



Research Article

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The causes of maternal mortality and associated risk factors in Khuzestan province (2009-2013)

Farkhondeh Jamshidi¹, Ali Ghorbani² and Razieh Mohammad Jafarri³

¹Associate Professor, Social Determinate of Health Research Center, Ahvaz Jundishapur University of Medical Sciences, Ahvaz, Iran

²Associate Professor, Department of Legal Medicine, School of Medicine, Ahvaz Jundishapur University of Medical Sciences, Ahvaz, Iran

³Associate Professor, Department of Gynecology, School of Medicine, Ahvaz Jundishapur University of Medical Sciences, Ahvaz, Iran

* Email: epidemiology2015@gmail.com

ABSTRACT

The maternal mortality rate (MMR) is one of the most important health indicators showing the socio-economic development of countries. Several direct and indirect factors are involved in increasing or decreasing MMR. The present study aimed at reviewing the causes of maternal mortality and avoidable factors in Khuzestan province during 2009-2013. In this descriptive study, 70 maternal mortality cases from March 2009 to March 2013 in Khuzestan province were studied. Data were collected from questionnaires and maternal mortality registration system. The mean age of death was 29.88 ± 6.46 years old. More than half of the mothers lived in urban areas. In 71.4% of cases, the mothers had high-risk pregnancies. Three main causes of maternal mortality were hemorrhage in 22 cases (31.4%), heart disease in 9 patients (12.9%) and unknown causes in 7 cases (10%). Seventy percent of maternal mortality occurred in the postpartum period. Family's delay in referral to health centers, delays in referrals and treatment were respectively observed in 48.6%, 42.9% and 65.7% of deaths. According to the results, hemorrhage was the main cause of maternal mortality. Nowadays, antibiotics, oxytocin and blood transfusion are used to prevent the incidence of such cases. Due to the high-risk pregnancy in the mothers, it is necessary to perform accurate pre-pregnancy care and consultation to delay or even prevent high-risk pregnancies.

Keywords: Maternal mortality, high risk pregnancy, hemorrhage, postpartum

INTRODUCTION

Maternal mortality rate (MMR) is the most important indicator showing the status of development of a country. MMR is a function of several factors including education level, rural road network and access to obstetric emergencies, the cost of healthcare services and telecommunications network and household income [1-2] and the provision of healthcare services and delivery complication during pregnancy [3-5].

All deaths during pregnancy, delivery and within 42 days of delivery are defined as pregnancy-related deaths regardless of gestational age [6-7]. Two underlying causes associated with MMR include direct causes such as hemorrhage, eclampsia, infections, hypertension and unsafe abortion [6-7] and indirect causes such as malaria, HIV, and anemia which intensify adverse effects of pregnancy [7]. Seventy five percent reduction in maternal mortality in 2015 compared to 1990 was discussed at the fifth Millennium Development Goals (MDGs) [9]. However, only 45%

decrease was observed unfortunately by 2013 compared to 1990 worldwide [7] and it seems impossible to achieve this goal [10-12].

In recent years, maternal, fetal and neonatal mortality rates have been significantly decreased in high-income countries. However, in countries with low to moderate income, the above indexes have been slowly improved [13-14]. In these regions, maternal and neonatal mortality rates are respectively 100 and 20 times higher than in high-income countries. The reasons for this difference are not clear, but factors such as lack of suitable labor and delivery equipment, the large number of labors by untrained people and the lack of medical facilities and essential drugs can be effective in this difference. It is estimated that 60 million women give birth each year in places lacking labor and delivery equipment. Of this, 52 million women give birth traditionally by a family member or an untrained person [15]. Despite this fact that most of these causes are preventable, 800 mothers die every day due to pregnancy and delivery-related factors [6].

There are many approaches and strategies to reduce maternal mortality rate. According to Paxton [16] and Starrs [17], access to emergency obstetric care and skilled labor agents are the main factors to decline MMR. Gabrysch [18] pointed out the role of specialized services in reducing maternal mortality during delivery. According to literature, mothers who live close to such facilities are less at the risk of death as compared to those far away from medical facilities. According to Hanson *et al.* [19], the mortality rate of pregnant mothers who are farthest from hospitals is 4 times of those with shortest distance to healthcare centers and hospitals. Clark demonstrated that the use of standard protocols and checklists to control patients has been effective in reducing maternal mortality in US [18].

Despite several studies on maternal mortality in Iran and throughout the world, it is necessary to conduct studies on maternal mortality in each province to identify the causes of mortality and associated factors to design effective educational and healthcare interventions. Accordingly, the present study was designed to investigate the causes of maternal mortality and its influencing factors in Khuzestan province during 2009-2013.

MATERIALS AND METHODS

It was a descriptive study in which 70 maternal mortality cases from March 2009 to March 2013 in Khuzestan province were studied. The maternal deaths had occurred in urban, rural and nomadic areas.

Data collection

After reporting the death of mother, the academic research team including experts from the health and treatment deputy reviewed health and medical records and statements of the deceased's family to confirm the death of mother according to the International Classification of Diseases.

