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Verbal Autopsy: Effective Tool to Evaluate 'Before the Encounter' causes of Neonatal Deaths

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Introduction

In 2018 about 2.5 million newborns died before the first month of life with average worldwide rate of 18 per 1000 livebirths[1]. Prevention of child death remains a major challenge before mankind. Neonatal mortality a major cause of under 5 mortality and remains most difficult to prevent completely and is integral part of Third Sustainable Developmental Goal[2]. These goals envision reducing the neonatal mortality equal to or less than12 per 1000 live births by the year 2030[2]. Neonatal mortality rate is an important factor in various health and socioeconomic indices[3]. Vast burden of the neonatal mortality is born by economically poor countries especially in South Asia (including India), Sub-Saharan Africa. Though these regiions have made significant strides in the reduction of neonatal mortality, still they have to cover a vast grounds before their figures are anywhere near North America and Western Europe[4].

In India, neonatal mortality was 23 per 1000 live births. This places India below some Saharan and Sub Saharan countries like Kenya and Libya. In India, many neonatal deaths occur at home and are seldom medically certified[5]. Apart from the medical causes, socio-economico-cultural causes are also important in Indian settings. While clinical records can identify medical causes of Neonatal mortality, 'before the encounter' causes play an equally important and potentially preventable factors.

We at a tertiary care centre in Western Maharashtra, used 'Verbal Autopsy' method, to analyse 'before the encounter' issues contributing to the neonatal mortality. We utilized 'Verbal Autopsy Questionnaire' which is a structured question series prepared by Maharashtra State Family Welfare Bureau with their prior permission[6]. This questionnaire encompasses various clinical and socio economic points for death audit.

Aims and Objectives

Aims of the study was to evaluate 'before the encounter' causes of neonatal mortality in the setting of the tertiary care referral centre. We believed that as far as neonatal mortality is

concerned there's always something that is 'more than meets the eye'. As a clinicians we concentrate more on medical aspects of the disease, giving social, economic and often logistical factors a miss. This study was aimed at identifying these factors and to study how they contribute to the presenting clinical situation and their possible prevention.

Materials and Methods

In this prospective single center observation study, in a tertiary care center in Western Maharashtra, we interviewed mothers of the diseased patients (neonates). Mothers were counseled about the questionnaire and their co-operation was sought and written consent was obtained. Bereaved mothers who were unable to cooperate were excluded. Neonates of the mothers who were not present in the Neonatal Intensive Care Units or Post Natal Observation Wards were also excluded from the study. This ensured accurate analysis of the factors as mother are considered most reliable source of history.

In addition, special emphasis was given to transport facilities of the neonate, condition of road, distance to the tertiary care center and time needed to cover the distance.

Observations

We interviewed more than 450 respondents, only 350 cases in which respondents were mothers themselves were considered.

Out of 350 cases, 98 (28%) were from Urban area and rest 252 (72%) were from Rural area. Among the diseased, 77% mothers were registered and 23% were unregistered. Disproportionate number of mothers (74%) i.e. 259 were illiterate or semiliterate (Schooled for less than 4th standard-elementary schooling), only 11 (3%) mothers were graduate or above 80 (22%) had educated till highschool level.

Table1- Urban/ Rural distribution

Urban	98(28%)
Rural	252 (72%)
Total	350 (100%)

Table 2- Education of mothers

Illiterate / Semi Literate	259 (74%)
Completed High school Education	80 (23%)
Graduate and Above	11 (3%)

Out of the 350 deaths, 199 were males and 151 were females. Interestingly 241 patients (69%) were outborn and 31% (109) were inborn (In the same hospital), among those that were outborn, 23 patients (around 6.5%) had a home delivery. Patients who delivered in other hospitals, about 29% (63 patients) were referred from other tertiary care centers, 75 (34%) were referred from Primary Health Centers and 80 patients were referred directly from private nursing homes conducting deliveries.

