Title: A study on maternal mortality in selected districts of Punjab and Madhya Pradesh

Background: Approximately 1 million women worldwide die annually due to pregnancy and childbirth-related causes, primarily occurring in developing countries. The risk of maternal mortality in developing countries is significantly higher compared to developed countries, with rates up to 100 times greater. Maternal Mortality Rates (MMRs) in India have varied widely across studies and locations. A longitudinal morbidity survey in Baskripal Nagar, Rajasthan, reported an MMR of 592/100,000 live births, while a risk approach study in rural Maharashtra showed an MMR of 253/100,000. A case-control study in Anantapur, Andhra Pradesh, found an MMR of 545 in urban areas and 830 in rural areas, with an overall rate of 798/100,000. A multi-centre study by the Indian Council of Medical Research (ICMR) reported MMRs ranging from 55 to 3245/100,000 live births in different hospitals across India. These variations may be due to factors such as the type of healthcare facility, the population served, and the availability of resources.

With an aim to determine the causes of maternal mortality, a community-based study was conducted in six districts of Punjab and Madhya Pradesh to between September 1994 to April 1995. The study highlights the processes involved in determining the outcome of maternal deaths and the importance of considering socio-cultural and behavioural factors in addition to biological causes.

Methodology:

A community-based study on maternal mortality was conducted in Punjab and Madhya Pradesh, India. In each state, 6 districts, rural and urban clusters were investigated. Instead of using a house-to-house survey approach, multiple key informants were approached to register all women deaths in the preceding year. Institutional records of subcentre, PHC, Community Health Centre and District hospital were also audited to include all reported deaths. Each maternal death was investigated using a verbal autopsy method by a doctor. Selected case studies were used to investigate socio-cultural and behavioural factors associated with deaths.

Study area and sample size: The study was conducted in 12 districts (6 Districts in Punjab- Ropar, Ludhiana, Patiala, Hoshiarpur, Jalandhar, Ferozepur, and 6 Districts in Madhya Pradesh- Ujjain, Shahjahpur, Dewas, Dhar, Mandla and Jabalpur) to investigate maternal mortality. Each district was divided into 5 blocks, with 4 rural and 1 urban block. A cluster of 30,000 population was selected from each block for the survey, resulting in a sample size of 1,50,000 in each district. The estimated population coverage was 9,00,000 in each state. Blocks and villages were selected randomly using a lottery system. A cluster of villages or urban area comprised of contiguous population, to avoid increasing costs and prevent problems related to transportation.

The survey involved enlisting all deaths in women, screening maternal deaths, investigating all maternal deaths, and interviewing controls for maternal deaths. A group of doctors assigned the biological cause of

death through consensus, and a model of the chain of events contributing to the maternal death was prepared. The focus was on how the death could have been prevented and identifying programmatic issues.

Survey forms used in the study:

S.No	Forms (Name)	Filled by	Respondent	Information obtained
1	Screening form	Surveyors	Key informants	Woman death, reproductive age deaths, Age at death. Maternal / Non-maternal deaths
2	Death Investigation form	Doctors	Member of family where maternal death has occurred	Verbal autopsy protocol
3	Case Control form	Supervisors	1. Control case 2. Family member where maternal death has occurred	Risk factors

Key persons involved in the survey: Surveyors, supervisors, investigators, and key informants were recruited and trained. The surveyors were responsible for contacting key informants, registering all deaths in women, and verifying the cause of death. Supervisors ensured the quality of the survey and provided effective supervision. Medical doctors experienced in obstetrics and gynaecology, willing to go to the rural areas, were recruited to conduct the detailed death investigations. Key informants like Sarpanch (Village headman), dai (Birth attendant), health worker, Anganwadi worker, Istri Sehat Sabha (ISS) Pradhan, Mahila Swasthva Sangh (MSS) members, village leader and chowkidar (person keeping record of death and birth in village) were identified in the village to provide information about the deceased women.

The training of the surveyors, supervisors and doctors was carried out separately. The surveyors were briefed on the following:

a. Detailed information regarding purpose of study and explanation of screening forms.

b. After giving this information, role plays were carried out. In the role play one of the participants acted as surveyor and one of the facilitators acted as Key Informant so that the surveyors were thorough with the problems which may be encountered while conducting the survey.

c. Investigating real key informants in the village to register all deaths in women.

d. Talking to the family where death has occurred.

e. Emphasis was kept on the accuracy of data so that no death amongst women is missed.

