Maternal Mortality in Denizli Region: Three Years Evaluation

Denizli İlinde Anne Ölümleri: Üç Yılın Değerlendirilmesi

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ABSTRACT Objective: Maternal mortality is defined as death of a woman while pregnant or within 42 days of termination of pregnancy irrespective of gestational age. It is closely related to socioeconomic prosperity of the country. Although overall maternal mortality ratio is 28.5 per 100.000 live births in Turkey, it shows great regional variations. In this study we aimed to analyze maternal mortality ratio and causes of deaths prospectively during three year period in the district of Denizli, Turkey. **Material and Methods:** Beginning from January 2006, maternal deaths were evaluated by a board formed within the directorate of health. Information gathered from primary care centers, related hospital and families was evaluated by the commission and causes of death were recorded. Deaths related to pregnancy and obstetrical causes were accepted as direct maternal deaths. On the other hand deaths that occurred during pregnancy or puerperal period due to previously existing diseases or that developed during pregnancy from non-obstetrical causes but aggravated by pregnancy were classified as indirect maternal death. Maternal mortality ratios were calculated at the end of 3 years as the ratio of maternal deaths to the total number of live births. **Results:** Maternal Mortality ratio of Denizli region was 22.8 per 100.000 live births. Thirty three percent of patients were lost because of postpartum hemorrhage, 33.3% due to amniotic fluid embolism, 22.2% due to pulmonary emboli and 11.1% died of complications secondary to hypertension. The most frequent cause for indirect maternal deaths was cardiac problems. **Conclusion:** Maternal mortality ratio in Denizli region is lower than the average ratio of our country but it is still higher than the ratio of West Anatolia. Postpartum hemorrhage which requires rapid and careful evaluation seems to have an impact on this difference. It may be possible to decrease maternal mortality ratio with further increasing the quality of prenatal and postnatal care.

Key Words: Maternal mortality; postpartum hemorrhage; embolism, amniotic fluid

ÖZET Amaç: Anne ölümü, gebelik haftasından bağımsız olarak gebelik sırasında ve doğumdan sonraki ilk 42 gün içindeki ölümleri tanımlayan ve bir ülkenin refah düzeyini gösteren önemli bir parametredir. Ülkemizde doğrudan anne ölüm hızı 100.000'de 28.5 olmakla birlikte bölgesel farklılıklar göstermektedir. Bu çalışmada Denizli ilinde üç yıllık süreçteki maternal mortalite oranı ve nedenlerini incelemeyi ve düzeltici faliyetleri belirlemeyi amaçladık. **Gereç ve Yöntemler:** Ocak 2006 tarihinden itibaren Denizli Sağlık Müdürlüğü bünyesinde anne ölümlerini inceleme komisyonu oluşturuldu. Her anne kaybını takiben komisyonumuz toplandı. Olguların sağlık ocağı takip kartları, hastane kayıtları incelendi. İlgili sağlık personeli ve aile ile görüşmeler yapıldı. Ölüm nedenleri belirlenmeye çalışıldı. Gebelik veya lohusalığa bağlı olan ölüm nedenleri doğrudan anne ölümü olarak; gebelik sırasında gelişen veya daha önceden var olan sağlık problemine bağlı gebelik ve lohusalık döneminde oluşan ölümler ise dolaylı anne ölümü olarak sınıflandırıldı. Üç yılın sonunda veriler değerlendirildi. Hesaplamalar doğrudan anne ölümlerinin canlı doğum sayısına oranlanmasıyla yapıldı. **Bulgular:** Doğrudan anne ölüm oranı 100.000'de 22.8 idi. Hastaların %33.3'ü postpartum kanamadan, %33.3'ü amniyon mayi embolisinden, %22.2'si pulmoner emboliden, %11.1'i hipertansiyona sekonder sebeplerden kaybedilmişti. Dolaylı anne ölümlerinde en sık karşılaştığımız neden kardiyak problemlerdi. **Sonuç:** Anne ölüm oranımız Türkiye ortalamasının altında olmakla birlikte, Batı Anadolu ortalamasından yüksektir. Özellikle postpartum kanamalı hastalarda daha dikkatli ve hızlı bir yaklaşım şarttır. Prenatal takip ve postnatal bakım hizmetlerinin ve kalitesinin artırılması ile ölüm hızlarını azaltmak mümkün olacaktır.

