

## Cause of death among reproductive age group women in Maharashtra, India

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Received May 9, 2009

**Background & objectives:** Reliable data on mortality and morbidity among women of reproductive age group are scarce in India. The present study is the Maharashtra component of a large multicentric task force study on the cause of death by verbal autopsy conducted in five States of India. The data pertaining to deaths among reproductive age group women are presented along with the factors contributing to these deaths.

**Methods:** House-to-house surveys of a representative population from rural and urban areas in six districts of Maharashtra were undertaken by probability of proportion to size (PPS) sampling. Information on death was obtained from the relatives of the deceased and cause of death was assigned using the standardized algorithm prepared. International Classification of Diseases – ICD- 10 was used to code the assigned cause of death.

**Results:** A total of 103 deaths in reproductive age group women were investigated, of which 7 (5.6%) were maternal while 96 (93.2%) were due to non maternal causes. Six out of seven maternal deaths were in rural area. Among the non maternal deaths, 46.8 per cent women had symptoms suggestive of anaemia and the leading cause of death was infectious and parasitic diseases (25%), tuberculosis being the top killer in this group. This was followed by injury and poisoning (20.8%), suicides being the leading cause in this category. Among non-communicable diseases, cancers contributed to 10.6 per cent deaths among which cancer esophagus and cancer cervix took a major toll.

**Interpretation & conclusion:** Communicable diseases, injury and poisoning and cancers are the major killers among reproductive age group women. Several factors responsible for accidents and suicides also contributed substantially to the mortality load among these women. Majority of the maternal deaths were seen in rural areas indicating the need to strengthen the maternal health care.

**Key words** Maternal deaths - non maternal deaths - reproductivity age group women - verbal autopsy

In many settings women are confronted by a dual burden of traditional health threats related to infectious diseases and maternal conditions alongside emerging challenges associated with non communicable chronic diseases. Largely, women in rural India experience more episodes of illness than

males and also are less likely to access health care facilities before the illness is well advanced<sup>1,2</sup>. This situation is directly linked to poverty; a vast majority of poor women caught in this vicious circle are young mothers in the reproductive age, who are deprived of their basic right to be healthy<sup>3</sup>. No specific estimates

are available to indicate health related disease burden in reproductive age group women in India. Reliable data on mortality and morbidity during pregnancy are scarce, and for female morbidity in general, the information is almost nonexistent in rural areas<sup>4</sup>. Paucity of adequate data makes the understanding more complex, for knowledge of the causes of death that may reveal the sickness load. In India, the data on cause of death are available from sources such as Medical Certification of Cause of Death in urban areas and Survey of Cause of Death in rural area. Although these sources exist, a good percentage of cases go unregistered and only 10 per cent of deaths are medically certified<sup>5</sup>.

A multicentric task force study on the cause of death by verbal autopsy was undertaken by the Indian Council of Medical Research (ICMR) during 2003-2005 in five States: Maharashtra, Assam, Bihar, Rajasthan, and Tamil Nadu. The objectives of the study were (i) to study the cause of death in reproductive age group women by verbal autopsy method; (ii) to study the socio-economic factors of the deceased; and (iii) to assess the factors at the personal, family and community level which contributed to these deaths. This paper pertains to findings on the cause of death among women in reproductive age group in Maharashtra State out of the 1377 verbal autopsies conducted during the study.

### Material & Methods

*Sampling design:* Sampling was done by dividing the State of Maharashtra into 6 geographical zones and one District was selected from each zone by probability of proportion to size (PPS) sampling. This division is as per National Family Health Survey (NFHS) criteria<sup>6</sup> adopted for the State. It was done to ensure representation of the entire State. In rural areas, villages were the primary sampling units (PSUs) and in urban areas municipal wards were the PSUs. PPS sampling was used to select 30 PSUs from each district based on rural urban spread. The selected districts were Thane, Pune, Jalgaon, Akola, Yavatmal and Bhandara. The ICMR had conducted a pilot study to develop and test the data collection instruments for adult and maternal deaths and the diagnostic algorithms to arrive at the cause of death. These instruments were translated into local language (Marathi) and included both narrative histories and structured questions.

*Study instruments:* The study instruments included a schedule for collecting information on identification and socio-economic data for deaths in reproductive age group women including maternal deaths. Separate

instruments were developed for recording history and information on signs and symptoms for reproductive age group women and maternal deaths. The study instruments had undergone rigorous validation and field testing during the pilot phase.