Data collection tool

Data recorded in the maternal mortality registration system and the national maternal mortality questionnaire of the Health and Treatment Deputy of Ahvaz Jundishapur University of Medical Sciences were used. The data include age, residence, occupation and education level, number of pregnancies, parity, and the number of abortions, the time between births, method of delivery, delivery agent, place of birth, period of death, the cause of death and factors affecting maternal mortality.

Data analysis

The collected data were statistically analyzed with the help of SPSSV22. The descriptive statistics including the mean and standard deviation, the percentage and number of data were calculated.

RESULTS

Demographic data

Seventy cases of maternal deaths from 2009 to 2013 were investigated in Khuzestan province. Of 70 mothers, 3 were under 18 years (4.3%), 55 were 18-35 years (78.6%) and 12 mothers were over 35 years (17.1%). More than half of mothers lived in urban areas and the majority of them were housewives. Approximately, 80% of mothers were under diploma in terms of education level (Table 1).

Table 1: The demographic data of mothers died in Khuzestan province during 2009-2013

Variable				
Quantitative	Mean	Standard Deviation	Minimum	Maximum
Age	29.88	6.46	16	46
Qualitative	Number	Percentage		
Residence				
Urban areas	38	54.3		
Rural areas	29	41.4		
Nomadic	3	4.3		
Occupation				
Housewife	66	94.3		
Employee	4	5.7		
Education level				
Illiterate	9	12.9		
Elementary and middle schools	46	65.7		
Diploma	9	12.9		
Academic	6	8.61		

Fertility features

The average number of pregnancy and parity was 2.91 ± 1.95 and 1.76 ± 1.77 , respectively. The interval between births was 2.38 ± 2.43 years. 84.3% of mothers had wanted pregnancy and more than 70% of mothers had high-risk pregnancy (Table 2).

Table 2: Fertility data of mothers died in Khuzestan province during 2009-2013

Variable				
Quantitative				
	Standard Deviation	Minimum	Mean	Maximum
Number of pregnancy	6.46	1	2.91	9
Parity	1.77	0	1.76	6
Number of abortion	0.67	0	0.40	2
Interval between births	2.43	0	2.38	10
Qualitative	Percentage		Number	
Type of pregnancy				
Wanted	84.3		59	
Unwanted	11.4		8	
Unknown	4.3		3	
High risk pregnancy				
Yes	71.4		50	
No	28.6		20	

Delivery Information of died mothers

Twenty four (46.2%) mothers had natural delivery and 28 (53.8%) mothers gave birth by caesarean. The majority of mothers (94.2%) gave birth in hospital. The delivery agent was a specialist in 38 cases (73.1%), trained midwives in 11 cases (21.2%) and untrained midwife in three cases (5.8%).

The causes of maternal mortality and its related factors

Three main causes of maternal mortality in Khuzestan province during 2009-2013 include hemorrhage, heart disease and unknown causes (Table 3).

Forty (60.6%) of mothers had not received healthcare services during pregnancy or the healthcare was not appropriate for the gestational age. Sixty one (11.4%) maternal deaths occurred in hospitals, 8 deaths at home (11.4%) and one on the way to hospital. Maternal mortality occurred mainly in the postpartum period (20 mothers during pregnancy (28.6%), 1 mother during delivery and 49 cases in postpartum (70%)).

Table 3: The causes of maternal death in Khuzestan province during 2009-2013

Direct causes	Number (%)
Hemorrhage	22 (31.4)
HELLP syndrome	3 (4.3)
Infection after delivery	3 (4.3)
Gestational Diabetes	1 (1.4)
Indirect causes	
Encephalitis	1 (1.4)
Leukemia	1 (1.4)
Heart disease	8 (11.4)
Influenza	1 (1.4)
Brain tumor	1 (1.4)
Cervical spinal cord tumor	1 (1.4)
Breast cancer	1 (1.4)
AIDS	1 (1.4)
Hepatic insufficiency	1 (1.4)
CCHF	1 (1.4)
CVA	2 (2.9)
TTP	2 (2.9)
ARDS	4 (4.2)
ERDS	1 (1.4)
Pulmonary embolism and heart disease	1 (1.4)
Unknown	7 (10)

Factors affecting maternal mortality in pre-pregnancy period include poor quality of pre-pregnancy healthcare services, poor quality of family planning services and improper use of contraceptive methods and non-utilization of family planning services despite the need (62.5%, 29.17% and 18.75%, respectively). The most important factors affect maternal mortality during pregnancy include negligence of doctors and other staff and delay in providing required services (55.55%), failure to fully and timely prenatal care, wrong diagnosis and treatment by health staff, midwives and doctors (50.79%) and insensitivity of mothers and families to danger signs during pregnancy and the lack of attention to the recommendations of health personnel (36.51%).

The factors affecting maternal mortality at the time of delivery include negligence of midwives and other hospital staff in provision of the required services at the right time (54.28%) and wrong diagnosis and treatment by obstetricians and gynecologists (28.57%). The main factors in the postpartum period include failure to provide the necessary healthcare services by doctors, midwives or other personnel, inappropriate and incorrect diagnosis and treatment in the hospital and disregarding the general condition of the mother at the time of hospital admission and delay in proper diagnosis and treatment (in 64.52% and 38.71% of cases, respectively). Generally, delay in treatment (65.7%), delay in decisions by families (48.6%) and delayed referral (42.9%) were involved in maternal mortality.

