

# Hypertension in Pregnancy Still Remains a Serious Complication Causing Severe Morbidity and Mortality of Mother

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## Abstract:

**Objective(s):** The aim of this study is to evaluate frequency and nature of maternal deaths and maternal near-miss cases in a tertiary care hospital.

**Materials and Methods:** A retrospective examination was conducted on records of the 16.612 women who delivered in a tertiary care center, over a ten-year period (1997-2006). The flow chart recommended by Say et al was used in the analysis of the maternal near-miss cases.

**Results:** The ratios of mortality related with pregnancy, maternal mortality and maternal near-miss were 68.11/100.000, 61.29/100.000 and 17.09/1000, respectively. The ratio of maternal near-miss to maternal mortality was 27.8 and the mortality index was 3.46%. Hypertensive disorders were the leading cause of maternal deaths and maternal near-miss events.

**Conclusion:** Hypertensive disorders were still leading cause of maternal deaths and maternal near-miss events. Absence of antenatal care and disrupted referral chains were major problems.

**Keywords:** Maternal morbidity; maternal mortality; maternal near-miss; preeclampsia.

## Introduction:

The ratios of maternal and perinatal mortality are indicators of the health status of a nation. Maternal near-miss ratio is more commonly used than maternal mortality ratio because it is more frequent than maternal deaths, making for more detailed analyses of the problems in obstetric care<sup>1</sup>. High maternal near miss/ maternal mortality ratio and low mortality index show good quality of obstetric care<sup>2</sup>.

The ratio of *maternal mortality in developing countries* is 290/100.000. It is 14/100.000 in developed countries and 260/100.000 globally. *Maternal near-miss ratios have been reported between 12.3/1000 to 82.3/1000* in several studies<sup>1,3</sup>.

Most of the maternal deaths are preventable, if solutions to prevent or manage complications are well known. *Hypertensive disorders of pregnancy affect 10% of all pregnancies*. Despite advances in evidence to guide therapy, hypertension is still one of the major causes of maternal and perinatal mortality and morbidity<sup>4</sup>. Patients receive inappropriate care with some frequency worldwide, leading to maternal and perinatal problems that might have been avoidable<sup>5</sup>.

Identification of causes of deaths has emerged as a priority in prevention of maternal mortality.

## Materials and Methods:

A retrospective examination was conducted on records of 16.612 women who delivered in a tertiary care center, over a ten-year period (1997-2006). *Maternal deaths and near-miss cases* were identified. The cases were analyzed according to definitions which have been adopted by the World Health Assembly (resolutions WHA20.19 and WHA43.24) under Article 23 of the Constitution of the World Health Organization.

Maternal mortality and maternal near-miss cases were examined in respect of World Health Organization/ International Classification of Diseases-10 (WHO/ICD-10) and Centers for Disease Control and Prevention/ American College of Obstetricians and Gynecologists (CDC/ACOG) definitions. The flow chart recommended by Say et al was used in the analysis of maternal near-miss cases<sup>2</sup>.

The data were analysed by SPSS 17 package program. Chi-square test and T-test were used for biostatistical analysis. A value of  $p=0.05$  was taken as the level of significance.

This study was approved by the institutional ethics committee of the Istanbul University, Cerrahpasa School of Medicine and was performed in accordance with the ethical standards laid down in the 1964 Declaration of Helsinki and its later amendments.

### Results

Of 16.612 pregnancies, 8.3% (1384/16.612) had resulted in abortion. Ectopic pregnancies were detected in 1.5% (250/16.612), molar pregnancies were detected in 0.06% (10/16.612) of cases.

According to CDC/ACOG definitions, there were 11 deaths associated with pregnancy, 9 deaths related with pregnancy, 2 deaths unrelated with pregnancy. According to the WHO/ICD-10 definitions, there were 10 deaths related with pregnancy and 9 maternal deaths. There were 251 maternal near-miss cases. Because cases in pregnancy-related deaths (CDC/ACOG) were the same in maternal deaths (WHO/ICD-10), both of these groups were analyzed together (Table I and Table III).

According to CDC/ACOG criterias; mortality ratio associated with pregnancy was 74.92/100.000, mortality ratio related with pregnancy was 61.29/100.000. According to WHO/ICD-10 definitions, mortality ratio related with pregnancy was 68.11/100.000, maternal mortality was 61.29/100.000, maternal near-miss was 17.09/1000, ratio of maternal near miss to maternal mortality was 27.8 and mortality index was 3.46%. Index of mortality related to direct

obstetric causes, related to indirect obstetric causes, related to the hypertensive diseases of pregnancy, related to the cardiovascular diseases were, respectively as follows: 2. 1%, 11.53%, 2.79%, 21.4%. Mortality index related to the *rheumatic heart disease* was 11.11%. None of the *maternal deaths* was due to hemorrhage. None of the maternal near-miss and/or maternal mortality cases was related with the infection and/or abortion and/or ectopic pregnancy and/or molar pregnancy.

