

The frequency of hypertensive disorders during pregnancy in maternal deaths in Isfahan Province, Iran

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Abstract

BACKGROUND: The findings of incidence or prevalence studies can help managers and policy makers evaluate the degree of changes and its relation with the performed interventions. This study aimed to determine the frequency of hypertensive disorders during pregnancy in maternal deaths that occurred during 2006-10 in Isfahan Province, Iran.

METHODS: This descriptive, cross-sectional study assessed all maternal deaths that occurred during 2006-10 in Isfahan. Data was collected by reviewing available documents using a checklist whose validity has been approved by experts. Data was analyzed by descriptive statistics and chi-square and Fisher's exact tests in SPSS₁₂.

RESULTS: In total, 58 women who had died due to complications of pregnancy and childbirth were studied. The mean age of the subjects was 30.2 ± 6.5 years (range: 17-45 years). From 22.4% of maternal deaths which were due to gestational hypertension, 92.3% were preeclampsia and eclampsia. One case of chronic hypertension (7.7%) was also observed. Other types of hypertension in pregnancy were not detected. The first direct cause of maternal death was hypertension disorders. Underlying diseases (36.2%) and bleeding (18.9%) were the other major causes of death.

CONCLUSION: The number of deaths caused by blood pressure disorders, as a direct and important factor in maternal deaths, reduced during the 5-year course of study. In order to improve pregnancy outcomes, measures should be taken for early detection and diagnosis of these disorders.

Keywords: Hypertension, Pregnancy, Maternal Mortality Rate, Preeclampsia, Eclampsia

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Introduction

Investments in maternal health are both valuable and important. Every day 1600 women throughout the world lose their lives due to complications of pregnancy or childbirth (one mother in every minute). More than 99% of these deaths occur in developing countries. The ratio of maternal death to maternal complications is one to 30.¹⁻³ The number of global maternal deaths in 2008 (358,000) was 34% lower than that in 1990.⁴

In 2008, maternal mortality rates in developing and developed countries were 290 and 14 per thousand live births, respectively.⁴ In addition, the risk of death is not the same in different countries as it is 1 in 1,800 in developed countries and 1 in 48 developing countries.⁴ The incidence of maternal

death in different regions shows a big gap between rich and poor countries. Therefore, a key task of the global health community is to close gaps in services provided to poor and rich regions.¹ In this regard and in response to the substantial burden to maternal death, improving maternal health has been considered as one of the Millennium Development Goals (MDG) and a prerequisite for development by the United Nations. Accordingly, international obligations of maternal mortality ratio (MMR) should be reduced by three quarters between 1990 and 2015.⁵

Around 147 countries lowered their MMR by at least 40% between 1990 and 2008. Iran was the third country in this group with an 80% fall in MMR. The probability of death due to complications of pregnancy and delivery has been evaluated among 172

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countries. The highest and lowest rates have been reported as one in 11 women (in Afghanistan) and one in 4300, respectively. A rate of one in 1500 was also published in Iran.⁴

Since 80% of maternal deaths result from relatively common conditions and one of the five known midwifery complications (bleeding, infection, unsafe abortion, high blood pressure, and obstructed labor), they are often preventable. With available facilities, complications of surgery or medical interventions can be inexpensively prevented or cured to ensure safe pregnancy and delivery.^{3,5}

Statistical studies have shown maternal mortality rate in Isfahan Province (Iran) to be 21.2 in one hundred thousand in 2010. It is believed that more than 80% of maternal deaths during 1999-2005 had occurred among women with risk factors during pregnancy who had been in need of care.⁶ Similarly, the Integrated Monitoring and Evaluation Survey in Tehran (Iran) showed that 88.3% of total pregnancies under the provincial health system in 2005 were among high risk women and required special care.⁷ Caregivers of pregnant women are usually able to predict the possibility of threats to the mother and to plan for preventing death.

