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Maternal mortality inquiry in a rural community of North India

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Abstract

Community inquiry on maternal mortality was conducted in a rural area of North India. Maternal deaths were identified by multiple informants and investigated by doctors. Amongst 257 deaths registered in women in the 15—44 year age group, 55(21.4%) were maternal deaths. Maternal mortality ratio was 230 per 100,000 live births. Major causes were antepartum and postpartum hemorrhage (18.2%), puerperal sepsis (16.4%), severe anemia (16.4%), abortion (9.1%) and obstructed labor (7.3%). This rapid, simple and low cost method is recommended for application in areas where vital registration system is unsatisfactory.

Introduction

Maternal mortality ratio is a sensitive indicator of health status of women and the quality of available maternity care services. Recent hospital-based studies from different regions of India report maternal mortality in the range of 300—1000 per 100,000 live births [4,10,12,15]. These studies may not represent the general level and pattern of maternal mortality due to overrepresentation of high risk cases. Population-based information on maternal mortality is unsatisfactory in most of the developing countries. This is because only a small proportion of deaths are registered and certification of cause of death is not possible in the majority of cases who die at home. Often the deliveries are not attended by qualified personnel [3].

Community-based prospective studies are required to generate accurate information on maternal mortality in developing countries. However, even with prevailing maternal mortality ratios of 400—500 per 100,000 live births, the data (number of maternal deaths) required for making statistically valid estimates of maternal mortality necessitates follow up of nearly one million population which is often not feasible due to financial constraints. Retrospective inquiry is an alternative. In the situation where prospective data is unavailable, symptoms and signs based diagnosis (verbal autopsy method) can be used to find out cause(s) of maternal deaths. This method may prove helpful to find out not only the medical cause(s) but also to understand the socio-economic, demographic and behavioral factors (with reference to utilization of care) related to the causation of maternal mortality. Findings of such surveys could be very useful for planning and monitoring practical, feasible maternity

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care programs in developing countries. A community-based retrospective inquiry for identification of maternal deaths and causes of maternal mortality is reported.

Materials and methods

Study area

The study was carried out in five of the eight community development blocks purposely selected from the rural area of the district of Ambala, North India. There were 774 villages. According to the Census of India 1981, 85% of these villages are connected to the towns by all weather metalled roads and regular communication facilities are available in 42% of the villages. Agriculture is the main occupation; 44% of the working population are engaged in cultivation. Literacy rate is 36%. Total population in 1986 was estimated to be 715,886 (projection based on Census of India, 1981) [2].

Indigenous medical practitioners and traditional birth attendants (TBAs) are available in almost every village. Peripheral health posts provided by the State Government are manned by auxillary nurse midwives (one for every 5000 population). There are five Primary Health Centres and 15 Rural Dispensaries with qualified doctors (graduate in modern medicine). Referral services are provided by four Government and two Mission Hospitals situated in the towns. In addition, many private maternity homes are also available in the towns.

Death identification

Fifteen field assistants were trained in conducting mortality inquiry in the community. They contacted village headman, TBAs, health workers and volunteers, village watchman (Chowkidar-who registers births and deaths) and several women in each street of the village; and enquired about the deaths which occurred in women of reproductive age (15—44 years) during the preceding 1 year (from October 22, 1985 to October 21, 1986). A local festive (Dussehra) was selected to fix

the 1-year recall period so that informants clearly understood the reference period of inquiry. Local events calendar was used to facilitate age identification. The surviving family members of the deceased were visited and a standardized, pretested questionnaire on reproductive history was administered to enquire whether the deceased was pregnant or died within 42 days after delivery. A team of doctors trained in Community Medicine and Obstetrics evaluated the completed questionnaires and identified maternal deaths.

Deaths inquiries from multiple sources in the village ensured that if one missed a death others reported it. In a subsample population of 40,000, a survey on a house-to-house basis identified the same number of deaths as had been recorded earlier by conducting community inquiry by utilising multiple informants in the villages.

Assigning the cause of maternal death

The definition of the diseases leading to maternal deaths were standardized, based on a list of symptoms and signs prepared in consultation with a panel of doctors trained in Community Medicine and Obstetrics. Maternal mortality was defined as the death of a woman while pregnant or within 42 days of termination of pregnancy, irrespective of the length of the pregnancy and its localization (FIGO definition).