All of maternal deaths directly related to obstetrical causes (55.6% of the maternal deaths) were due to the hypertensive diseases of pregnancy. One of the *maternal death* was due to *unexpected complications of tocolytic therapy with magnesium sulfate*. Among three maternal deaths indirectly related to the obstetrical causes, there was one with heart failure caused by the *rheumatic heart disease*, one with *cardiomyopathy* and one with *metastatic breast cancer*. According to WHO/ICD-10 definitions, among pregnancy-related deaths there was one with *secondary lung cancer of unknown origin*. According to CDC/ACOG definitions, among pregnancy-associated deaths there was one with *acute lymphocytic leukemia*. The classification of the maternal deaths according to the WHO/ICD-10 and CDC/ACOG definitions was shown in table I.

Of cases of maternal near-miss, 90% were directly, 9.2% were indirectly related to obstetric reasons, 0.4% were incidental (one with an acute lymphocytic

**Table-I**

*The classification of maternal deaths according to the WHO/ICD-10 and CDC/ACOG definitions.*

Classification	Mortality associated with pregnancy (CDC/ACOG)	Mortality related with pregnancy (CDC/ACOG) Maternal mortality (WHO)	Mortality related with pregnancy (WHO/ICD-10)
	N (%)	N (%)	N (%)
1. Unsuccessful pregnancies (Abortus, ectopic pregnancy, molar pregnancy etc.)	-	-	-
2. Hypertensive diseases of pregnancy	5 (45.5)	5 (55.6)	5 (50)
3. Obstetric hemorrhage	-	-	-
4. Infection related with pregnancy	-	-	-
5. Other direct obstetric complications (Not included in first 4 groups)	-	-	-
6. Indirect complications (Not included in 7 <sup>th</sup> group)	4 (36.4)	3 (33.3)	4 (40)
7. Unexpected complications of pregnancy	1 (9.1)	1 (11.1)	1 (10)
8. Unknown/ undetermined	-	-	-
9. Incidental causes	1 (9.1)	-	-
Total	11	9	10

leukemia) and 0.4% were associated with accidents (one with a flame burn). Hypertensive disorders of pregnancy constituted 69.3% and obstetric hemorrhage 19.5% of cases. 1.2% of cases were due to other complications which were directly related to obstetric reasons (one with an amniotic fluid embolism, one with a pulmonary embolism, one with a dural sinus thrombosis). Among the cases indirectly related to obstetric causes there were eight women with rheumatic heart diseases, three women with congenital valvular heart diseases, two women with thyrotoxicosis, two women with diabetes mellitus, two women with severe anemia, two women with pneumonia, one woman with diabetes insipidus, one woman with epilepsy, one woman with cirrhosis, one woman with Wegener's granulomatosis. The classification of the maternal near-miss cases according to the WHO/ICD-10 definitions was shown in table II.

Of hypertensive diseases of pregnancy associated with maternal deaths 83.33% were preeclampsia, 16.66% were superimposed preeclampsia. Of them 66.66% have been complicated by eclampsia, 66.66% have been complicated by HELLP (Hemolysis, Elevated Liver Enzyme Levels, and Low Platelet Levels) syndrome, 33.33% have been complicated by both eclampsia and HELLP syndrome. *Intraventricular hemorrhage* occurred in two *eclamptic* women.

Of hypertensive diseases of pregnancy associated with maternal near-miss cases 84.4% were preeclampsia, 11.11% were superimposed preeclampsia, 2.77% were chronic hypertension, 1.66% were gestational hypertension. Of them 31.66% have been complicated by eclampsia, 34.44% have been complicated by HELLP syndrome, 9.4% have

been complicated by both eclampsia and HELLP syndrome.

11.11% of *maternal deaths occurred* in the *antepartum* and 88.88% occurred in the postpartum cases 75% of *postpartum* deaths occurred within the first 7 days, 50% occurred within the first 72 hours, 37.5% occurred within the first 48 hours and 25% occurred within the first 24 hours. All of maternal deaths and 76.9% of maternal near-miss cases occurred *before 37 weeks* of gestation.

Of maternal deaths, 55.6% *had not received antenatal care*, 33.3% *had received antenatal care from other centers*. Two thirds of cases who had received antenatal care from another center had been transferred within the last 7 days, one third had been transferred within the last 24 hours. Of maternal near-miss cases, 33.1% *had not received antenatal care*, 42.2% *had received antenatal care from other centers*. The demographic characteristics of maternal deaths were shown in table III.