Anahtar Kelimeler: Maternal mortalite; doğum sonrası kanama; embolizm, amniyon mayi

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Pregnancy related complications are important causes of maternal morbidity and mortality. According to International Statistical Classification of Diseases and Related Health Problems (ICD); maternal death is defined as the death of a woman while pregnant or within 42 days after the end of the pregnancy, irrespective of duration and site of the pregnancy, from any cause related to or aggravated by pregnancy or its management, but not from accidental or incidental causes. Maternal mortality ratio is calculated by number of maternal deaths divided by number of live births.[1] Maternal mortality ratio can be classified as direct and indirect maternal deaths. Direct maternal deaths are the ones occurring due to conditions and complications related to pregnancy and may occur in antenatal, intrapartum or postpartum period.[1] Hemorrhage, sepsis and eclampsia are the most frequent causes of direct maternal deaths.[2] Deaths resulting from previously existing diseases or that developed during pregnancy are classified as indirect maternal mortality.[1] In Turkey, maternal mortality ratio was found to be 28.5 per 100 000 live births in national maternal mortality study, but it shows great variations according to regions.[3] In this study, we aimed to analyze the maternal mortality ratio and causes of deaths prospectively during three year period in the district of Denizli, Turkey.

MATERIAL AND METHODS

Beginning from January 2006, maternal deaths were evaluated by a board formed within the directorate of health. The board was formed by four specialists from the departments of obstetrics and gynecology, pediatrics, anesthesia and reanimation and internal medicine in addition to a physician and a nurse from the department of maternal and child health. Information gathered from primary care centers, related hospital and families was evaluated by the commission and the cause of deaths was identified in consensus immediately after the event. All information was analyzed by the specialists, and the deaths were classified as direct and indirect maternal mortality according to ICD classification.[2] Deaths of women who lived in Denizli region but gave birth in another city were also included in the calculation. In data analysis, the frequencies and rates were tabulated. Maternal mortality ratio was calculated as the ratio of number of maternal deaths to the total number of live 100.000 live births.

RESULTS

Overall 14 maternal deaths occurred in three year period (maternal deaths per live births were 4/13.194 in 2006, 7/13.502 in 2007 and 3/13.697 in 2008). There were nine direct and five indirect maternal deaths. The maternal mortality ratio was calculated as 22.3 /100.000 for 3 year period. The causes of deaths were tabulated in Table 1. Four patients died due to postpartum hemorrhage in three years (33.3% of direct maternal deaths). One of them gave birth at a district hospital and she died during transportation to a province hospital. The second case had a very rapid deterioration and had died at the operation room in an hour after deli-

TABLE 1: Direct causes of maternal mortality.

Age (year)	Time of death	Cause of death	Risk Factors
42	During pregnancy	Pulmonary embolism	Varicose veins, increased maternal age
38	Postpartum first 24 hours	Amniotic fluid embolism	
34	Postpartum first week	Pulmonary embolism	Fracture in ankle one months before delivery
33	Postpartum first 24 hours	Postpartum atony	
32	Postpartum first 24 hours	Postpartum atony	
31	Postpartum first 24 hours	Amniotic fluid embolism	
30	Postpartum first 24 hours	Amniotic fluid embolism	
30	Postpartum first 24 hours	Postpartum hemorrhage due to thrombocytopenia	Hypertension
29	Postpartum first 24 hours	Postpartum atony	

very. In the third case, postpartum hemorrhage was detected 4 hours after caesarian section and medical treatment and blood transfusion were initiated. During follow-up pulmonary edema was developed due to excessive fluid replacement and the patient was lost 11 hours after the birth. In the last patient with postpartum hemorrhage there was thrombocytopenia due to preeclampsia. Birth had occurred just after the admission in a province hospital in another city. Thrombocytopenia and hypertension were detected but postpartum hemorrhage could not be controlled and the patient died. Hence, this case was classified as hypertensive disorder of pregnancy.