Table 3- Place of Delivery and referrals

Inborn	109 (31%)	
Outborns	241 (69%)	
	Referred from Other Tertiary Care Centres (Out of 241)	63 (29% of Outborns)
	Referred from Primary Health Centres (Out of 241)	75 (34% of outborns)
	Referred from Private Nursing Homes (Out of 241)	80 (37% of Outborns)

Out of total 241 cases referred from outside, only 99 cases (41%) were accompanied by qualified medical professionals or paramedics, only 142 cases (59%) were transported in the medical ambulances and rest 99 cases (41%) were trasnported in other modes of transport potentially disturbing the 'warm chain'. However, among the ones transported in medical ambulances about 38% (54 cases), had no provision of warmers or sufficient neonatal resuscitation equipment.

Table 4- Neonatal Referrals and our experience

Total referrals who succumbed		241 (69% of total deaths)
Transported in medical ambulances		142 (59%)
	Accompanied by qualified medical professionals	99 (41%)
	Medical ambulances that had warmers and necessary resuscitation equipments	54 (38%)
Transported by other means (like autorickshaw, taxi etc.)		99 (41%)

Among 241 deaths that were referrals, about 185 cases (77%) had to cover a distance of more than

50 kilometers or needed about 2 hours of transport, only 23% cases were within 50 kilometers of radius ans/or within 1 hour of drive before being transported to our centre.

Table 5- Distance Covered before referrals

More than 50 kilometers and/or needing 2 hours of transport	185 (77%)
Less than 50 kilometers and/or needing 1 hour or less of transport/drive	56 (23%)

Out of the total 350 deaths, 8% (27), were twins or multiple pregnancies. Rest were singletons.

56% (196 out of 350 deaths) of those succumbed had higher than second birth order and 14% (49 of 350) had second birth order whereas 30% (105) had first birth order.

Among the deaths with 2 or higher birth order (total 245 deaths) spacing of about 4 years or more was observed in 18% (44 deaths of 245), less than 3 years was found in 30% (73 deaths of 245) and about 52% (127 deaths) had spacing of 2 years or less.

Table 6- Spacing analysis

Birth order	Number and Percentage
First order	105 (30% of total 350 deaths)
Second Birth order	49 (14% of 350 deaths)
Higher Than second birth order	196 (56% out of 350 deaths)
Total	350 (100%)

As a hospital policy, we start breast feeding immediately after birth or within 4 hours of birth. In the neonates which delivered outside that succumbed, we found that over 61% (147 patients) were not intiated with breastfeeding at all, 19 % patients (45 patients) were given mixed feeds and only 20% (48 patients) were given breastfeeding.

Most common complaint/ reason for referral with which diseased neonates were admitted was respiratory difficulty (respiratory distress either from meconium or from hyaline membrane disease), second most common compliant reason for referral was low birth weight (prematurity). Other reasons were neonatal jaundice, umbilical stump discharge or convulsions etc.

Discussion

Our study aims at analysing socio-economio-cultural factors that impact neonatal mortality 'before the point of contact' with a tertairy care centre. In our case, disproportionate number of patients were from rural background. In analysis by Sankar et al[7], they found that neonatal mortality in India is twice as high as that in urban areas. In our study, we also found that disproportionately high number of deaths are from rural areas. Neonates of mothers who were illiterate/semi literate had higher mortality. This is confirmed by various studies. A study by Fosenca et al[8] found that adolescent and older mothers with low education level have greater Neonatal mortality. Causes may be multi factorial but lack of awareness of importance of the antenatal care and nutritionmay be playing an important part. Distance needed to be covered before visiting the tertiary care facility is an important consideration. A study done in France[9] suggested that for out of the facility born neonates, mortality increased sharply after a distance of 45 kilometers. In our study, we found that the distance of 50 kilometers and a transportation time of over 1 hour is associated with increased mortality owing to neonate's homeostatic compromise that occurs as a consequnce of increased distance. Similar instance of high mortality was associated with the reduced spacing between pregnancies. In a Kenyan study[10], it was observed that neonatal and infantile mortality decreases by almost 16% by each year of spacing. Early breastfeeding was associated with significantly lower neonatal mortality. Its however not very surprising given the fact that there's a global consensus on it.

Conclusion

We conclude that Verbal Autopsy is a very effective method not just to pinpoint clinical and subclinical 'medical' causes of neonatal mortality but it also is an effective tool for determining socioeconomic and logistical causes of mortality before 'point of contact'.

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