Supervisors received training at SWACH Foundation, Chandigarh. The training covered effective supervision techniques, overall supervision plan, methods of supervision, and quality control measures. Supervisors reviewed the records and verified the information collected by surveyors. Additionally,

supervisors were trained to identify and confirm maternal deaths. They were also provided training in managerial skills to ensure smooth execution of the project and efficient management of supplies and logistics.

The investigators were also trained at SWACH Foundation, Chandigarh. The training of the investigators addressed the possible problems in the investigation were along with solutions. Emphasis was given on checking all reproductive age deaths to avoid missing maternal deaths due to misclassification. Special attention was given to investigating abortion deaths due to social stigma and illegal abortions. Detailed explanation of the causes of maternal death as per WHO classification was also provided to ensure consistency in data collection.

The survey was coordinated with the state and district health staff to ensure their cooperation and assistance. The state health authorities informed all the concerned district Chief Medical Officers to extend all possible help in hiring surveyors, providing records, and in some instances providing technical assistance also. The district authorities also helped in preparing a time table and a plan for the survey. The co-ordination with the state and district health authorities not only helped in carrying out the investigation but also helped to create a sense of ownership amongst the staff regarding the problem of maternal mortality.

To ensure high-quality data collection, surveyors who were willing to go to rural areas after receiving intensive training, were selected. Supervisors checked surveyor forms and visited households to verify deaths. Investigators also verified reproductive age deaths to ensure no maternal death was missed. If a surveyor was found to be ineffective, they were removed, and the survey was repeated.

The training and coordination efforts ensured that the survey was conducted in a standardized and rigorous manner, and that the data collected was accurate and reliable. This allowed for a comprehensive assessment of maternal mortality in the study area, which could be used to inform policy and interventions to reduce maternal deaths.

Results: A total of 1938 deaths of women were recorded in Madhya Pradesh whereas in Punjab, a total of 1742 deaths were reported. Out of these, the deaths of women of reproductive age in Madhya Pradesh was 732 (37.8% of all women deaths) and in Punjab it was 428 (24.6% of all women deaths). The number of maternal deaths in Madhya Pradesh, during the reference period was 146, while in Punjab it was only 66.

Distribution of women deaths, reproductive age deaths and maternal deaths

	Punjab	Madhya Pradesh
Total women deaths	1742	1938
Reproductive age deaths	428	732
Maternal deaths	66	146

Key highlights: Madhya Pradesh had a higher maternal mortality rate than Punjab due to sociocultural, behavioural, attitudinal, and health infrastructure factors. In Punjab, 21.2% of maternal deaths occurred during pregnancy, 15.2% during delivery, and 63.6% in the postpartum period. In Madhya Pradesh, 30.8% of maternal deaths occurred during pregnancy, 14.4% during delivery, and 54.8% in the postpartum period.

Age at first pregnancy:

First pregnancy occurred earlier in Madhya Pradesh than Punjab. Risk of maternal mortality increased with early marriage and teenage pregnancy. 59.6% women in Madhya Pradesh had their first pregnancy in 15-19 years, compared to 31.8% in Punjab.

Occupation in relation to maternal mortality: 36.3% women who died in Madhya Pradesh were Daily Wage Labourers, compared to only 1.5% in Punjab. Working as a daily wage labourer during pregnancy was a risk factor for premature labour and undernutrition.

Month of pregnancy during which death occurred: Maximum deaths during pregnancy occurred in the 8th month (31.6%). Over 60% of all pregnancy deaths occurred in the last trimester, emphasising the importance of rest and food during this period can help prevent premature labour.

Referral: In Punjab, a higher percentage of women (86.3%) who died during childbirth were referred to a hospital compared to Madhya Pradesh (49.3%), indicating greater awareness about the need for referral care in Punjab than in Madhya Pradesh.

Place of referral: In Punjab, about 82.4% of patients were referred to District hospitals but only 35.5% in Madhya Pradesh, while women in Madhya Pradesh were likely to visit PHC/CHC as compared to Punjab. The reasons for these differences might be related to costs, distances, transport and communication issues.

Persons referring the women: Self-referral or advice from relatives played a significant role in promoting referrals in Madhya Pradesh, while professionals had a limited impact. In Punjab, most referrals were made by Dai or RMP. Doctors and nurses rarely referred cases in Punjab and Madhya Pradesh.

Condition of women at the time of referral: 20.9% women were in shock and 23.3% were bleeding at referral. 13.2% who were referred had fits. 22.2% women in Madhya Pradesh had high fever compared to 7.6% in Punjab, indicating high proportion of sepsis/ infection in Madhya Pradesh as compared to Punjab.

Amount of money spent by the family of the deceased: 59.6% of families in Madhya Pradesh could not afford health services, compared to only 4.5% in Punjab. This highlights the need for government-supported, subsidized, or free referral services in low per capita income states.

