern Asia are neonatal deaths. Almost 30 percent of global neonatal deaths occurred in India[1]

Even though neonatal mortality is a serious problem, there has been little attention paid to understanding its causes and determinants especially in developing countries like India. Most of the studies conducted in India so far have focus on infant mortality. There are some studies conducted on factors associated with neonatal mortality but none of them in Madhya Pradesh. Madhya Pradesh has second highest neonatal mortality rate in all the states of India.[2] In MP approximately 80% of deliveries were being conducted at home.[3] Though with the implementation of Janani Suraksha Yokna, this proportion has drastically come down. In the absence of access to hospital care, most neonatal births and deaths in rural area has been occurring at home.[4] . However most of the studies are hospital based. So it is difficult to ascertain the causes of neonatal mortality that are usually unattended by the health personnel.

From this background, the aim of this community based study is to assess the causes of neonatal mortality

OBJECTIVE

To study the causes of neonatal mortality in the area covered by CHC Natwara (Shahpura Block) of Jabalpur district using verbal autopsy method.

METHODOLOGY

Study area: Jabalpur district has 7 development blocks. They are Jabalpur, Kundam, Majhauli, Panagar, Patan, Shahpura and Sihora .The study has been conducted in the area covered by Community Health Center Natwara, of Shahpura Block. Shahpura block occupies 870.17 sq.km and only 23 km away from medical college Jabalpur. Most of the deliveries in Shahpura occur at home and assisted by TBA. The provision of maternity services at the CHC Natwara is of limited quality and facility of caesarean section is not available. But Traditional Birth Attendants (TBAs) are available in all localities.

Basic demographic profile: CHC Natwara has 136 villages with a cumulative population of 1,13,407, as per the 2001 census. The literacy rate

of the block is 53.51%. According to the Census-2001, the literacy rate of Jabalpur district is 76.21% with a female literacy rate of 59.47%.[5] CHC Natwara is divided into 4 sectors and 20 sections(Sub Health Center).One PHC and three ayurvedic dispensary are running under CHC.Total 40 seats of health workers are sanctioned and 39 workers are on their position. There are 169 CHV and 158 dais in Natwara and all, these TBAs are trained.

Study subjects: The study subjects included mother or caregivers of deceased neonates and the persons who were present at the time of death of neonates.

Sample size: All neonatal deaths registered during the period of 1st April 2005 to 31st March 2006 at CHC Natwara of District Jabalpur of MP.

Study design: The study design used is Observational (Cross-sectional) study design.

Data collection techniques and tools: After getting information regarding neonatal deaths from the register maintained in CHC Natwara, health workers were approached from relevant sectors to get more detailed information about these deaths including name of father, address, age etc. Total 92 neonatal deaths were registered during the study period, but workers could provide details of only 74 deaths. Out of these total deaths 3 were still births, 1 was post neonatal death and 1 could not be traced due to migration. Thus total 69 neonatal deaths were included in study.

The data collection technique employed was in-depth interviews of the respondents. The data collection tool used was a pre-designed standard verbal autopsy questionnaire. From each neonatal death thus identified, person(s) who were present at time of death were interviewed using verbal autopsy questionnaire.[6] The maximum duration between neonatal deaths and verbal autopsy was 18 months.

The verbal autopsy tool had five parts: identifying information, verbatim open-ended history, care-seeking behaviour for the fatal illness, screening questions directed to syndrome modules, and factors associated with death.

We asked the mother, next-of-kin or caregiver to tell about the events leading up to death in their own words, and probes freely to follow up particular aspects. We then read through a structured checklist which was used to question the family about the absence or presence of particular symptoms and signs during the week preced-

ing the death, the duration of illness, and any relevant information. The checklist included: fever, cough and/or fast breathing, diarrhoea and/or vomiting, rash, loss of weight, convulsions, birth difficulty, congenital malformations, and "others" for any symptoms not listed. The final part of the questionnaire included information on the history of pregnancy and delivery, and also the characteristics of the child and his/her family. Information on variables such as birth weight, birth order, type of feeding, vaccination status, age and education of the mother, and living conditions in the house were collected.