The team of doctors visited each family in which maternal death had occurred. Confidentiality of the interview was ensured and surviving family members (usually husband and or mother-in-law) were interviewed using a standardized, pretested interview schedule on identifiable symptoms and signs of disease preceding death, health care history, socio-economic and demographic factors. The informant(s) was asked to narrate the history of illness. Signs and symptoms were recorded in chronological order alongwith the treatment history. All prescription slips or any other record of illness available in house were examined. Traditional birth attendants (TBAs) and doctors who attended the case

were interviewed independently. On the basis of the history of signs and symptoms narrated by family member, TBA and doctor, diagnosis of cause of death was made by the investigators. Hospital records of those cases who had died in hospitals were also reviewed.

All maternal deaths were discussed by an independent panel of doctors from Community Medicine and Obstetrics to finalize the cause of death. The final list of causes was prepared taking into consideration the causes assigned by the panel and certified causes in the cases who died in hospitals.

The cases were classified according to "appropriateness" of care received. "Appropriate" care was defined for each case depending on whether the patient was taken in time to a health facility where it could have been managed in a satisfactory manner. Birth attendant was defined as trained if she had received training at a Primary Health Centre according to the norms established by the Government of India. Socio-economic status was defined by taking into consideration occupation, education, caste hierarchy, land holding and material possession of certain consumer items as bicycle, tractor, radio, television, furniture etc.

Estimation of births

A retrospective household survey in the subsample population revealed a crude birth rate of 32.4 per 1000 population. This rate was used to estimate the number of live births in the study population.

Results

A total of 257 deaths in women of reproductive age (15—44 years) were identified. Amongst these, 55 (21.4%) were maternal deaths. Maternal mortality ratio was estimated at 230 per 100,000 live births (Table I).

Of the 55 maternal deaths, 34 were ascribed to direct obstetric causes, 11 to indirect obstetric causes, 4 to non-obstetric causes and 6 deaths could not be classified. Major causes of maternal deaths were hemorrhage

Table I. Estimate of maternal mortality in a rural area of North India, 1986.

	No.
Population[a]	715,886
Live births[b]	23,910
Reproductive age deaths (15—44 years)	257
Maternal deaths	55
Maternal mortality ratio (per 100,000 live births	230

[a] Based on 1981 census, district Ambala [2].
[a] Estimated at birth rate 33.4 per 1000 population, determined by a retrospective sample survey in the study population [9].

during pregnancy and postpartum period 10 (18.2%), puerperal sepsis 9 (16.4%), severe anemia 9 (16.4%), abortion 5 (9.1%) and obstructed labour 4 (7.3%). A clear cut cause could not be assigned in 6 (10.9%) cases, two of these had fever, one had pedal edema and epistaxis, one had unconsciousness and two were sudden deaths (Table II). Of the 5 abor-

Table II. Probable causes of maternal deaths in a rural area of North India, 1986.

Cause of death	No.	%
Direct obstetric causes		
Hemorrhage (antepartum and postpartum)	10	18.2
Puerperal sepsis	9	16.4
Abortion	5	9.1
Obstructed labor	4	7.3
Eclampsia related fits	3	5.5
Retained placenta	2	3.6
Anesthetic drug reaction	1	1.8
Indirect obstetric causes		
Severe anemia	9	16.4
Stroke	2	3.6
Non-obstetric causes		
Tuberculosis	2	3.6
Gastroenteritis	1	1.8
Suicide	1	1.8
Undetermined	6	10.9
Total	55	100.0

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tion deaths, 4 were induced by unqualified "doctors" or midwives and one was spontaneous. Abortion related deaths were due to hemorrhage in 2 cases and sepsis in 3 cases.

The socio-demographic factors related to maternal deaths are shown in Table III. The largest number of deaths were in poor socio-economic class. The majority of the deaths occurred in the age group of 20—29 years.

Table III.   Socio-demographic factors related to maternal deaths.

Factors	Maternal deaths (N = 55)
Socio-economic status	
Upper class	2
Middle class	10
Poor class	43
Age (years)	
15—19	8
20—24	18
25—29	11
30—34	8
35—39	10
40—44	0
Parity	
0	18
1	6
2	11
3	6
4	9
5	4
6	1
Pre-natal care source	
Auxillary nurse midwife	18
Qualified doctor[a]	6
Unqualified doctor[b]	19
None	20
Person who rendered treatment (terminal illness)	
Qualified doctor in hospital	17
Qualified doctor in home	9
Unqualified doctor in home	21
None	8

[a] Graduate in modern medicine.
[b] Practitioner of indigenous and modern medicine without any formal training.

