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Verbal Autopsy Study for Perinatal and Under- 5 deaths in urban informal settlements of Mumbai, India

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Introduction

The overall quality and availability of national health information systems vary widely across the world, resulting in a dearth of accurate death registrations and causes in many different countries [1]. Verbal autopsy (VA) is a practical method of determining the probable cause of death, particularly useful in areas where other systems for medical certification for cause of death are not available, through standardized interviews of next of kin or caregivers [2]. Verbal autopsy consists of semi-structured interviews with family members conducted by a trained field worker to identify symptoms and circumstances of the deceased immediately before death [3]. These VA methods are currently being utilized in over 45 low and middle-income countries (LMICs) where data is analyzed and likely causes of death is assigned according to the International Statistical Classification of Diseases and Related Health Problems (ICD-10) [3].

In 2007, the World Health Organization (WHO) introduced international standards for verbal autopsy with three questionnaires designed to target specific age groups. The first focuses on perinatal and neonatal deaths, children under the age of four weeks, through questions regarding the pregnancy, delivery, and mother's health. The second questionnaire focuses on post-neonatal and child deaths among children ages four weeks to fourteen years old to address major causes of post-neonatal child mortality [4]. The third and final questionnaire focuses on adolescent and adult deaths or persons aged fifteen years and up, including deaths related to pregnancy and focus on female deaths [4]. The respondents of these questionnaires should ideally be the most recent caregiver of the deceased to ensure accuracy of information reported and should be conducted as close to death as possible to mitigate potential recall bias among participants. Specifically, the questionnaires were developed to allow for the certification and coding of ICD-10 as well as establish causes of death with 'reasonable accuracy' from a well-administered VA interview [3]. The questionnaires may be adapted to the local context if necessary but ideally changes should be kept to a minimum to ensure the standardization in verbal autopsy methods across areas of use. While verbal autopsy cannot determine all causes of death, it does deliver incredibly valuable information to assist in identifying gaps in reporting to illustrate a 'holistic view of the causes and contexts of deaths' [3].

Research Context/ Purpose:

As of 2015, the United Nation launched its Sustainable Development Goals (SDGs) with the third goal focusing on ending preventable deaths of newborns and children under the age of five. Specifically noted, poverty, poor housing conditions, lack of access to safe drinking water and sanitation facilities puts children living in informal settlements at a heightened risk of illness, developmental delays, and death. At 42 deaths per 1000 live births [6], India's under-5 mortality rate (U5MR) is currently declining. Maharashtra with 28 deaths per 1000 live births is under the national average, though further information is required to better understand

the causes and context of deaths occurring in order to create appropriate and effective prevention strategies catered to the local context. SNEHA, a Mumbai-based non-profit organization is in a uniquely effective position among this topic given that it works to improve preventative and promote healthcare among marginalized slum communities. The organization has recently completed a mixed-methods study using verbal autopsies to explore causes and contributory factors for perinatal and under-5 deaths in informal settlements of the Municipal Corporation of Greater Mumbai (MCGM) and to identify preventive strategies for community level interventions and for health service delivery.

Methods

Objective: The objective of the study is to explore the causes and contributory factors for perinatal and under-5 deaths in the community through verbal autopsies with family members.

Study Design: The quantitative component focused on classification of cause of deaths and its unique relationship to socioeconomic, demographic, and other various factors while the qualitative component included content analysis of narratives and panel discussions with experts to identify contributory factors and prevention strategies for stillbirths and under-5 deaths.

Study Sample: Study locations were identified as the vulnerable slum areas of Mankhurd, Govandi, and Malvani where SNEHA is familiar with the landscape through its child health and nutrition program implemented between 2016 to 2019. The total sample included in this study was 31.

Data Collection and Analysis: Cases of deaths were identified by SNEHA's field workers via routine surveillance conducted through program activities to identify and report births and deaths in under-5 years. Interviews were conducted, confidentially, using the 2016 World Health Organization (WHO) Verbal Autopsy Instrument each by two interviewers with the parents or caretakers of the children during the illness and death. The questions included within the questionnaire interviews allowed for responses with either a yes/no response, multiple choice, or with a duration in which cause of death was assigned by clinicians and allowed for inclusion of any additional narrative deemed necessary or other localized relevant questions. All participants provided informed consent and interviews were conducted from six weeks to three months from the date of death to ensure and respect a minimum of a six-week mourning period and to mitigate recall bias among respondents. The quantitative data as well as qualitative data from the case stories were analysed.

Results

A total of thirty-one verbal autopsy interviews were completed over the course of the study period, with 94% of cases including the mother and the additional 6% of interviews involving the grandmother. The child- sex

distribution of cases indicated a majority of the cases involving male children at 19 (61%) of the overall pool with 12 (39%) females.

