

Trends and Causes of Maternal Mortality in West of Iran from 2002 to 2016: Implications for Sustainable Development Goals

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ABSTRACT

Background: The mortality rate is one of the most important indicators that represent the socioeconomic development of the country. To reduce maternal mortality rate, it is vital to recognize the trend and causes of maternal mortality. This study aimed to determine the mortality rate and causes of maternal mortality in Hamadan province from 2002 to 2016.

Materials and methods: The study was performed as a retrospective descriptive study in Hamadan province. To investigate the causes of mothers' death in Hamadan province, the data were extracted from the maternal care system for 2002 to 2016. Furthermore, locally weighted scatter smoothing (LOWESS) method was used to smooth the trend of the mortality rate. The data analysis was carried out using STATA software.

Results: The maternal mortality rate has reduced from 35 per 100,000 live births in 2002 to 14 per 100,000 live births in 2016. The most important causes of maternal mortality in Hamadan province were bleeding and preeclampsia, Also the majority of deaths occurred in the hospital.

Conclusion: The rate of maternal mortality in Hamadan has a decreasing trend and is met for the United Nations Sustainable Development Goals (SDGs) before 2030. Despite the decline, the cause of death by blood and bleeding remains as the main causes of maternal mortality. To reduce maternal mortality, all women need to be provided with the equal access to prenatal and post-pregnancy complications during pregnancy, sex education, and family planning.

Keywords: Cause of death, Maternal mortality, SDGs.

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INTRODUCTION

Mortality measures are the reflection of the public health status and one of the most important indicators that show the state of socioeconomic development of the countries.¹ Among this, maternal mortality is an indicator that indicates the status of women's literacy, access to midwifery services, emergency services, healthcare costs, the existence of communication networks, and the income level of families, which has been determined as one of the most important goals of the United Nations Millennium Development Goals (MDGs).² In the development of the MDGs, countries have pledged to reduce maternal mortality by three-quarters of 1990. In addition, since 2015, the MDGs continue with the name of Sustainable Development Goals (SDGs). In SDGs, the countries have pledged to bring the maternal mortality rate to less than 70 per 100,000 live births in 2030.³⁻⁵

The latest statistics show that despite the decrease in maternal mortality, maternal mortality is high in some regions so that in 2016, more than 300,000 maternal deaths have been reported worldwide. The report also shows that the rate of maternal mortality has fall down to less than 2.3% yearly.⁶ Therefore, in order to resolve this issue, it is essential to identify the causes of maternal mortality to choose appropriate healthcare interventions.⁷

One limitation of the statistics disseminated by health organizations is that the statistics are nationwide and thus do not provide us with much information about provincial and district levels.⁶ Therefore, beside the national level, the causes of maternal mortality are required to be investigated at the provincial level.

Hamadan Province is one of the 31 provinces in Iran located in the west of the country, and its health indicators indicate the

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province's relatively favorable condition.⁸ However, the rate of maternal mortality of Hamadan province has not been investigated during a long period of time with its causes, and as a result, our information about the progress of the province toward the MDGs and SDGs is limited. In this study, we aimed to investigate the trend and cause of maternal mortality in Hamadan province from 2002 to 2016.

MATERIALS AND METHODS

Study Design and Setting

The present study has been performed as a retrospective descriptive study in Hamadan province.

Data Source

In order to investigate the causes of the maternal death of Hamadan province from 2002 to 2016, data were extracted from the maternal surveillance system. In this system, the collection of information related to the services delivered to pregnant mothers and death from pregnancy complications in both urban and rural areas of the province are collected, and then, this information is sent to Ministry of Health.

Statistical Analysis

In this study, frequency of the maternal deaths with rates were used. The maternal mortality rate was calculated by dividing the number of annual maternal death in every year on the number of annual registered births. In addition, in order to correct the trend, locally weighted scatter smoothing (LOWESS) plot smoothing method was used to remove fluctuation.⁹ The data analysis was carried out using STATA software.

RESULTS

According to the findings of this study in Hamadan province from 2002 to 2016, in sum, 81 mother's deaths occurred. Accordingly, trend of the maternal mortality rate from 2002 to 2016 has a decreasing trend so that in 2002, it was 35 per 100,000 live births in 2002 and 23 per 100,000 in 2005. Afterward, the rate reached to 15.5 per 100,000 live births in 2010 and 14 per 100,000 live births in 2016. These results indicate the 60% reduction in maternal mortality during this 15-year period.

Table 1 shows the characteristics of maternal mortality over 15 years. Moreover, investigating the cause of death shows that the most important cause of maternal mortality in Hamadan province is the bleeding, preeclampsia, and heart disease. The results also show that the majority of deaths occurred after childbirth and the lowest number of deaths occurring during childbirth. Investigating the deaths in terms of the order of childbearing indicates that most deaths occurred in the second childbirth. Regarding the place of death, 91% of the cases of maternal mortality have occurred in hospitals. The majority of deaths of these women have undergone a cesarean method (Figs 1 and 2).