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Predominently, cases were with low parity (0 —2). Less than one third of cases had availed of prenatal care from qualified personnel. Fourteen died during pregnancy, 18 within a day of child birth, and 23 in puerperium. Untrained TBAs conducted delivery in 24 cases out of a total of 41 who died after delivery. The majority of the women who died at home took treatment from unqualified village practitioners. Under the prevailing circumstances families provided "appropriate" care at home or in hospital in 15 cases, there was delay in providing care in 7 cases, and care was considered "not appropriate" in 33 cases.

Of the 55 maternal deaths reviewed by the independent panel of experts, 51 had the same cause of death as assigned by the investigating team. Panel labelled 2 cases of eclampsia related fits as stroke and cause undetermined, one case of intestinal obstruction as puerperal sepsis, one case of cause unknown as eclampsia related fits. The causes assigned by the panel were compared to the certified cause in 17 cases who had died in hospitals. In 15 cases, panel diagnosis coincided with the hospital. Among the other two cases the diagnosis of the panel was stroke, and puerperal sepsis, while in hospital records causes were septicemia shock due to puerperal sepsis and cardiorespiratory failure, respectively.

Discussion

In this community-based retrospective inquiry in the rural area of a district in North India, estimate of maternal mortality ratio was 230 per 100,000 live births. The national maternal mortality ratio has been estimated to be 400—500 per 100,000 live births in India [3]. The lower mortality ratio in this study could be due to relatively better socio-economic conditions, better development of health care infrastructure and existence of effective health care delivery system in the area. Improvements of maternal and child health care have been ongoing in this area since 1984. Specific interventions include

training of TBAs in safe and hygienic delivery, identification of high risk cases and referrals, antenatal tetanus toxoid immunisation, anemia prophylaxis and nutrition education. Coverage with reference to the above interventions have improved. Infant mortality rate (IMR) has declined from 90 in 1983 to 54 per 1000 live births. Crude death rate is 6 per 1000 [9]. These are also lower than the IMR of 107 per 1000 live births and crude death rate of 13 per 1000 in rural India (age distribution of the population is similar). There are wide variations in mortality not only between the States of India but also within the States; IMR varies from 32 to 152 per 1000 live births. Crude death rate varies from 6 to 17 per 1000 population [14]. Maternal mortality ratio reported during the last 15 years from the rural areas in different regions of India range from 280 to 1360 per 100,000 live births (WHO, unpublished document). In some developed countries, the maternal mortality ratio is less than 10 while in many developing countries it is more than 200 per 100,000 live births [7].

In retrospective inquiry, deaths can be missed. This possibility was minimum in this study because death of an adult women is a conspicuous event and almost everyone in the village comes to know of it. Inquiry from multiple sources ensured that if any one missed a death, others reported it. In order not to miss maternal deaths, particularly those occurring in early pregnancy, all cases of deaths in women of reproductive age were carefully reviewed for menstrual history preceding death. Even deaths due to criminal abortion in unmarried girls (which the family usually attempt to conceal) were located. Identification of the death on an adult women in reproductive age was as reliable as the survey in each household, as verified by subsample comparisons made in 40,000 population. Therefore, the estimate of maternal mortality reported in this study is fairly reliable. Although it may not be as accurate as a prospective survey, it is useful for monitoring the trends in maternal mortality and for evaluation of the impact of programs aimed at

improved maternal survival.

Major causes of maternal deaths reported in this study were hemorrhage, sepsis, severe anemia, abortion and obstructed labor. This is in agreement with a recently published report of the Registrar General of India on a prospective survey of causes of death in rural India [13]. Unlike most of the hopsital studies, anemia is an important cause of maternal deaths in community studies and infective hepatitis is not present. On the other hand, in contrast to hospital-based information, eclampsia does not figure prominently in this study. Other causes such as hemorrhage, sepsis and abortion dominate the causes in hospitals as well as in community studies, though their proportion is variable (Table IV). This may be because of the predominancy of case selection in institutions.

Signs and symptoms-based method of assigning cause of death have been used previously in reproductive and maternal mortality studies [5,8]. In the absence of recorded history of disease, laboratory investigations and autopsy findings, it is difficult to validate this method of assigning cause of death. In this study information on signs and symptoms preceding death was collected by professionals from the multiple sources (family members, TBA and attending doctor). In 51 out of 55 cases cause of death assigned by an independent panel of experts was the same as assigned by the investigating team. In 15 out of 17 hospital deaths, cause assigned by the expert panel coincided with the certified cause in the hospitals. This lends credence to the methodology adopted in this study.

