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Azar Danesh Shahraki
Department of Obstetrics and Gynecology,
Isfahan University of Medical Sciences,
Iran

Maternal Mortality in Isfahan Province 2001-2006

¹Azar Danesh Shahraki, ²Javed Hussain Akhtar and ³Elham Moazam

To identify causes of maternal mortality in Isfahan province, summarize case review findings and suggesting strategies for improving maternal outcomes. A descriptive, cross-sectional survey of maternal deaths occurring in Isfahan province of Iran from 2001-2006 was enrolled. All available documents about women who died during pregnancy or within 42 days after termination of pregnancy according to hospital medical records and health system reports were reviewed for demographic data, medical and obstetrical history, failures in management and causes of deaths. Sixty six maternal deaths were recorded during study period. The mean age of them was 29.1±4.7. About 60% of them were illiterate or in elementary school grade. Eighteen woman (27.3%) died in prenatal period, 8 (12.1%) died during delivery and 40 (60.6%) died after delivery. (33.7%) of their pregnancies were unplanned. Prenatal care of 40 mothers (60.6%) was not satisfactory. The major causative factors were hemorrhage 23 (34.8%), hypertensive disorders 12 (18.2%), cardiovascular disease 11 (16.6%). The failure in managing obstetrical emergencies was seen in %55 of maternal deaths. Obstetrical hemorrhage and hypertensive disorders are still major causes of maternal death. A high percentage of maternal deaths are preventable and improving the quality of care in all levels of maternal care and sensitizing health care professional about obstetrical complications is recommended in Isfahan.

Key words: Maternal mortality, Isfahan, Iran, pregnancy complications/mortality, causes of death, maternal health services, post partum hemorrhage

INTRODUCTION

Maternal Mortality Rate (MMR) is a sentinel public health indicator, reflecting a breakdown in the health care system in its broadest sense (Rutstein *et al.*, 1976). Reduction of maternal mortality is an important millennium development Goal (http://www.who.int/mdg/publications/mdg_report/en/index.html.)

There are great variation and disparities in maternal mortality levels and causes between countries and regions. As stated by the WHO (2005a, b) report Make Every Mother and Child Count, the major causes worldwide are severe bleeding/hemorrhage (25%), infections (13%), eclampsia (12%), obstructed labor (8%) and indirect causes (20%) (<http://www.who.int/wmr/2005/en/index.html>). In Asia the leading causes of maternal deaths in 2006 were hemorrhage (30.8%), anemia (12.8%), other indirect causes of death (12.5%), sepsis/infection (11.6%) while in developed countries there were other direct causes (21.3%), hypertensive disorders (16.1%), embolism (14.6%) and other direct causes (14.4%) (Khan *et al.*, 2006).

MMR in Islamic Republic of Iran decrease from 245 per 100/000 live births in 1976 to 27 per 100/000 live births in 1976 per 100/000 in 2004 which is a remarkable achievement, but much more remains to be done to address the underlying problems in mother's and woman health. (<http://www.who.int>). In Iran based on latest official reports, the major causes of maternal death are hemorrhage (31%), eclampsia (17%), infections (11%) and cardiovascular disease (5%) (www.fhp.hbi.ir).

Isfahan is one of the most industrialized provinces of Iran and is located in central part of the Iran, with over the 4.5 million populations. Maternal mortality surveillance system was enrolled in this province from 1999. For planning any program to reduce MMR, it is essential to review the situation and to assess and consider preventive and therapeutic measures contribute to maternal health. The objectives of the study are to analyse maternal deaths by their medical characteristics and to identify risk factors amenable to interventions, which may further reduce maternal mortality.

On the other hand, these unfortunate deaths teach important lessons to help prevent future mortality. They also provide clues for understanding maternal morbidity and improving woman's health in general.

The purpose of this study is to present Isfahan specific data related to maternal causes of death, over the 6 years period (2001, 2006), summarize case review findings and suggest strategies for improving maternal outcomes.

MATERIALS AND METHODS

This is a descriptive cross-sectional study, which enrolled in Isfahan province of Iran in 2007.

Definition: A maternal death was defined as the death of a woman during pregnancy or within 42 days of termination of pregnancy, irrespective of duration and site of termination of pregnancy, from any cause related to or aggravated by the pregnancy or its management but not from accidental or incidental causes (WHO, 1992).

Case finding: All maternal deaths occurring in Isfahan province from 2001 to 2006 were identified through mandatory facility and health care networks reporting to health center of Isfahan province.

