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Verbal Autopsy as a Tool of Identifying the Causes of Childhood Death: Assessing the BRAC System

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Introduction:

Documentation of the causes of death is a prime epidemiological need. It is instrumental in assessing the health status of a population and also in estimating the time-trends in cause-specific deaths, therefore may be useful in fixing interventional priorities. Verbal autopsy (VA) is an epidemiological tool that is used to ascribe causes of death of children who were not under medical supervision at the time of death,¹ and it refers to a method of retrospective interview of individuals who have attended a death and can describe what happened during the few hours, days or months preceding death². Though VA shows some potentials but still it is subject to scrutiny for any unwarranted optimism and the technique must be interpreted with caution. In Bangladesh, although the mortality rates in infancy and childhood are still very high but there exists much inadequacies in knowledge about their causes. Most infant and childhood deaths occur at home, and that too in the absence of any medical attendance. So valid information on causes of death in most cases is not available, and thus puts hurdles against progress of epidemiological knowledge in public health. Even in urban hospitals, post-mortem autopsy is a rarity - the method conflicts much with the cultural and religious norms of the common people. Such constraints in collecting data puts both the Government and the NGO's in disarray and the allocation of their scarce resources for disease control works with inadequate epidemiological inputs. So it becomes incumbent on public health professionals to find some alternative ways. For that, options are a few. In Bangladesh VA as a tool to determine causes of death needs meticulous examination

In Bangladesh and other developing countries, VA is being used as an epidemiological tool by many in public health organizations. It has been used in India (Kielman et al, 1983), in Bangladesh (Chowdhury et al, 1980, Chen et al, 1980, Islam et al, 1982, Zimicki 1986), in South America (Puffer & Serrans 1973, Mata 1978), in Senegal (Garenne and Fontaine, 1986), in Kenya (Omandi - Odhiambo et al, 1984), in The Gambia (Alonso et al, 1987)². In a rural community with no diagnostic facilities, VA presents with some new hopes. It is in this setting that BRAC's Watch Project has been using the technique since 1987 in six unions - 3 in Mainkongj and 3 in Joypurhat - in 158 villages with a population of over 110,000. It was felt important that the sensitivity and specificity of VA be meticulously tested, otherwise the whole initiative may suffer from some inherent weaknesses. Moreover, it is not unlikely that an interviewer - most instrumental in the process - may possess idiosyncratic perception about important signs and symptoms of a common disease. Such subjective views may lead to undue commissions and omissions and thereby render VA susceptible to errors. Thus the data may get contaminated at the very collection point. But such inaccuracies are avoidable if the pathways of such contamination are rightly detected. Besides, the diagnostic acumen of the team needs to be assessed for any possible gaps in current clinical knowledge on common diseases. This study was carried out to validate the

VA routinely carried out by the staff of BRAC as well as to make improvements where deficiencies are identified.

2. Methodology:

The study area includes all project villages of BRAC that lie within 15 KM from the Manikgonj city centre. It consists of all children of age below 12 years dying as in-door patients in Manikgonj Adhunik (modern) Sadar Hospital during the period from April 1993 to December 1994. Of this population, the criteria for selecting a case as sample required an unambiguous hospital diagnosis. The patients coming from far flung villages were excluded from the study to avoid much difficulties in the data collection.

The VA questionnaire is divided into two parts: a). section with socio-demographic details including age, sex, date of birth and death; b). open ended portion to record the respondent's unprompted description of the illness that lead to the child's death and also some present and past history of diseases that are deemed relevant and that comes up after interviewing. The field worker took adequate efforts to interview parents or relatives who had the closest contact with the child during the terminal illness, usually the mother. The history was collected within 6 weeks of the occurrence of death. The concerned field staff were kept blind about the hospital diagnosis. Each completed questionnaire was reviewed independently by the concerned doctor presently working with the BRAC's VA technique