Prominent socio-economic and behavioral factors related to high maternal mortality ratio were poverty, lack of prenatal care, delivery by untrained TBA and care by unqualified village practitioners. Greater community awareness on high risk factors and importance of prenatal care is required. Maternal mortality has been shown to be lower in booked cases in comparison to the unbooked ones [1,6,11]. Due to cultural reasons most of the deliveries in developing

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Table IV.   Major causes of maternal deaths in regions of India (in percentages).

Causes	Hospital-based				Community-based (rural)	
	Calcutta [10] 1974—1980 N = 129	New Delhi [15] 1975—1983 N = 573	Imphal [4] 1976—1985 N = 128	Pune [12] 1980—1985 N = 113	All India [13] 1986 N = 176	Present study 1986 N = 55
Hemorrhage	17.1	9.4	20.3	12.4	21.6	18.2
Puerperal sepsis	13.8	19.0	7.0	8.0	13.1	16.4
Eclampsia	7.7	9.8	8.6	16.8	11.9	5.5
Abortion	25.6	12.3	25.0	10.6	8.0	9.1
Obstructed labor	—	—	—	—	6.2	7.3
Rupture uterus	—	2.4	7.0	2.6	—	—
Cesarean complication	—	3.3	6.2	0.8	—	—
Retained placenta	—	—	14.8	—	—	3.6
Anemia	2.3	20.1	—	—	17.0	16.4
Infective hepatitis/ jaundice	20.9	10.5	0.8	29.2	—	—
Others	13.2	12.7	9.4	18.6	—	12.7
Undetermined	—	—	—	—	22.2	10.9

countries take place at home. Therefore, in order to reduce maternal mortality, all TBAs should be properly trained in the skills of improved obstetric practices. They should be trained to treat postpartum hemorrhage by bimanual compression or by administration of oxytocic drugs because it is difficult to transport the women from remote villages. Furthermore, the referral compliance is poor. In this study 4 out of 5 abortion related deaths were due to abortion induced by unqualified village practitioners or midwives. TBAs can create greater awareness in the community regarding the utilisation of available services in the hospitals which are approved for pregnancy termination.

This study illustrates the simplicity of carrying out maternal mortality surveys. The maternal death identification survey was conducted by field assistants (equivalents of primary health care workers) within a 1-month period and investigation of the cause of death was also completed in 1 month. Total expenditure was Rs. 15,000 (approximately US$1150). It includes salary of field assistance and professionals, transport and the

cost of protocol forms. In a retrospective house-to-house survey, the cost would have been more than three times the money spent in this study. Inquiry from multiple informants is a suitable method to find out maternal deaths in the community. Lay persons can be trained on selected items (easily identifiable) related to case finding. Training on cause of death involves a thorough knowledge on a large number of signs and symptoms, which may be difficult. Therefore, a two stage survey (a) lay persons trained to register all deaths (b) professionals to investigate cause of death, has simplified the present investigation. However, this investigation does not provide data on births, and an exact maternal mortality ratio therefore cannot be computed. To overcome this limitation, a sample survey in the area on birth rate (40,000 population) and population estimate on the basis of the census were used to estimate the maternal mortality ratio. This approach saves a lot of time and money and is therefore recommended.

Causes of death were classified in broad disease categories since only main signs and

symptoms are recalled in this retrospective survey. Most prominent signs and symptoms were taken into consideration and a single cause of death was assigned. It was difficult to decide the immediate and underlying causes although it is realized that more than one disease was present in some individuals. Further refinement of the method of assigning cause of death is desirable. In this study, professionals investigated only maternal deaths. Investigation of all reproductive age deaths could have increased the reliability of maternal death identification and provided a focus on preventable causes of death during this age period. Higher costs and complexity in analysis of data prevented us from undertaking this task in the present study. In situations where qualified doctors are not available, para medical personnel may be considered to undertake the study after further simplification of the method. For international comparisons, the causes can be categorised according to international classification of disease.

Retrospective inquiry from multiple sources in the community is a rapid, simple and low cost method to estimate level and pattern of maternal mortality in countries where registration of vital events is grossly incomplete and investigation of cause(s) is unsatisfactory. Such efforts may catalyse the establishment of maternal mortality committees in developing countries. A series of such investigations can be used not only to evaluate services but to inform, instruct and standardize the methods of dealing with the complications in rural areas so as to reduce high maternal mortality rates.

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