Regarding the mother's obstetric history, relevant information has been broken down into five categories: *Gravida* (occurrences where the women is or has been pregnant), *Parity* (occurrences of pregnancies reaching viable gestational age of 24 weeks), *Abortions* (the number of pregnancies previously terminated), *Living Children* (the number of woman's additional living children), and *Deaths* (the cases of mother's previous children's death) [5]. The findings suggest that 39% of all women had 1-2 pregnancies (Gravida). Though, majority (61%) of the women had three or more pregnancies, only 49% of them reached the viable gestational age. Data on parity also suggest that 6% women did not have a pregnancy reaching the viable gestational age. 13% women had reported of any abortions. Nearly one third (32%) of all women did not have a live child, followed by 32% women with 1-2 children and 36% with three or more children. 94% of women reported at least one previous death of a child exclusive of this study (Table I).

Table I. Mother's Obstetric History

Total numbers	Gravida	Parity	Abortions	Living Children	Deaths
0	-	2 (6%)	27 (87%)	10 (32%)	-
1-2	12 (39%)	14 (45%)	4 (13%)	10 (32%)	29 (94%)
3 or more	19 (61%)	15 (49%)	-	11 (36%)	2 (6%)
Total	31 (100%)	31 (100%)	31 (100%)	31 (100%)	31 (100%)

All women had availed antenatal care services, mostly (65%) from government health facilities. Government hospitals were preferred place of delivery (65%), followed by private hospitals (16%) and home (16%). 90% of the births were full term pregnancies. 32% of all children (excluding still births) had low birth weight (Table II).

Table II. Antenatal and delivery care received for the deceased child

Availed antenatal care (ANC)	31 (100%)
Antenatal Care facility	
Government facility	20 (65%)
Private facility	9 (29%)
Missing	2 (6%)
Place of delivery	
Government hospitals	20 (65%)

Private/Trust hospitals	5 (16%)
Home	5 (16%)
Enroute	1 (3%)
Gestational period	
Pre-term births (≥38 weeks)	3 (10%)
Full term births (≥39 weeks)	28 (90%)
Birth weight	
Low (<2500 gms)	10 (32%)
Normal (2500 gms or more)	16 (52%)
Not available	5 (16%)

Among the 31 cases in the study, more than half (52%) of the children who died were in the neonatal period, followed by children under one year of age (22%). 16% of all deaths were still births. 42% of the deaths were in government hospitals, followed by home (35%) and private hospitals (13%) (Table III). Though majority of the deaths took place in health facilities, data suggests that in more than half of all the cases (55%), there was a delay in reaching the health care facility *(not included in the table).*

Table III: Type and place of death

Type of death	
Still births	5 (16%)
Neonatal deaths (<28 days)	16 (52%)
Infant deaths (> 28 days- 1 y/o)	7 (22%)
Under 5 deaths (1 y/o +)	3 (10%)
Place of death	
Government hospitals	13 (42%)
Private	5 (13%)
Home	11 (35%)
Enroute	1 (3%)
Missing	1 (3%)

The most common estimated causes of death reported were acute respiratory distress syndrome (19%), Intra Uterine Fetal Death (16%), and congenital anomaly (13%). The deaths were also categorized using International Classification of Diseases (ICD 10) which suggests that deaths due to diseases of respiratory system (respiratory

distress, pneumonia, aspiration and suffocation) was high at 39% (Table III). Additionally, the respondents reported that preceding the child's death, a majority of cases [22 (71%)] had symptoms similar to pneumonia such as irregular breathing, cough, or fever *(reported from case stories).* Of all cases of child illnesses, treatment was sought in 12 cases.

Table IV: Estimated Cause of Death

ICD 10 category	Estimated Cause of Death	Total
Diseases of respiratory system	Respiratory Distress/ Acute Respiratory Distress Syndrome (ARDS)	6 (19%)
	Pneumonia	3 (10%)
	Suffocation	2 (6%)
	Aspiration	1 (4%)
Certain conditions originating in the perinatal period	Intra Uterine Fetal Death (IUFD)/Still births	5 (16%)
	Negligence	2 (6%)
Congenital malformations, deformations and chromosomal abnormalities	Congenital Anomaly	4 (13%)
Diseases of the nervous system	Meningitis	2 (6%)
	Convulsion	1 (4%)
Endocrine, nutritional and metabolic diseases	Hypoglycemia	2 (6%)
Diseases of the digestive system	Diarrhea	1 (4%)
Not classified	Unknown	2 (6%)

Conclusions

Understanding the patterns and trends among cases of perinatal and under-5 deaths aids in ensuring that interventions implemented are appropriate and effective to the population being served. These verbal autopsies show that the major causes of deaths are respiratory in nature; either pneumonia or acute respiratory distress. The finding is vital to further implement interventions such as the uptake of vaccines or WASH measures to mitigate this large share of deaths. Timing of the deaths suggests that majority of the deaths took place in the neonatal period emphasizing the need for a targeted intervention to avoid such deaths. Further, creating awareness in the community among caregivers about childhood morbidity, danger signs and treatment seeking is essential. At the health system level, improving the capacity of health facilities to manage serious complications including standard protocols for care and transfer and communication between referral facilities can aid in reducing the burden of deaths.

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