*Data collection:* The survey was conducted twice a year at six monthly intervals. The recall period was fixed at 6 months (*i.e.*, deaths occurring in the last six months). All the selected PSUs consisting of wards in urban areas and villages in rural areas in each of the six districts were covered. In PSUs where population was less than 2000, all the households were surveyed. In large PSUs, with more than 2000 population, 100 consecutive households from center and towards north, east, west and southern directions were surveyed. This ensured a representative sample of 500 households from each PSU. A total of 89,663 households were surveyed (43,311 in urban area and 46,352 in rural area).

Field investigators collected data using the standardized tools under supervision of a social scientist. Initially the narrative history was recorded from the respondent after which structured questions were asked. The structured questions were on identification, socio-economic background, place of death, treatment received for illness before death, symptoms of the deceased with duration, *etc.* The interviewers filled in a separate module for each reported symptom. The respondent was a person who was with the deceased at the time of death and could give proper information. Medical certification and medical records if available, were used to identify the cause of death.

*Data analysis:* Standardised algorithm developed by ICMR was used to assign the cause of death and International Classification of Disease-10 (ICD-10) codes<sup>7</sup> up to a minimum of three digits were used to code the assigned cause of death.

The elicited information on the cause of death was analysed using SPSS-PC version 12 in relation to socio-economic characteristics of the household, place of death, delivery conducted by whom, type of treatment received, *etc.* A trained doctor independently assigned the cause of death by reading the collected data. Opinion of one or more physician was taken wherever needed in assigning the cause of death.

The study protocol was approved from the Institutional Ethics committee of National Institute for Research in Reproductive Health, Mumbai. Written informed consent in local language was obtained from the respondent during household survey. Confidentiality

was maintained regarding the cause of death arrived at during verbal autopsy.

### Results

During the period of study, verbal autopsies were done for a total of 594 female deaths and 103 deaths were reported in women in the age group 15-44 yr. Of these, seven (6.8%) were maternal deaths while 96 (93.2%) were deaths due to non maternal causes. Among the 96 deaths due to non maternal causes, 42 (56.3%) were in rural area while 54 (43.7%) were in urban area. However, six out of seven maternal deaths were in rural area.

Among those women who died due to non maternal causes, 86.3 per cent were Hindus while 11.8 per cent were Muslims. Thirty one per cent were illiterate, 48.9 per cent had education up to middle school while 19.7 per cent had above secondary education. Majority (61.5 %) were engaged in household work, 20.9 per cent were unskilled workers, while the remaining were in other occupations such as skilled worker, service, *etc.* Majority of (66.7%) deaths occurred at home, 17.6 per cent in government hospitals, 5.9 per cent in private hospitals, and 8.8 per cent at other places (on way to hospitals/health centers, on the spot deaths in case of transport accidents and drowning). It was observed that 39.5 per cent deaths occurred at home in rural areas as compared to 30.2 per cent in urban areas. Also 8 out of 9 deaths occurring at other places were in rural areas, these were deaths due to injury and poisoning.

The leading cause of death among these women was infectious and parasitic diseases (23.3%) followed by injury and poisoning (19.4%) (Table). Among infectious and parasitic diseases, 12 deaths (50%) were due to tuberculosis, mainly due to pulmonary tuberculosis except one due to extra pulmonary tuberculosis. Tuberculosis was the leading cause of death both in urban and rural areas with 50 per cent of the deaths concentrated among illiterates. Deaths due to tuberculosis in those living in “*Kutch*” and *semi-pucca* houses (9 deaths) were more as compared to those living in “*pucca* houses” (3 deaths).

AIDS contributed to 16.6 per cent (four deaths) in this age group as the second leading cause of death among communicable diseases. Two deaths each due to AIDS were from urban and rural areas and these were in married women (30-35 yr age group) who were diagnosed cases of HIV. Among the remaining eight deaths in this category, causes of deaths were typhoid, diarrhoea, dengue fever, viral hepatitis and malaria.

**Table.** Cause of death in reproductive age group women (N= 103)

Category	ICD-10 code	N	(%)
Infectious & parasitic diseases	A00-B99	24	23.3
Injury, poisoning and certain other external causes	S00-T98	20	19.4
Symptoms, signs and abnormal clinical and laboratory findings not elsewhere classified	R00-R99	12	11.6
Neoplasms	C00 – C97	11	10.6
Diseases of the circulatory system	I00-I99	10	9.7
Pregnancy, childbirth and the puerperium (maternal causes)	O00-O99	7	6.8
Diseases of the genito-urinary system	N00-N99	5	4.8
Liver diseases	K70-K77	4	3.8
Diseases of nervous system	G00-G98	4	3.8
Others*		6	5.8