Data gathering: The Isfahan commission of maternal mortality investigates every maternal death and completes from of signal report for cases of maternal death, these forms were also used for confirmation of cause and available factors inducing death. Another checklist was used for gathering required date. Demographic data, gestational history, history of antenatal care, past medical and drug history were the topics of items in this checklist.

Case review: All available hospital medical records, health facility records related to each woman's pregnancy and death were obtained. A primary and secondary reviewer of specialist analyzed all documents and summarized each case. The data gaps were completed via interviewing with her relatives or her health care providers. The results of autopsies were used, if available.

RESULTS

There were 66 maternal deaths reported by health system networks in the time boundary of the study. Age of the mothers varied between 16 and 44 year (mean 29.1 ± 4.7), only eight Women (12.1%) were employed and 16 (24.2%) of them were in higher class of socioeconomic status.

The distribution of demographic data of maternal deaths was shown in Table 1.

Most of them (80.3%) did not belong to high-risk age groups. A majority of them came from underserved areas in the province. Only 25.8% of the mothers came from Isfahan district, capital of province, which is not the reflection of the size of population. Only 10.6 of dead mothers were in high-grade educational level and about 60% were illiterate or in elementary level.

Table 1: Percentage of deaths according to age group, region, education, occupation and socioeconomic status

Characteristics	Frequency	Percent
Age		
≤18 year	1	1.5
18-35 year	53	80.3
>35	12	18.2
Region		
Isfahan city	17	25.8
Other cities or Villages	99	74.2
Occupation		
Housewife	58	87.9
Employed	8	12.1
Education		
Illiterate	9	13.6
Elementary	30	45.5
Lower secondary	11	16.6
Upper secondary	9	13.6
High grade education	7	10.6
Socioeconomic status		
Good	16	22.2
Moderate	28	42.4
Poor	22	33.3

Table 2: Gestational history of death mothers

Gravidity	Frequency	Percent
Primigravida	17	25.8
Gravida 2-4	35	53.0
Gravida ≥5	14	21.2
Abortion history		
0	41	62.1
1	14	21.2
≥2	11	16.7
History of infertility		
+	6	9.0
-	60	90.9

The gestational period at the time of death ranged from 8 weeks to 41 weeks. Five women (7.6%) were on their first trimester, 12 women (18.2 %) in second trimester. Forty nine women (74.2%) died in their third trimester or after delivery.

There were 46 women (16.7%) with high parity (5 and higher). Gestational history of mothers are presented in Table 2

Twenty women (30.3%) did not use any contraceptive method and (33.7%) of their pregnancies were unplanned. None of them received preconception care.

Prenatal care of 40 mothers (60.6%) was not satisfactory. Thirteen women (19.7%) got routine care. While 6 cases (9.1%) received intensive care, 7 mothers (11.6%) didn't get any prenatal care. 18 woman (27.3%) got care from specialists while 41 women (62.1%) used health care facilities.

Eighteen women (27.3%) died in prenatal period and eight (12.1%) died during delivery. Majority of them (60.6%) died after delivery. Route of delivery in 68% of them were cesarean section.

Past medical history of death of mothers is presented in Table 3.

Table 3: Past medical history of death mothers, Isfahan, Iran 2001-2006

Diseases	Frequency	Percent
Pre-eclampsia	7	10.6
Cardiac disease	4	6.0
Genitourinary disease	9	13.6
Diabetes mellitus	3	4.5
Epilepsy	3	4.5
Hematologic disorders	3	4.5
Pulmonary disorders	4	6.0
Other	4	6.0

Table 4: The failures in maternal management based on the Isfahan commission of maternal mortality

Causes	Death (%)
Mismanagements of obstetrical emergencies	55
Defects in routine prenatal care	44
Paying no attention to alarm signs	39
Defects in preconception care	36
Latency in conducting essential interventions	36
Factors associated with referring system	33
Inadequacy of education of mother and her family	33

Genitourinary disorders and pre-eclampsia were the most prevalent past medical disease.

Forty Seven women (71.2%) suffered from obstetrical complications, the most common complication was pre-eclampsia (10.6%). The failures in maternal management based on the Isfahan commission of maternal mortality are shown in Table 4. Mismanagements of obstetrical emergencies, Defects in routine prenatal care, paying no attention to alarm signs, Defects in preconception care were among the most repeated factors.