DISCUSSION

The maternal mortality rate fell sharply (80%) over the past 15 years. The rate was 35 per 100,000 live births in 2002 to about 14 per 100,000 living births, which indicate a reduction by 80% in the maternal mortality rate in Hamadan Province. According to the SDGs that call for reducing maternal mortality to less than 70 per 100,000 live births in 2030, Hamadan met this goal before 2030. However, given the MDGs, which required three-quarters reduction in maternal mortality by 2015, as we did not have the data from 1990 to 2015, and therefore, we cannot accurately determine the rate of decline, but we can infer, however, by a reduction of 60% from 2002 to 2016, we can infer that Hamadan provinces very likely to achieve the target of development in 2015. The results of other studies at the country and the provinces show that the situation in Hamadan province is suitable for the maternal mortality rate. In a study conducted by the World Health Organization, it was found that the maternal mortality rate in Iran was 25 per 100,000 live births in 2015, while it was 14 per 100,000 live births in Hamadan.^{6,10-12}

The previous studies show that the main cause of reducing maternal mortality is the increased access to midwifery

Table 1: Characteristics of cases of maternal mortality in Hamadan province from 2002 to 2016

Year	Place of death			Cause of death					Type of delivery			Time of death			Total mortality
	Home	Hospital	Other	Embolus	infection	CVD	Bleeding	Preeclampsia	C/S	NVD	After labor birth	Breeding	Pregnancy	Year	
2002	1	9	3	2	2	0	3	1	7	4	10	0	1	1	11
2003	1	5	1	2	1	0	1	1	4	2	4	1	1	1	6
2004	0	6	1	1	0	0	3	1	0	6	5	0	1	1	6
2005	1	0	8	1	0	2	4	2	5	2	7	0	2	2	9
2006	0	0	4	1	0	1	1	1	1	1	2	0	2	2	4
2007	0	0	5	2	0	1	1	1	2	3	3	0	2	2	5
2008	-	3	-	-	-	1	1	1	3	-	3	-	-	-	3
2009	-	4	2	-	-	2	0	0	3	-	3	0	1	1	4
2010	-	3	2	-	-	-	-	1	2	-	1	0	2	2	3
2011	0	2	6	1	2	2	2	1	5	2	7	0	2	2	9
2012	0	1	1	-	-	1	1	-	-	1	1	0	1	1	2
2013	-	1	6	2	-	-	3	2	3	2	4	1	2	2	5
2014	-	5	2	-	-	1	1	-	1	2	3	0	2	2	5
2015	-	4	1	-	-	-	2	1	0	3	3	0	1	1	4
2016	-	5	3	1	-	1	-	-	1	1	2	0	3	3	5

services and reduce the overall fertility rate and pregnancy in high-risk pregnancies, increasing access to the prevention methods of pregnancy—unwanted pregnancy. In Iran, as well as the development of health networks across the country and implementing the family doctor’s plan, access to health services, especially in rural areas, has increased, and this causes a reduction in maternal mortality in Iran and Hamadan province. Studies have also shown that illiteracy rates are related to mortality rate, which reflects the impact of literacy and knowledge on maternal mortality. Therefore, empowerment and enhancing the level of maternal health by strengthening educational programs and using suitable technology for health education, especially in rural areas, can have a significant impact on reducing maternal mortality in Iran and Hamadan.^{7,8} Therefore, all women should provide with access to prenatal and prepregnancy, pregnancy, sexual education, and family planning. Moreover, the accurate registration of the maternal mortality cases is emphasized to measure the health indicators of

women in order to adequately allocate the financial and human resources as well as the expression of inequalities in the deaths of mothers.

The results of the study show that the most important causes of maternal mortality in Hamadan provinces were bleeding and preeclampsia, which has not changed during the 15 years and remain as the main cause of the death in Hamadan mothers. Other studies conducted in Iran and other parts of the world also show that the main cause of maternal mortality is bleeding. Therefore, it should be given priority to reducing the death caused by blood, access to blood products, emergency measures, and fast sending of patients.^{13–15} Moreover, to reduce maternal mortality, with use of value of a modified early obstetric warning system (MEOWS) checklist,¹⁶ high-risk mothers were to be identified. It is also necessary that all mothers be evaluated in term of the systolic blood pressure and the risk of thromboembolism. Finally, health service providers, including physicians and midwives, should be retrained to increase skills for early detection of the patients.