\*Anaemia, Diabetes, Congenital heart disease, Mental & behavioural diseases

Among 20 deaths due to injury and poisoning, the leading cause of death was suicides in seven (35%). All deaths due to suicides were in rural areas. Among the remaining 13 deaths, the causes of death were drowning (4), burns (3) and transport accident (3) while one death each was due to asphyxiation, exposure to electric current and lightning. Twelve deaths (11.6%) of the total deaths were under the category, ‘symptoms, signs and abnormal clinical and laboratory findings not elsewhere classified’. The cause of deaths in this category included unspecified fever, unspecified jaundice and undetermined cause. In the five undetermined cases, the verbal autopsies were conducted, but on the basis of the history given by the respondents, the cause of death could not be assigned. Cancers contributed to 10.6 per cent of the total deaths in this age group. Among cancers, cancer of oesophagus contributed to 27.2 per cent deaths followed by cancer cervix (18%). Acute myocardial infarction contributed to maximum deaths *i.e.*, 60 per cent among the diseases of circulatory system followed by stroke, rheumatic heart disease, *etc.*

Overall, top five killer diseases were tuberculosis, cancers, suicides, acute myocardial infarction and renal failure (Fig. 1). Tuberculosis was the top killer both in rural and urban areas followed by cancers. Forty seven per cent of the deceased women (n=45) had associated symptoms suggestive of malnutrition and anaemia. The age-specific distribution of cause of death showed that

except for injury and poisoning, deaths due to other leading causes of death were concentrated in the 35-44 yr age group. Deaths due to injury and poisoning were maximum in the 15-24 yr age group (Fig. 2). Five out of seven suicidal deaths were in the age group 15-24 yr. Maximum number of deaths due to infectious and parasitic diseases occurred among the illiterate group (Fig. 3). When asked about the drainage system of the households where deaths occurred, only seven (29.1%) had closed system, in 14 (58.4%) households the drainage system was open while in 3 (12.5%) there was no drainage system.

Of the seven maternal deaths, six were in rural areas. Four deaths occurred in primary health centre, two deaths occurred at private hospital while one death

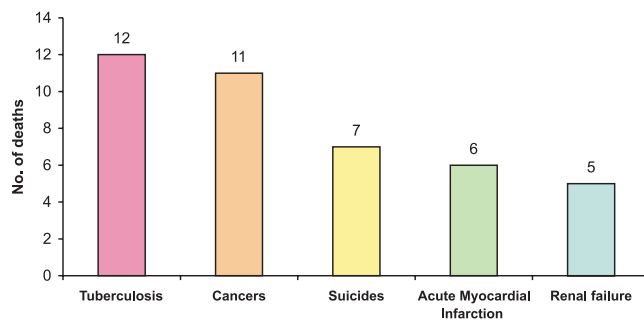


Fig. 1. Top five killer diseases in reproductive age group women (n=96).

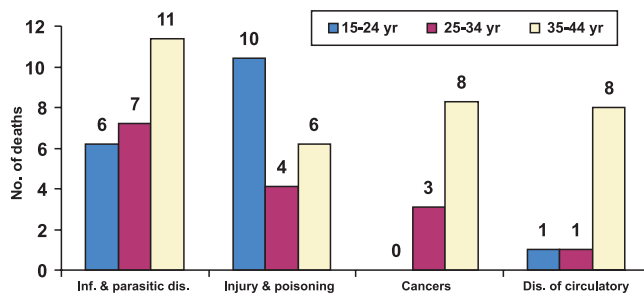


Fig. 2. Age specific cause of death in reproductive age group women (n=96).

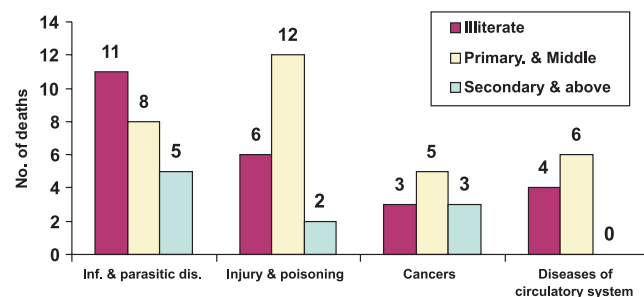


Fig. 3. Literacy-wise classification of cause of deaths in reproductive age group women (n=96).

occurred at home. In six cases the age of the women was in the range of 19-24 yr while one was 38 yr old.

Six deaths were due to causes such as eclampsia, post-partum haemorrhage, puerperal sepsis, antepartum haemorrhage, pregnancy induced hypertension and hepatitis. In one case death occurred in third month of pregnancy, the cause could not be determined.