In the classification of the maternal near-miss cases there was a *statistical significance* in terms of gravida and weeks of gestation ( $p: 0.003$ ,  $p: 0.002$ ), while there was no *statistical significance* in terms of maternal age, parity and fetal gender ( $p: 0.779$ ,  $p: 0.083$ ,  $p: 0.455$ ). There was no significant difference between years in the classification of maternal near-miss cases ( $p: 0.315$ ). In multigravidas and grandmultigravidas, hemorrhages were *second* only to hypertensive diseases while in primigravidas indirect obstetric causes were *second* only to hypertensive diseases. In term pregnancies obstetric hemorrhages were relatively increased. The demographic characteristics of maternal near-miss cases were shown in table IV.

**Table -II**

*The classification of maternal near-miss cases according to the WHO/ICD-10 definitions.*

Classification	Maternal near-miss (WHO/ICD-10) N (%)
1. Unsuccessful pregnancies (Abortus, ectopic pregnancy, molar pregnancy etc.)	-
2. Hypertensive diseases of pregnancy	174 (69.3)
3. Obstetric hemorrhage	49 (19.5)
4. Infection related with pregnancy	-
5. Other direct obstetric complications (Not included in first 4 groups)	3 (1.2)
6. Indirect complications (Not included in 7 <sup>th</sup> group)	23 (9.2)
7. Unexpected complications of pregnancy	-
8. Unknown/ undetermined	-
9. Incidental causes	2 (0.8)
Total	251

**Tablo-III**  
*The demographic characteristics of maternal deaths.*

Parameters	Mortality associated with pregnancy (CDC/ACOG)	Mortality related with pregnancy (CDC/ACOG) Maternal mortality (WHO)	Mortality related with pregnancy (WHO/ICD-10)
	Mean+SD	Mean+SD	Mean+SD
Age group (year)	29.55±5.35	28.56±5.36	28.9±5.1
	N (%)	N (%)	N (%)
<19	-	-	-
20-24	2 (18.2)	2 (22.2)	2 (20)
25-29	3 (27.3)	3 (33.3)	3 (30)
30-34	4 (36.4)	3 (33.3)	4 (40)
35-39	2 (18.2)-	1 (11.1)-	1 (10)-
≥ 40	-	-	-
	Mean+SD (range)	Mean+SD (range)	Mean+SD (range)
<i>Gravida</i>	3±1.73 (1-5)	3±1.65 (1-5)	2.8±1.68 (1-5)
	N (%)	N (%)	N (%)
Primigravid	4 (36.4)	3 (33.3)	4 (40)
Multigravid	7 (63.6)	6 (66.6)	6 (60)
Grandmultigravid	-	-	-
	Mean+SD (range)	Mean+SD (range)	Mean+SD (range)
<i>Parity</i>	1.09±1.37 (0-4)	1.1±1.4 (0-4)	1±1.4 (0-4)
	N (%)	N (%)	N (%)
Nulliparous	5 (45.5)	4 (44.4)	5 (50)
Primiparous	3 (27.3)	3 (33.3)	3 (30)
Multiparous	3 (27.3)	2 (22.2)	2 (20)
Grandmultiparous	-	-	-
<i>Bad obstetric history (+)</i>	3 (27.3)	3 (33.3)	3 (30)
<i>Type of conception</i>			
Spontaneous	11 (100)	9 (100)	10 (100)
ART	-	-	-
<i>Antenatal care</i>			
Absent	5 (45.5)	5 (55.6)	5 (50)
Other center	4 (36.3)	3 (33.3)	3 (30)
Cerrahpasa School of Medicine	2 (18.1)	1 (11.1)	2 (20)
<i>Type of delivery</i>			
Vaginal	2 (18.2)	2 (22.2)	2 (20)
Cesarean section	8 (72.7)	6 (66.7)	7 (70)
Undelivered	1 (9.1)	1 (11.1)	1 (10)
	Mean+SD (range)	Mean+SD (range)	Mean+SD (range)
<i>Length of stay in hospital (day)</i>	10.82±13.98 (1-40)	7.56±12.4 (1-40)	8.4±12 (1-40)
Total 11	9	10	