Person accompanying the woman in the hospital: 72% of women were accompanied by their husbands during hospitalization, while 39.5% were accompanied by their mothers-in-law. Perception of the family about death: 54.7% of family members believed that the death of the woman was preventable, while 31.6%

of believed that the death was not preventable. 13.6% of family members were not sure whether the death of the patient was preventable or not.

Causes of maternal death: In Punjab, postpartum haemorrhage (PPH) was the immediate cause of death in 42.4% of cases, compared to only 19.2% in Madhya Pradesh. In Madhya Pradesh, sepsis was the cause of death in 18.5% of cases, compared to 9.1% in Punjab. Also, 13.7% women in Madhya Pradesh died due to hypertensive disease of pregnancy, compared to 10.6% in Punjab. Severe anaemia was present in 29 (19.9%) of the cases in Madhya Pradesh as compared to 6 (9.1%) in Punjab.

Risk factors associated with maternal deaths: In Madhya Pradesh, women who died from illness were more likely to have come from nuclear families (46.6%) compared to Punjab, where only 22.7% of deceased women lived in nuclear families. This demonstrates that the lack of support women received from their families hindered their health and well-being. The major decision-makers in households are often the husband or father-in-law, and IEC campaigns should target them. In many families, these decision-makers are also the primary income earners, and their involvement in healthcare decisions can impact outcomes.

Illiteracy among women who died in Madhya Pradesh (86.9%) was significantly higher than in Punjab (60.6%), reflecting poor socio-economic conditions and attitudes toward health and care-seeking. Illiteracy and poverty among women may lead to undernourishment, anaemia, and increased risk of maternal mortality.

Antenatal care: Antenatal care coverage was poor in Madhya Pradesh when compared to Punjab.

Regular antenatal check-ups (3 or more times during pregnancy) were provided to 53.0% pregnant women in Punjab compared to only 21.9% in MP. Maximum maternal mortality in Madhya Pradesh occurred during pregnancy.

Only 19.2% of women who died took Iron Folic Acid tablets in Madhya Pradesh, while 50% women in Punjab took these tablets for more than 30 days.

Mode and Place of delivery: Most of the deliveries were normal in both Madhya Pradesh and in Punjab. 45.6% of women delivered at home in Punjab as compared to 57.5% in Madhya Pradesh, indicating that these women had complications because of which they had to be delivered in the hospital.

Type of birth attendants: In Madhya Pradesh, 43.8% of deliveries were handled by untrained personnel, compared to 19.7% in Punjab. This difference might have contributed to the higher incidence of sepsis or high fever in Madhya Pradesh, as unclean practices during delivery are more prevalent among untrained birth attendants than the trained staff.

Complications after delivery: The number of cases with complications after delivery was significantly higher than the control group in both Punjab and Madhya Pradesh. In Punjab, only 22.7% of cases had no

complications, compared to 89.4% in the control group, while in Madhya Pradesh, only 20.5% of cases had no complications, compared to 94.5% in the control group.

The most common complication in Punjab was **excessive bleeding** (34.8%), while in Madhya Pradesh it was **unconsciousness after delivery** (27.4%). In Punjab, only 42.4% of pregnancies resulted in live births, while in Madhya Pradesh, only 17.8% did. This means that a significant number of families experienced the tragedy of losing a child before or shortly after birth, in addition to the risk of maternal death.

The study found that young age at first pregnancy, poverty, and involvement in daily wage labor were important factors associated with maternal deaths in Madhya Pradesh. In Punjab, these factors were less frequent, and referral to a hospital or health facility were more common.

The study also found that health facilities were more accessible in Punjab than in Madhya Pradesh, with 65% of villages in Madhya Pradesh having no health facility compared to 45.5% in Punjab. Additionally, maternal health awareness was higher in Punjab, which may have contributed to the lower mortality rate. The presence of risk factors was very important in the case of maternal deaths in comparison to the controls, highlighting the need for targeted interventions to reduce maternal mortality.

Problems encountered during the study:

1. Villagers were reluctant to discuss maternal deaths, requiring tactful handling.

2. Surveyors initially contacted only one or two key informants, leading to incomplete information.

3. Double reporting occurred when a death was reported both at the in-law's home and the woman's native village.

4. Some surveyors were unable to carry out the task satisfactorily and had to be replaced.

5. In some cases, the investigating team faced resistance and had to employ strategies to gain cooperation.

6. False information or contradictory statements were sometimes provided by family members expecting compensation.

8. Information was sometimes unavailable due to the unavailability of the person who accompanied the deceased mother.