This descriptive account is then summarized and interpreted to give a likely cause of death for that child. A pediatrician was also contacted in case of uncertainty to assign cause of death. The questionnaire was semi-structured (containing some open-ended and some closed questions having "Yes/No/Does not know" options. It contained the basic information about the neonate, respondent and also the various factors and causes supposed to be associated with deaths. Some modifications were made into questionnaire after review of relevant literature and due consideration was given to the rural setup of the study. Children who die in their homes may not appear in any health statistics or they may be reported by lay people.

RESULT

Table 1: Distribution of neonatal deaths according to immediate and underlying cause of deaths (n=69)

Cause of Death	Early neonatal deaths (n=47)	Late neonatal deaths (n=22)	Total (n=69)
Immediate Cause			
Sepsis	9 (13.0)	12 (17.4)	21 (30.4)
Birth asphyxia	10 (14.5)	2 (2.9)	12 (17.4)
RDS	8 (11.6)	1 (1.4)	9 (13.0)
Pneumonia	7 (10.1)	3 (4.3)	10 (14.4)
Congenital	4 (5.8)	1 (1.4)	5 (7.2)
Others*	2 (2.9	1 (1.4)	3 (4.3)
Unidentified	7 (10.1)	2 (2.9)	9 (13.0)
Underlying cause			
Prematurity/LBW	20 (29)	1 (1.4)	21 (30.4)
Difficult Labour	4 (5.8)	1 (1.4)	5 (7.2)
Others^	8 (11.6)	2 (2.9)	10 (14.5)
Unable to specify	15 (21.7)	18 (26.1)	33 (47.8)

*Others –Feeding problem, Hypothermia ,Neonatal jaundice etc.; ^Others-malpresentation, APH, Maternal Complication, Post term, twins

Mother was main respondent in 50.72% cases followed by father (23.1%). Mother could not be the main respondent in about half the cases due to socio-cultural factors.

DISCUSSION

Sepsis was the most important cause of death particularly in the late neonatal period. Birth asphyxia, pneumonia and RDS were the other important causes of death contributing predominantly to the early neonatal deaths. In 13% (9/69) cases no definite conclusion can be drawn about cause of death.

Bang et al[7] found neonatal sepsis (52%) as the major cause of death followed by birth asphyxia (20%) and prematurity (15%). In this study pneumonia was included as a septic cause of death. Bang[7] also observed that all deaths due to prematurity and asphyxia occurred in first 3 days of life, while all sepsis deaths took place after 3rd day of life.

WHO observed that the direct causes of neonatal deaths globally are infection (32%), asphyxia (29%), prematurity (24.5%), congenital malformation (10%), and others (5%) [8]

National neonatal and perinatal data base (NNPD) in its hospital based study observed that neonatal sepsis accounts for 23% neonatal deaths in hospital born children and 36% deaths in out born children. Other causes of death were Birth asphyxia (20%) abnormal jaundice (1.7%), and congenital malformation (2%).[9]

In a study conducted in and around Patna on 1000 neonatal deaths prematurity including low birth weight was the most important cause of neonatal deaths (25.4%;). Other important causes of neonatal deaths were birth injury/asphyxia and neonatal sepsis. Deaths due to prematurity, congenital malformation, respiratory distress syndrome, neonatal pneumonia, post natal aspiration were more common during first seven days of life. In this study, deaths due to birth injury/asphyxia, neonatal sepsis, neonatal tetanus and sudden deaths were more common during 8-28 days of life.[10]

A study of neonatal mortality in Meerut district revealed at least 2/3rd of neonatal mortality was due to exogenous factors with tetanus neonatorum and septicemia being the principal causes of mortality each accounting for a mortality rate of 4.7 per 1000 live births.[11]