In this study, we had some limitations. The most important limitation is under-registration of Iranian death registration system. The studies endorse presence of misclassification and under-registration, and therefore, the system cannot capture all deaths along with the right causes, and it was noticed that we have to be careful in interpreting the findings obtained from the death registration system.^{17,18} The second limitation is that we conducted the study at the provincial level, and the provincial causes represent results in a mean value and cannot represent the status at district level; so, we suggest that future studies to be conducted at district level to looking for disparity in maternal mortality among districts.

CONCLUSION

The maternal mortality rate in the province has greatly been reduced. However, no change has been made in the main cause of death include the bleeding over time. Therefore, to improve this indicator in the next few years, health professionals need to provide solutions to reduce the deaths from bleeding.

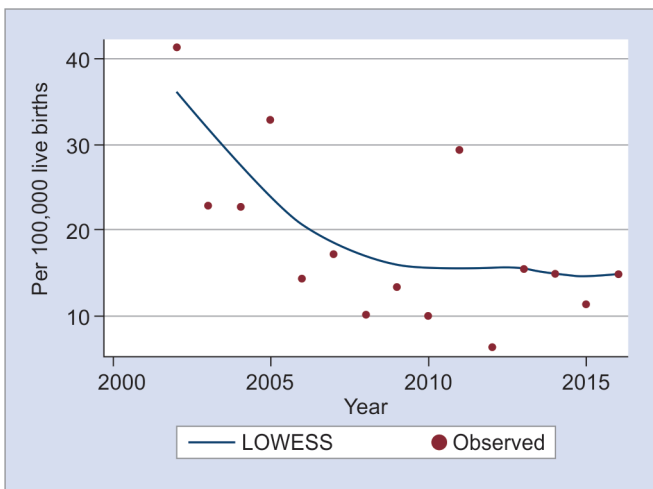


Fig. 1: Trend of maternal mortality rate in Hamadan province, 2002 to 2016

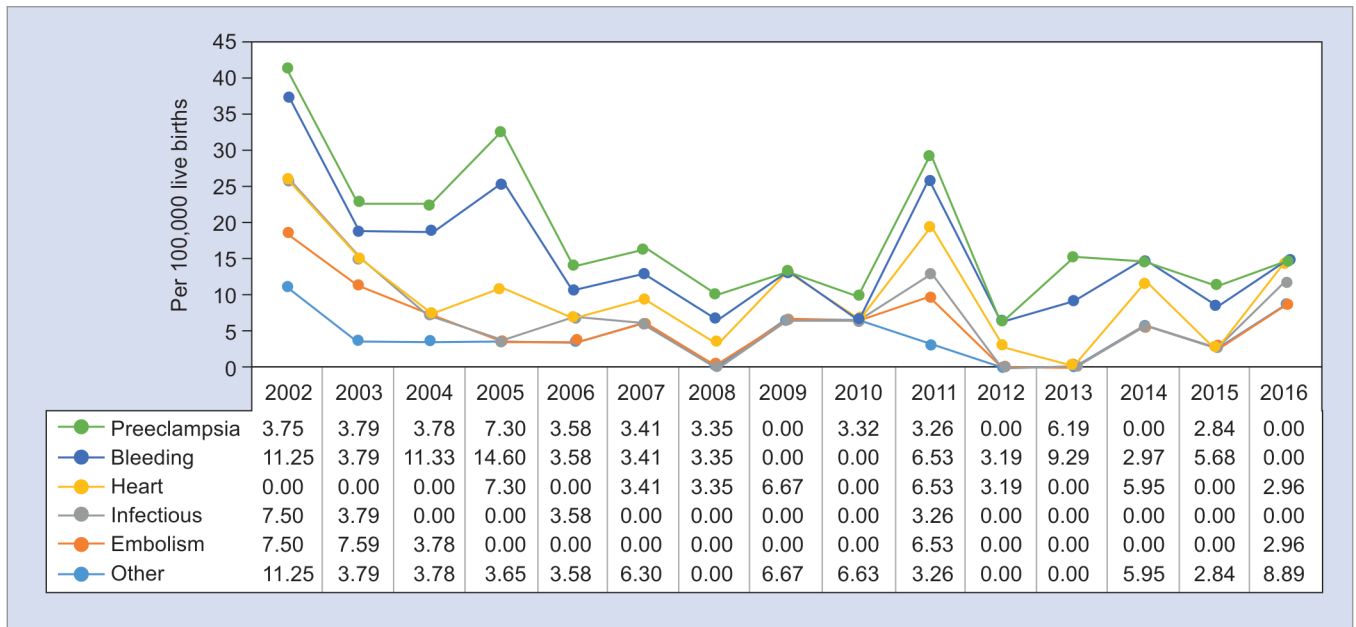


Fig. 2: Trend of cause of maternal mortality in Hamadan province, 2002 to 2016

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