Hypertensive disorders occur in 5-10% of all pregnancies. They are divided into four main groups of chronic hypertension, preeclampsia and eclampsia, preeclampsia and eclampsia with chronic hypertension, and gestational or transient hypertension.^{8,9} Chronic hypertension is defined as blood pressure greater than 90/140 mmHg before pregnancy or before the 20th week of pregnancy.¹⁰ Hypertensive disorders and infections, bleeding, and death are the three factors of death. They are responsible for the majority of maternal mortality and morbidity. Hypertensive disorders are also a major cause of infant mortality and morbidity.⁹ From 3201 maternal deaths during 1991-97 in the United States, about 16% were caused by complications of high blood pressure in pregnancy and more than 50% were preventable.⁸

In recent years, regular studies called Maternal Mortality Surveillance have been conducted in Iranian provinces including Isfahan. The results of these studies have shown that over the past years, hypertension has been among the main three causes of maternal death in Isfahan.⁶ Like every other system to evaluate health care outcomes and complications, maternal mortality surveillance systems may underestimate the real numbers. However, the trends of changes in the incidence and prevalence of a complication can help managers and policy makers assess the degree of changes and their relations with

the performed interventions.¹¹ Therefore, this study aimed to determine the prevalence of hypertensive disorders in pregnancy and maternal deaths during 2006-10.

Materials and Methods

In a descriptive study, women who had died due to complications of pregnancy and childbirth during 2006-10 in Isfahan were included. Since the number of subjects was limited, all of them were analyzed. The inclusion criterion was death during pregnancy or until 42 days after delivery that had been caused by complications of pregnancy and childbirth or diseases aggravated by pregnancy. The exclusion criterion was death in accidents or incidents. Only Iranians (or foreigners with citizenship) who were permanent residents of Isfahan were included in this study.

Data was collected by reviewing documentations using a checklist whose validity was confirmed by experts. According to the Iranian Maternal Mortality Surveillance System, maternal deaths are announced to provincial health centers by the city health department or unofficial sources. A team of midwives, a gynecologist, and family health experts would then go to the city of death to complete questionnaires about the mother's death. The questionnaire contains information from family files or medical documents and semi-structured interviews with technical staff and family members of the dead woman. All sections of the questionnaire were studied in this study and information including cause of death, hypertensive disorders, age, region of residence, ethnicity, number of pregnancies, education, occupation, point of death, type of pregnancy (wanted or unwanted), pregnancy care, the time of pregnancy termination, and delivery was evaluated. Finally, data was analyzed using descriptive statistics and chi-square and Fisher's exact tests in SPSS₁₂ (SPSS Inc., Chicago, IL, USA).

Results

Overall, 58 women who had died due to complications of pregnancy and childbirth were studied. The mean age of women was 30.2 ± 6.5 years (range: 17-45 years). The mean parity number was 2.5 ± 1.5 (range: 0-7) and the mode was 1. Most subjects with pregnancy induced hypertension (82.8%; $n = 48$) lived in urban areas and had a high school diploma (36.2%; $n = 21$). Moreover, 25.9% of the studied women ($n = 15$) had only finished elementary school. While the majority of subjects (86.2%) were housewives, 12.1% were employees.

Hypertensive disorders had caused 22.4% ($n = 13$)

of maternal deaths among which 92.3% (n = 12) were preeclampsia and eclampsia, and 7.7% were chronic hypertension. Other types of hypertensive disorders were not seen in this study. Changes in the prevalence of hypertension as a cause of death in 5 years showed a sinusoidal variation, i.e. there was not a significant increasing or decreasing trend in the prevalence of hypertension (Figure 1). Among the main causes of maternal death, bleeding was the only reason with incremental changes (R2 = 0.4) (Figure 2).

During the five-year period of the study, hypertensive disorders were the second cause of death (or the direct cause of maternal death). Two other major causes of death were underlying disease (36.2%) and bleeding (18.9%). Underlying diseases are

classified as indirect causes of death. Maternal hypertension was the cause of death in one woman (7.7%) under the age of 18 years old and two women (15.4%) older than 35 years of age.

The number of maternal deaths among foreign immigrants (Afghans) was high. There was no significant difference between Iranians and non-Iranians in frequency of abnormal blood (Table 1). Moreover, no significant differences in age, region of residence, number of pregnancies, education, occupation, point of death, type of pregnancy (wanted or unwanted), pregnancy care, pregnancy, and delivery were found between women who had died due to hypertension in pregnancy and those who had died of other causes.