In a study conducted in rural Uttar Pradesh to access the causes of 1048 neonatal deaths and still births by verbal autopsy there were 430 still-births reported, comprising 41% of all deaths in the sample. Of the 618 live births, 32% deaths were on the day of birth, 50% occurred during the first 3 days of life and 71% were during the first week. The primary causes of death on the first day of life (i.e. day 0) were birth asphyxia or injury (31%) and preterm birth (26%). During days 1-6, the most frequent causes of death were preterm birth (30%) and sepsis or pneumonia (25%). Half of all deaths caused by sepsis or pneumonia occurred during the first week of life. The proportion of deaths attributed to sepsis or pneumonia increased to 45% and 36% during days 7-13 and 14-27, respectively.[12]

Usefulness and Limitations of Verbal autopsy method

First study to access the usefulness and limitations of verbal autopsy to access the causes of neonatal deaths exclusively was conducted in Karachi, Pakistan. Other studies included infants and under five children. VA identified at least one diagnosis accurately in 71% of the newborns. VA under diagnosed low birthweight and prematurity in the field. Verbatim and modules diagnostic method comparing any field against main hospital diagnoses revealed high sensitivities for too early/too small syndrome (90%) and neonatal tetanus (84%). VA correctly identified some important causes of neonatal death in the field. Assigning multiple diagnoses using both open- and closed-ended questions increased the likelihood of correct ascertainment. [13]

K M Edmond et al [14] evaluated the diagnostic accuracy of a verbal autopsy (VA) tool in ascertaining the causes of stillbirths and neonatal deaths in rural Ghana. A total of 311 stillbirths and 191 neonatal deaths had both a VA and a hospital reference standard diagnosis. The VA performed poorly for stillbirth diagnoses such as congenital abnormalities and maternal haemorrhage. Accuracy was higher for intrapartum obstetric complications and antepartum maternal disease. For neonatal deaths, sensitivity was >60% for all major causes; specificity was 76% for birth asphyxia but >85% for prematurity and infection. Overall, VA diagnostic accuracy was higher than expected in this rural African setting.

Given the use of VA data for policy and program development, it is important to explore new methods to assign causes of death that overcome limitations in conventional VA methods. The influence of the hierarchy to assign cause of death, for example, has important implications. Those with specific disease interests may apply a hierarchy that results in a cause of death distribution with a larger number of deaths attributed to their disease of interest. For conditions such as birth asphyxia and serious infections, for which effective interventions have been proven to reduce mortality, the use of a hierarchy that illustrates their importance in neonatal cause of death distributions can help promote action.[15] Assigning multiple causes of death may alleviate this issue of assigning precedence to particular causes of death. In fact, researchers have recommended identifying multiple causes of death as many childhood deaths result from more than one cause and may be prevented if one of the causes is treated.[16] However, assigning multiple causes of death also presents challenges. Marsh et al. reported some differences in cause-of-death structure when multiple causes were assigned. For example, LBW increased from 26% of deaths when a single cause was assigned to 39% when multiple causes were allowed, but birth asphyxia showed little change, from 14 to 15%.[17] Physician assignment of multiple causes from VA may lack sensitivity due to the need for consensus among several physicians. Snow et al[18] found that 27% of neonates were diagnosed with two causes of death based on hospital records, compared with only 7% assigned two causes through physician review of VA data. Assigning multiple causes can also result in overlapping causes of death. In Nepal, Lee et a[19] reported that 29% of birth asphyxia deaths were classified as being premature and 42% also met criteria for serious infections. Baqui et al[20] reported similar findings in India, where 23% of deaths attributed to sepsis or pneumonia also met criteria for preterm birth.

CONCLUSION

The important direct causes of death were sepsis, birth asphyxia and pneumonia. The major predisposing causes of death were prematurity and low birth weight. All these causes are related to major and basic aspects of health i.e hygiene and nutrition. If the hygiene and nutritional status of the population is improved, these deaths can be brought down. These issues are addressed in the Reproductive and child health program. The government is also running the *Janani Suraksha Yojna* to promote institutional deliveries. Education and socioeconomic development are key issues that should be addressed if neonatal mor-

tality is to be brought down. But this will bring down mortality in all age groups including neonates paradoxically increasing the proportion of neonatal deaths. Most important intervention which can specifically decrease neonatal mortality is promotion of institutional deliveries in hospitals equipped adequately in terms of both manpower and material resources.

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