**Tablo-IV**  
The demographic characteristics of maternal near-miss cases.

Parameters	Maternal near-miss (WHO/ICD-10)
	Mean±SD (range)
Age (year)	28.24±6.1 (17-46)
	N (%)
≤ 19	16 (6.4)
20-24	54 (21.5)
25-29	89 (35.5)
30-34	47 (18.7)
35-39	29 (1.6)
40-44	15 (6)
>45	1 (0.4)
	Mean±SD (range)
Gravida	2.73±2.02 (1-12)
	N (%)
Primigravid	95 (37.8)
Multigravid	131(52.2)
Grandmultigravid	25 (10)
	Mean±SD (range)
Parity	1.17±1.5 (0-7)
Nulliparous	117 (46.6)
Primiparous	60 (23.9)
Multiparous	61 (24.3)
Grandmultiparous	13 (5.2)
Bad obstetric history (+)	80 (31.9)
Type of conception	
Spontaneous	247 (98.4)
ART	4 (1.6)
Antenatal care	
Absent	83 (33.1)
Other center	106 (42.2)
Cerrahpasa School of Medicine	62 (24.7)
Type of delivery	
Vaginal	31 (12.4)
Cesarean section	220 (87.6)
	Mean±SD (range)
Length of stay in hospital (day)	6.8±4.76 (2-42)
Total	251

### Discussion:

The results of this study showed that although the rates of mortality related with pregnancy and maternal mortality were lower than global rates, they were higher than those of developed countries. Mortality index was higher than that of some developing countries (Syria

1. 7%, Brazil 1.61%), while lower than that of the others (Bolivia% in 3.57%)<sup>6-8</sup>.

In the determination of the maternal near-miss cases three different methods have been used based on the clinical diagnosis/ intervention/ organ-system insufficiency<sup>1</sup>. Absence of standard definitions and criterias for identifying maternal near-miss cases prevents the reliability of comparisons. WHO reached consensus on the definition of the maternal near-miss and identification criterias of the maternal near-miss cases. Signs of organ dysfunction that follow life-threatening conditions are used to identify maternal near misses so that the same classification of underlying causes is used for both maternal deaths and near misses. By using the same classifications, reliable comparisons can be made within and between countries and regions<sup>2</sup>. In this study mortality index was higher than that of many studies. It was considered that higher mortality index was due to lower maternal near-miss ratio. Because it differs from other studies in the case selection criteria. The WHO consensus on maternal near-miss definition was used to define cases. The flow chart recommended by Say et al was used in the analysis of the maternal near-miss cases.

Maternal mortality has dropped significantly in Turkey since the adoption of the Millennium Development Goals (MDGs). Under the Health Transformation Project, Turkey have improved maternal mortality rate significantly beyond comparison with the countries of the same income level. According to WHO statistics for 2010, the maternal mortality rate in countries of the high-middle income group was 91/ 100.000, while it was 16.4/ 100.000 in Turkey. Global causes of maternal deaths are (in descending order): haemorrhage, puerperal sepsis, unsafe abortion<sup>9</sup>. In developed countries indirect causes of maternal deaths are more commonly seen than direct causes<sup>10</sup>. Hypertensive diseases of pregnancy are causes of 9% of maternal deaths in Asia and Europe and 12-18% of it in developed countries<sup>11,12</sup>. From 1991 to 1996 maternal mortality ratio in our clinic was 80/ 100.000. Of the causes of the maternal deaths 62.5% were hypertensive diseases of pregnancy, 12.5% were infection, 12.5% were hemorrhage, 6.25% were unintended complication of tocolytic therapy with magnesium sulfate, 6.25% were fulminant hepatitis<sup>13</sup>. Maternal mortality rate has decreased over the years. As in developed countries, hemorrhage and infection have lost their importance as causes of the maternal



deaths. Unlike developed countries, hypertensive disorders of pregnancy has maintained its first place. In multigravidas and grandmultigravidas, hemorrhages were *second* only to hypertensive diseases while in primigravidas indirect obstetric causes were *second* only to hypertensive diseases. In term pregnancies obstetric hemorrhages were relatively increased. Hemorrhage was still threatening the mother's life, though it was not a cause of the death with appropriate treatment. Mortality index related to hypertensive diseases of pregnancy was lower than the mortality index related to indirect obstetrical causes. Mortality index related to direct obstetric causes was lower than the mortality index related to indirect obstetric causes, though direct obstetric causes were more common than indirect obstetric causes. In spite of improved care, mortality was high when pregnancy was complicated by hypertension. *Eighty percent of the maternal deaths due to hypertensive diseases of the pregnancy had not received antenatal care.*

Our clinic serves as a referral center for high-risk pregnancies. *88.9% of maternal deaths could have been prevented by antenatal care, effective timely referral and management.* Absence of antenatal care continues to be an important problem for our region.

Because this was a retrospective study, it was limited by records of patients. *Absence of autopsies for maternal deaths was one of the limitations of this study.*

Hypertensive disorders were still leading causes of maternal deaths and maternal near-miss events. Absence of antenatal care and *disrupted referral* chains were major problems.

*Antenatal care, effective timely referral/ management can minimize severe complications and prevent maternal mortality.* The risk factors for hemorrhage such as multigravidity should be avoided. The patients should be trained about risk factors and antenatal care.

Acknowledgments: Authors don't have any acknowledgment.

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