Table 1. Distribution of variables in the studied subjects

Variable		With PIH (%)	Without PIH (%)	P
Region	Urban	76.9	84.4	0.678
	Rural	15.6	23.1	
Parity	First	38.5	26.7	0.486
	Second to fourth	53.8	64.4	
	Fifth and more	7.7	8.9	
Ethnicity	Iranian	92.3	91.1	0.689
	Non-Iranian	7.7	8.9	
	Illiterate	7.7	11.6	
Education	Elementary School	23.1	27.9	0.781
	Lower than high school diploma	23.1	14.0	
	High school diploma	38.4	37.2	
	University degree	7.7	9.3	
Job	Housewife	92.3	86.4	0.492
	Employee	7.7	13.6	
	Pregnancy	7.7	26.7	
Time of death	Childbirth	7.7	0.0	0.257
	Postpartum	84.6	73.3	
Type of pregnancy	Wanted	92.3	86.4	0.492
	Unwanted	7.7	13.6	
Prenatal care	Yes	100	88.8	0.577
	No	0.0	11.1	
	After abortion	7.7	24.4	
Time of termination of pregnancy	Between weeks 22 and 36	69.2	37.8	0.930
	Between weeks 37 and 42	23.1	37.8	
Delivery	Vaginal	8.3	22.6	0.407
	Cesarean section	91.7	77.4	

PIH: Pregnancy induced hypertension

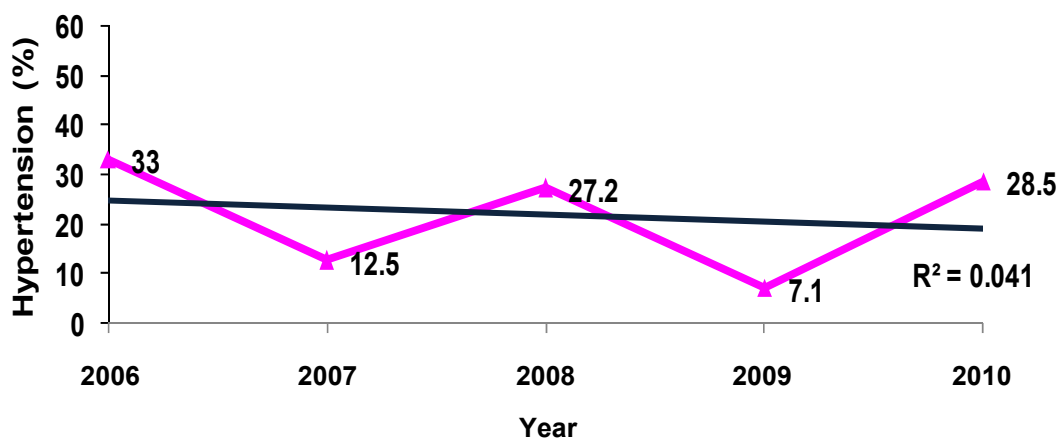


Figure 1. Changes in frequency of hypertension among pregnant women during 2006-10