DISCUSSION AND CONCLUSION

Seventy five percent reduction in maternal mortality in 2015 compared to 1990 was discussed at the fifth Millennium Development Goals (MDGs) [9]. However, we unfortunately witnessed only 45% reduction in MMR by 1990 throughout the world [7] and it seems impossible to achieve this goal [10-12].

In the United Kingdom, maternal mortality caused by hemorrhage was dramatically decreased after the widespread use of oxytocin, antibiotics and blood transfusions. However, hemorrhage is still the most important factor causing maternal mortality [21]. Numerous studies confirm this fact [22-29]. In this study, hemorrhage was the first cause of maternal death in Khuzestan province during 2009-2013. Despite this fact that hemorrhage is preventable, it unfortunately causes a constant trend of maternal mortality for many years. Plans to reduce maternal mortality from hemorrhage should include education about symptoms and risk factors and sensitization of families, timely diagnosis and referral to health centers by health staff and doctors, implementation of appropriate therapeutic interventions and providing feedbacks in an appropriate cycle.

Many diseases including sickle cell disease (SCD), obesity, diabetes, hypertension and chronic kidney disease increase the risk of death during pregnancy. In societies where these diseases are prevalent, the risk of maternal mortality with indirect causes increases [9]. In this study, heart disease is the most common cause of maternal mortality after hemorrhage which is consistent with the results of Mobasheri [26]. It is essential to provide appropriate national protocols and monitor their implementation to prevent maternal mortality due to such diseases. Some studies have also stressed that maternal mortality due to embolism (air, amniotic fluid and blood clot) and adverse effects of anesthetic drugs mainly with underlying etiology can be reduced by strengthening healthcare systems.

In Khuzestan province, pre-pregnancy (prenatal) care has fortunately received special attention by health centers, especially in rural areas. High quality healthcare services and the first prenatal care can be effective in early diagnosis of many underlying diseases as well reducing deaths due to indirect causes of maternal mortality.

The majority of mothers had died in the postpartum period. The same result has been obtained in several studies [22, 23, 27, 29, 34-36]. Proper attention to the vital signs of patients in hospitals, delivery facilities and hospital stay as well as informing mothers and families of the danger signs and high quality care in health centers may prevent postpartum maternal deaths.

The World Health Organization recommends caesarean delivery only in 10-15% of cases [37]. Unnecessary caesarean increases maternal and neonatal complications and the cost of health care. The maternal mortality in caesarean delivery is almost 5-4 times higher than normal vaginal delivery [38]. In our study, more than half of mothers had caesarean delivery. This is consistent with the results of Clark [19], Mobasheri [26] and Mardan [39]. Education in the field of caesarean complications, promotion of physiological birth and encouragement to participate in childbirth preparation classes as well as avoiding unnecessary cesarean by specialists can be effective in reducing maternal mortality.

In the present study, more than half of the mothers had not received health care services during pregnancy or the number of cares was less than defined in the national protocol of integrated maternal care as mentioned by Mobasheri [38]. The majority of mothers in this study had a high-risk pregnancy which is consistent with the results of Jamshidpour [40]. It is essential that healthcare centers actively pursue mothers who do not attend health centers to receive required healthcare services.

According to Nevis *et al.* [41], reduced overall fertility is an important factor in reducing mortality rate worldwide. Literatures indicate multiple pregnancy as a risk factor for maternal mortality. Unfortunately, the majority of mothers (81.5%) had died in the first and second pregnancy. Accordingly, health authorities must design and implement effective interventions in this regard.

According to Kassebaum *et al.* [36], the highest and lowest rates of maternal mortality were respectively observed in the age groups above 30 years and 20-29 years indicating reduced maternal mortality in all age groups during 1990-2013. Unfortunately, the majority of mothers in our study were at a suitable age for childbearing (18-35 years). This is consistent with the results of Jamshidpour [30].

In this study, only about 9% of mothers had an academic degree. According to Hogan, the education level of mothers is strongly associated with mortality rates [9] and increased education level is effective in reducing MMR.

CONCLUSION

1. According to the results, it seems that reengineering of the public health system should be considered. Unfortunately, in the current health care system, the quantity and quality are not considered alike. Reviewing pre-pregnancy documents and records of mothers, especially those lived in urban areas showed that the majority of mothers had not received pre-pregnancy (prenatal) care. Despite the high risk pregnancy, the mothers had not been followed-up properly. Postpartum care should be done at appropriate times and intervals defined in national protocols.

2. Priority should be given to training plans for enabling healthcare service providers for timely and accurate decision-making in emergency situations and timely referral of mothers as well as enabling healthcare personnel for correct diagnosis and prompt and adequate action to save mothers.

3. The protocols and guidelines for proper operation and constant monitoring of service delivery can be effective in reducing maternal mortality rate.

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