These field workers were sufficiently oriented on symptoms, of common diseases and the use of VA manual in vernacular language. In addition to the training at the beginning of this technique they had refresher training each year as a follow up. There were 3 male and 3 female field workers responsible for collection of events and VA. They had experience of 7-12 years, in this study area

The Sadar Hospitals of Manikgonj provided access to the hospital records of its paediatric unit once a month to a researcher who collected relevant information like home address, father's name, age, date of death, cause of death from the registers. The diagnosis made at hospitals was considered standard and compared case by case with the diagnosis derived by the VA. In assigning a diagnosis, the International Classification of Diseases (ICD) was followed and precaution was taken to record only the underlying cause of death rather than physiological end-points like cardio-respiratory arrest. When evidence was insufficient to ascribe a specific cause of death confidently, it was labeled as undetermined.

A total of 58 deaths were identified in this study area. However, the supervisor or the field worker was not able to locate 12 children's homes (5 males

and 3 females) due to the inadequate address maintained in the hospital records. These were eliminated and further analysis was carried out only on 46 deaths.

Sensitivity of VA for a specific disease is expressed as the percentage of confirmed cases correctly identified as true positive, whereas *specificity* is the percentage of non-cases (without the disease) truly identified as non-cases. Sensitivity measures the strength of VA in estimating the true positive cases and for specificity, it is the strength of avoiding making false positives.

RESULTS:

Table 1 shows the distribution of death by age and sex. Of all deaths, only 2 cases are aged 5 and above, 6 in 1-4 years and the rest are under 1. Of infant deaths, 34 are neonatal and only 4 are post-neonatal. Out of all neonatal deaths (n=34), 82 percent belong to perinatal mortality - dying within 7 days of birth. In the study population, 76.5 percent of all neonatal deaths are male, but in other age-groups the sex-wise distribution shows no difference. It is worth noting that all deaths in 8-28 days old infants are in males.

Table 1. Distribution of deaths by age and sex

Age	Sex				Total	
	Male		Female		Number	Percent
	Number	Percent	Number	Percent		
0 - 7 days	20	62.5	8	57.1	28	60.9
8 - 28 days	6	18.7	0	0.0	6	13.0
0 - 28 days	26	81.2	8	57.1	34	73.9
29 days - <1 year	2	6.2	2	14.3	4	8.7
1 - 4 years	3	9.4	3	21.4	6	13.0
5 - 11 above	1	3.1	1	7.1	2	4.3
Total	32	100.0	14	100.0	46	100.0

4.2 Causes of death

Table 2. Hospital and VA derived causes of death

Causes of death	Hospital		VA	
	Number	Percent	Number	Percent
Neonatal or birth asphyxia	20	43.5	20	43.5
ARI	7	15.2	6	13.0

Prematurity	7	15.2	5	10.9
Gastroenteritis/ Diarrhoea	-	-	3	6.5
Kidney disease	2	4.3	3	6.5
Tetanus	-	-	2	4.3
Sepsis/ Septicemia	3	6.5	1	2.2
Obstetric complication	-	-	2	4.3
Meningitis Encephalitis	4	8.7	-	-
Tumour	1	2.2	1	2.2
Undetermined	2	4.3	1	2.2
Total	46	100.0	46	100.0

Both the VA and the hospital diagnosis identified neonatal or birth asphyxia in equal number of cases and it happens to be the number one killer (43.5 percent) in the study population. VA finds ARI the second and prematurity the third largest killer, the former caused 13.0 percent and the latter 10.9 percent deaths. In the hospital, both ARI and prematurity are found to be the second commonest cause. None was diagnosed as dying of gastroenteritis, tetanus and obstetric complications in the hospital, but the VA found positive cases for all three. In the hospital, 4 cases were diagnosed as dying of meningitis, but none was diagnosed as such by the VA. Both the VA and the hospital found a death caused by malignancy/cancer. Two cases in the hospital and one in the VA remain undetermined.