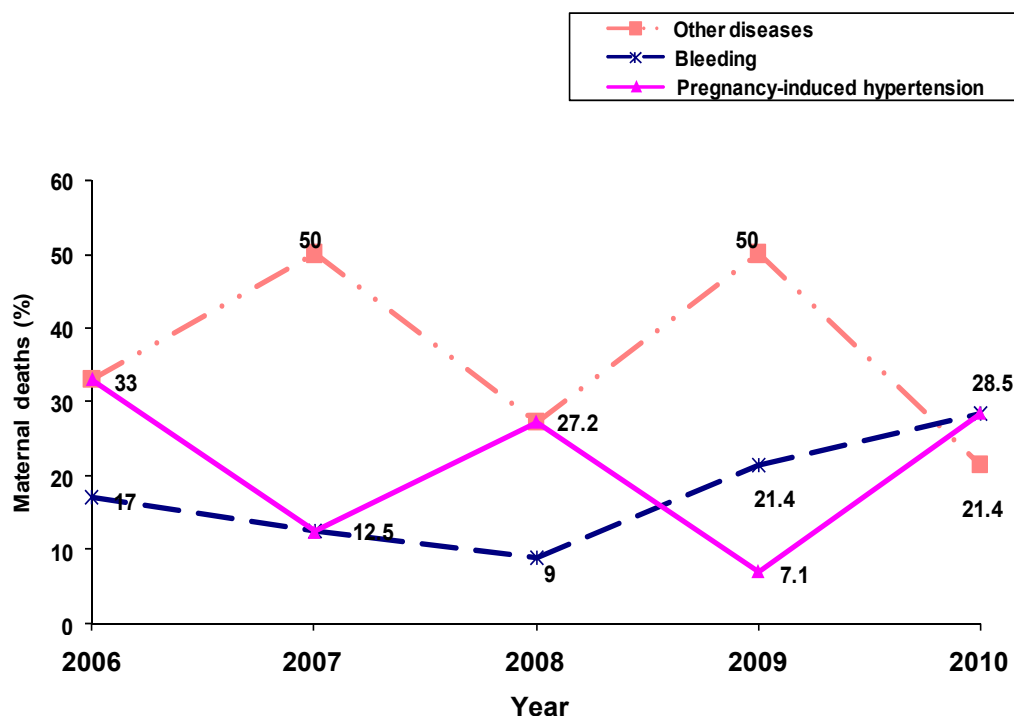


Figure 2. Changes in frequency of three main causes of maternal death during 2006-10

Discussion

This study was performed to determine the frequency distribution of blood pressure disorders in maternal deaths from complications of pregnancy and childbirth in Isfahan Province during 2006-10. Our findings showed hypertension to be the second leading cause of maternal death and the first direct cause of death. In a study on maternal deaths in West Azerbaijan Province, hypertension was the second cause of death during 2001-06.¹² Hypertensive disorders have been reported to be responsible for 16% of maternal deaths in developed countries. The rates for the other three main causes of death, i.e.

bleeding (13%), abortion (8%), and sepsis (2%), were lower.⁸

A comparison between Iranian provinces in terms of causes of maternal death during 2001-07 showed bleeding and high blood pressure as main causes of death. Moreover, frequency of maternal deaths due to hypertension in Isfahan was found to be moderate.¹ Similarly, a comparative Iranian study during 2006-08 reported bleeding and high blood pressure in pregnancy as the first and second causes of maternal death, respectively.⁴ Therefore, the relative frequency of hypertension in pregnancy in Isfahan is similar to other provinces of the country. This finding is consistent with the etiology of maternal mortality in

developed countries. Therefore, in order to reduce the number of maternal deaths, strategies have to be planned for identification and early diagnosis of this complication based on social, economic, and cultural context of the country.

In this study, preeclampsia and eclampsia were the most common types of hypertensive disorders. These conditions are associated with warning symptoms such as headache, epigastric pain, and proteinuria. They mainly occur after 20 weeks of pregnancy. Most cases of preeclampsia and eclampsia can be identified through assessment of predisposing factors. They are easily treatable with timely diagnosis. Since all mothers who died due to high blood pressure in pregnancy were receiving pregnancy care, the quality of the provided care needs to be improved.

In the United States, the overall prevalence of chronic hypertension in pregnancy is 3% which increases in older, obese, and African-American mothers.¹⁰ In this study, the prevalence of chronic hypertension was as low as 7.7% due to timely diagnosis and treatment of infected mothers during pregnancy. Considering that chronic hypertension can be controlled with maternal care, pregnant women will not be at risk if the quality of care before pregnancy is improved.

The results of this study showed no significant relation between age and the prevalence of hypertension. A study in Thailand evaluated 12,562 pregnancies and could not find a significant difference between the incidence of gestational hypertension among 13-19 year-old women and older women.¹³ However, in a systematic review by Schoen and Rosen in 2009, pregnancy outcomes were compared between young and older women (above 44 years of age). The results showed the incidence of hypertensive disorders in older mothers to be 10-13% and the relative risk of developing hypertension as 3.2%.¹⁴ The inconsistency between our findings and those of Schoen and Rosen might be caused by different age categories. We categorized age according to the definition of high risk pregnancies (under 18 years of age and over 35 years old). Another reason can be the limited number of cases of maternal death.