Fifty one women (83.3%) died from the causes that directly associate to pregnancy and 22.7% of deaths had indirect causes.

Among the direct causes, hemorrhage was the most common medical cause of maternal death (34.8%), followed by hypertensive disorders (18.1%) Cardiovascular diseases consist 16.6% of the causes. The other causes of maternal mortality were other indirect causes (9%), embolism (4%) other direct causes (7.5%) and septicemia (3%).

DISCUSSION

This study of maternal deaths review provides meaningful information about when, how and why woman in Isfahan province died while pregnant or during 42 day after delivery. The leading causes of maternal mortality were hemorrhage, hypertensive disorders and cardiovascular diseases. In Reproductive Age Mortality Study (RAMOS), which enrolled in 1996 in Iran, the major causes were hemorrhage (29.3%), eclampsia (14.4%), cardiovascular disease (13%) and postpartum infections, our results support this data (Naghavi, 1996).

In official reports, the causes were hemorrhage (31%), eclampsia (17%), infections (11%) and cardiovascular disease (5%) (www.fhp.hbi.ir).

Isfahan is an industrialized province in Iran, the infection in this province is much lower than other parts of the country.

WHO's systematic review of maternal mortality and morbidity points to some important regional differences in the contribution of the major causes of maternal death, in Africa and Asia 33.9 and 30.8% of maternal deaths respectively are attributable to postpartum hemorrhage. (Khan *et al.*, 2006). The emphasis must be undertaken on prevention and treatment of this complication in Isfahan/Iran and other developing countries.

Maternal deaths due to hemorrhage, infection, toxemia and cardiac disease are declining in the developed countries due to improved medical practice (Khan *et al.*, 2006). Isfahan has etiological encompassing parts of both developed and developing pattern of causes.

Cardiac disease in pregnancy is associated with a high mortality, heart disease can be congenital but more often it is acquired.

In Isfahan and Iran, cardiovascular diseases are important factors contribute to death during pregnancy.

Hypertensive disorders are the leading cause of maternal mortality in developed countries. Unfortunately, it declines more slowly than other causes. The relative high frequencies of hypertensive disorders in Isfahan lie in an intermediate position between the patterns seen in developing countries and those seen in developed countries.

Sepsis is generally the first cause of death to decline as the overall MMR falls. Lower rate of death from infection or sepsis in Isfahan reflects both improvements in the hygienic standards of delivery care and the wider use of antibiotics.

It is stated that in many developing countries, official statistics under report maternal death. The (Anonymous, 2005-2006) study in Iran revealed that, there is under reporting in official statistics of maternal mortality (Naghavi, 1996) (www.fhp.hbi.ir) in Iran, but causes of death accommodate with official reports. This means that the pattern of causes can be a good represent of causes in general population.

In Isfahan according to the results of this study, important issues in reducing maternal motility are as the following:

- Access and utilization of family planning services; 20% of reported deaths found in high risk age groups and 21.2% of them had over the 4 gravity. According to fact that no pregnancy, no death, family planning is of great priority.

- Literacy; over the 75.9% of women in Iran are literate. In Isfahan this is much higher. In our study about 60% of dead mothers were illiterate or in primary levels of education.

Clearly, literacy is important in the prevention of maternal mortality. Iran health system is assisting the government in integrating more aspects of reproductive health and prenatal care information and services into its primary health care networks. Using this opportunity improving illiterate women knowledge via appropriate instructional technology must be consider.

- Improving the quality of care in hospitals; 97% of the mother died in hospital. In 1997 and 2003 43 and 73% of mother deaths in Iran took place in hospitals, respectively. Such a high proportion can be in some extent due to underreporting of deaths that occurred outside the hospitals, but it also reveals that development in Iran lead to improving access and utilization of health care system.
- Improving the quality of care in obstetrical emergencies; in 55% of deaths, mismanagement in obstetrical emergencies was seen. Providing clinical guidelines and continues education of specialist is very important.
- Other; None of the mothers utilized preconception care which could prevent many of this high-risk pregnancies. All women must have access to high-quality delivery care. Such care has three essential elements: a skilled attendant at delivery; access to emergency obstetric care in case of a complication; and a referral system to ensure that those women who do experience complications can reach life saving care in time.

One of the limitations of our study is that, we relied upon reported deaths, however, the aim of our study was not to assess MMR, it emphasized on causes and available associated factors. Complementary population-based study is recommended for investigating MMR and pattern of causes in our community with appropriate intervals.

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