4.3 Sensitivity and Specificity:

Table 3. Sensitivities and specificity of VA with hospital derived diagnosis

Causes of death	Sensitivity (<i>in percent</i>)	Specificity (<i>in percent</i>)
Neonatal or Birth asphyxia	80	84.6
ARI	57.1	94.9

Prematurity	57.1	97.4
Malignancy or Cancer	100.0	100.0
Sepsis / septicemia	33.3	100.0

The study shows that the sensitivity and specificity of the VA widely vary from disease to disease. For some diseases, the sensitivity and specificity are found higher than 80 percent, but in others very disappointing. The present study reveals that VA can correctly identify (sensitivity) 80 percent of deaths of neonatal or birth asphyxia. For prematurity and ARI, the sensitivity is 57.1 percent. The VA can determine cancer or malignancy as cause of death with 100 percent accuracy. But for sepsis or septicemia, the sensitivity falls to 33.3 percent. The VA could exclude false diagnosis (specificity) of neonatal or birth asphyxia in 84.6 percent of cases. For ARI and prematurity, the specificity is 94.9 percent and 97.4 percent respectively. For malignancy the specificity is 100 percent.

5. Discussion:

Due to budget limitations this study could be carried out only for a period of 21 months yielding a sample of 46 deaths that could be studied in detail. It is interesting to note that there have been studies with samples of deaths as low as 15, 25 and 41. It would have been ideal to have had long enough data collection as so that at least 100 cases were available for better analysis (3). However VAs forms a good tool to evaluate longitudinal surveys and registrations of vital events (4). It is predicted that even with all the limitations identified so far, VAs will be used more widely in surveillance as they are of value to public health (5). This is particularly expected in areas where vital registration is incomplete (6).

This study was carried out as a validation process of an ongoing VA system. Even though the sample size is small, useful information has been provided confirming the accuracy of VA in diagnosis conditions such as birth asphyxia. On the other hand the VA system completely missed out meningitis, encephalitis as well as some

difficulties in identifying sepsis/septicemia. It was surprising that 3 diarrhoeal deaths were missed by the hospital but picked up by VA. It is likely that dehydration was the hospital diagnosis. Gray has indicated in a report that acute condition like diarrhoea, low birth weight birth injury etc. are more suitable for VAs than chronic conditions, meningitis, malaria etc. (5). This indicates areas that need emphasis in the future. It should be possible to selectively validate the accuracy of selected diseases over a period of time so that levels of VA accuracy may be increased (3).

The sensitivity and specificity of the data in this study shows some variations. These variations have been studied in other observed as well. Variations have been observed between diseases in the same study as well for the same diseases between various studies (3).

The VA was carried out by field workers who had completed 12 years of schooling and experienced in data collection. The data was collected within a period of 6 weeks. Both these are strengths of this study. However field workers living part of the study area were readily accepted. However the interviewers were sensitive to the level of grief of the mother and would delay the interview according to the existing situation. The lowest recommended period suggested is 15 days (7). However periods extending even upto 6-24 months are considered acceptable from accuracy of recall (8). However the recorded lowest period is 1 week and the highest 52 weeks (3).

In this study the data collection used a format that was open. No checklists of symptoms were provided. Experience from other VA studies suggest a checklist would have been more appropriate for interviewers who are not medically trained. However in this study the diagnosis was made by a medical professional. Similarly no algorithms were used in this study. Which could have improved the quality of the data (3). The mortality was classified post hoc by a physician assessor. It would

probably be more useful to include a pre determined notability classification (3).
These are same of the limitations of this study.

There are some limitations in the reference diagnosis as well. As the hospital chosen for the study in the project area for VA does not have modern laboratory equipment's it is possible that some inaccuracies in the diagnosis could have occurred. This is a grave limitation in any developing country setting which this VA study as well as others in similar settings will have to account and plan for (3).

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