Good quality prenatal care can help reduce complications during pregnancy, especially among at risk or high risk women.¹⁵ In this study, although all mothers with hypertension had been receiving prenatal care, delayed diagnosis and treatment and weaknesses in providing emergency care were observed in most cases. Previous studies have suggested different prevalence of hypertension in various races and geographic areas. In two studies of maternal death in the United States of America, the

prevalence of this disorder was higher in black women.^{16,17} However, the frequency of hypertensive disorders in Iranian and Afghan populations was not significantly different. Significant differences were also absent when other variables were compared. The main reason is probably the low number of subjects.

Conclusion

Hypertensive disorders are direct and important factors in the etiology of maternal deaths. Bleeding and infection are currently considered as major factors after hypertension. A similar pattern is observed in most developed countries like Canada which has the lowest maternal death rate due to direct hypertension. In order for early detection and diagnosis of this disorder, measures should be taken and scheduled and the staff and physicians need to be trained.

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Conflict of Interests

Authors have no conflict of interests.

References

1. Stopping the invisible epidemic of maternal deaths. *Indian J Med Sci* 2004; 58(10): 454-5.
2. Betran AP, Wojdyla D, Posner SF, Gulmezoglu AM. National estimates for maternal mortality: an analysis based on the WHO systematic review of maternal mortality and morbidity. *BMC Public Health* 2005; 5: 131.
3. Sibbald B. The struggle to reduce maternal mortality. *CMAJ* 2007; 177(3): 243-4.
4. Ministry of Health PAFhoMHD. Report of Activity and results of Maternal mortality surveillance. 2008.
5. Emami Afshar N, Jalilvand P. Maternal Mortality Surveillance. Tehran: Tandis Publication; 2006.
6. Maternal Mortality Surveillance. Isfahan: Isfahan Health Center, Population & Family Health Department, Mother's Health Unit; 2010.
7. Integrated Monitoring & Evaluation Survey. Tehran: Ministry of Health, Vice Chancellery of Health, Population & Family Health Office; 2005.
8. Cunningham F, Leveno K, Bloom S, Hauth J, Rouse D, Spong C. *Williams Obstetrics*. New York: McGraw-Hill Companies, Incorporated; 2009.
9. Wacker J, Lewicka S, Haack D, Bastert G. Hypertension in pregnancy. *J Steroid Biochem Mol Biol* 1993; 45(1-3): 65-8.
10. Podymow T, August P. Hypertension in pregnancy. *Adv Chronic Kidney Dis* 2007; 14(2): 178-90.
11. Keshtkar A, Changizi N, Majdzadeh R, Emami

- Afshar N, Saghafi SH. Analysis of maternal mortality in the years 2001-2006, Assessment of risk factors and classify provinces. Tehran: Ministry of Health, Vice Chancellery of Health, Population & Family Health Office; 2008.
12. Farokhislamloui H, Nanbakhsh F, Heshmati F, Amirabi A. Epidemiology of maternal death in West Azerbaijan Province 2001-2005. *Urmia Med J* 2006; 17(1): 23-31. [In Persian].
 13. Thato S, Rachukul S, Sopajaree C. Obstetrics and perinatal outcomes of Thai pregnant adolescents: a retrospective study. *Int J Nurs Stud* 2007; 44(7): 1158-64.
 14. Schoen C, Rosen T. Maternal and perinatal risks for women over 44--a review. *Maturitas* 2009; 64(2): 109-13.
 15. Bhutta ZA, Ali S, Cousens S, Ali TM, Haider BA, Rizvi A, et al. Alma-Ata: Rebirth and Revision 6 Interventions to address maternal, newborn, and child survival: what difference can integrated primary health care strategies make? *Lancet* 2008; 372(9642): 972-89.
 16. Fang J, Madhavan S, Alderman MH. Maternal mortality in New York City: excess mortality of black women. *J Urban Health* 2000; 77(4): 735-44.
 17. Chang J, Elam-Evans LD, Berg CJ, Herndon J, Flowers L, Seed KA, et al. Pregnancy-related mortality surveillance--United States, 1991-1999. *MMWR Surveill Summ* 2003; 52(2): 1-8.

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