## Discussion

Among deaths due to non maternal causes, a large proportion of (66.7%) deaths occurred at home. More deaths at other places such as on way to hospital/clinic in rural areas indicate the problems of accessibility of proper medical facilities in the vicinity of the rural areas. Many women had symptoms suggestive of anaemia (fatigue/looking pale or white) which might have contributed to mortality in these women.

The leading cause of death among the reproductive age group women was infectious and parasitic diseases (26% of total deaths in urban areas) which is slightly more than that reported in the Medical Certification of Cause of Death (MCCD) report- 2000 (22.9%)<sup>8</sup>. Fifty per cent of the deaths among infectious and parasitic diseases were due to tuberculosis. The Survey of Cause of Death - Rural report (SCD-Rural) for the state of Maharashtra -2003<sup>9</sup> also reports tuberculosis as the third leading cause of death among the reproductive age group women. Up to 80 per cent of all deaths among women due to tuberculosis occur during the childbearing years<sup>10</sup>. In a survey carried out in Wardha District (Maharashtra), tuberculosis prevalence rates were shown to be related to literacy, income and living standard<sup>11</sup>. In the present study also 50 per cent of the T.B. deaths occurred among illiterates. Also the number of deaths in those living in 'Kuthca' and 'semi-pucca' houses were more as compared to those living in 'pucca houses'.

Maximum number of deaths due to infectious and parasitic diseases occurred among the illiterate group which indicates that education plays an important role in seeking early treatment and preventing deaths though this association was not statistically significant. In majority of the households where deaths due to communicable diseases occurred, the drainage system was not proper. Poor environmental sanitation was associated with the occurrence of communicable diseases, however this association was not statistically significant.

Injury and poisoning was the second leading cause of death and suicides accounted for 7.2 per cent of the total deaths which is slightly less than that reported in

SCD-rural 2003<sup>9</sup>. In a large study in rural Villupuram district in Tamil Nadu, India, 38,836 verbal autopsies were done in 1999-2000. Injuries accounted for 18.5 per cent of the total deaths, about half of which were due to suicides. Three fourths of all suicides were in the age group of 15-44 yr, with 45 per cent in 15-24 yr age group. The predominant method of suicide was self-poisoning (47%) and generally this involved ingestion of agricultural pesticides<sup>12</sup>.

Non communicable diseases such as cancers and circulatory diseases (heart diseases and stroke) were among the first five leading causes of death in both urban and rural areas which were initially considered the diseases of the developed countries and also diseases occurring in older age groups. These findings are similar to the MCCD report 2000<sup>8</sup>. In the present study, cancers contributed to 10.6 per cent of the total deaths in the reproductive age group women. In the SCD report for Maharashtra<sup>9</sup>, 9.8 per cent deaths were reported in reproductive age group women out of the total deaths in this age group. This indicates that interventions for prevention of deaths due to these causes need to be focused in younger age groups also. Affluence, improved socio-economic conditions, stress, changed dietary practices, and sedentary lifestyle have contributed to an increase in non-communicable diseases at a younger age.

In the recent report of Registrar General, India<sup>13</sup>, the causes of maternal deaths in India are haemorrhage 38 per cent, sepsis 11 per cent, hypertensive disorders and obstructed labour 5 per cent, abortion 8 per cent and other conditions 34 per cent. In the present study, six out of seven maternal deaths occurred in rural areas which indicates that more intervention measures for reducing maternal mortality should be done in rural areas. Besides medical causes, many other factors at personal and community level may contribute to maternal deaths. Six out of seven maternal deaths occurred in 18-24 yr age group. Early age at marriage and pregnancy is one of the major factors for maternal deaths.

In conclusion, communicable diseases, injury and poisoning and cancers were found to be the major killers among reproductive age group women. Among communicable diseases, tuberculosis was at the top and various factors such as general health status of women, literacy and living standard and compliance to treatment by the women, contributed to the occurrence of deaths

due to tuberculosis. Non communicable diseases and suicides also take toll of deaths in not only urban but also in rural areas; hence intervention measures must be done in both the areas. A comprehensive approach that includes in addition to reproductive health interventions, interventions addressing underlying undernutrition among women, communicable diseases and social reforms need to be undertaken.

### Acknowledgment

Authors acknowledge the Indian Council of Medical Research (ICMR), New Delhi, for providing financial support for the study (NIRRH/MS/10/2008) and thank to the Task force members of the study "Cause of Death by Verbal Autopsy".

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