Based on the clinical findings, amniotic fluid embolism was suspected to be the cause of death in three patients (33.3% of direct maternal deaths). In one patient, echocardiographic demonstration of right ventricular dilatation had supported the diagnosis. However, the diagnosis was not confirmed by autopsy in these patients. All of three patients were lost in one to two hour period after giving a birth.

Two maternal deaths (22.2% of direct maternal deaths) were attribute to pulmonary embolism; one was 42-year-old and had varicose veins, and the other was 34-year-old and had a history of broken ankle one month ago.

There were 5 indirect maternal deaths within the same period; three patients died due to cardiac problems, and two due to cerebrovascular events (Table 2). Two women had had a history of mitral valve replacement. First case was 28-year-old and cardiac failure was developed at 32 weeks of pregnancy and she died while hospitalized at the cardiology unit due to decompensated cardiac failure. The second case was 24-year-old, and cardiac failure developed within the first hour after delivery. She was treated and discharged from the hospital six days after giving a birth. On the thirteenth day after birth she presented with dyspnea and died in the emergency room. The last patient was 36-year-old with 35 weeks of pregnancy. Her family had called an ambulance because of sudden chest pain, but she was asystolic when paramedics arrived. She died despite cardiac resuscitation. Cause of death in this case was classified as myocardial infarction.

Two women had died due to cerebrovascular events. The first one was 24-year-old, and she was admitted to hospital with the complaints of emesis and loss of consciousness six days after vaginal delivery. Subarachnoid hemorrhage was detected on cranial computed tomography and the patient died in intensive care unit 4 days after admission. The second one was admitted to hospital because of loss of consciousness and cerebral venous thrombosis was identified. Pregnancy was detected at the hospital during clinical work-up.

DISCUSSION

Maternal mortality is an important indicator of prosperity and quality of health services in a given country. The maternal mortality rate was greater than 200/100.000 in 1995.[3] Due to increasing quality of antenatal care and the proportion of women receiving antenatal care, maternal mortality rate decreased progressively during last decade. Maternal mortality ratio (MMR) in Turkey was found to be 28.5/100.000 according to National Mortality study, and estimated to be 44/100.000 according to World Health Organization, United Nations Children Fund (UNICEF), United Nations Population Fund

TABLE 2: Indirect causes of maternal death.

Age (years)	Time of death	Cause of death	Risk factors
36	35 weeks of pregnancy	Myocardial infarction	
30	6 weeks of pregnancy	Cerebral vein thrombosis	
28	32 weeks of pregnancy	Cardiac failure	Mitral valve replacement
24	Postpartum 13th day	Cardiac failure, pulmonary embolism	Mitral valve replacement
24	Postpartum 6th day	Subarachnoid hemorrhage	

(UNFPA) and World Bank.[4,5] National Maternal Mortality study was performed in 16.139 settlements in 29 cities evaluating 54% of the population, and the results were generalized to whole country (Reproductive age mortality study, RAMOS).[4] This approach involves identification and investigation of causes of death of reproductive age women by using multiple source of data such as vital registrations, interviews of family members and health care providers, health facility and burial records. However, possible deficiencies of registration system for births and deaths, problems in health facility records and deliveries at home may decrease the power of such studies. In the estimation of WHO group, the reported MMR by RAMOS study was accepted as lower limit of uncertainty while upper limit of uncertainty was RAMOS estimation multiplied by two. The midpoint of uncertainties was taken as the point of estimate of MMR.[5]

Depending on the natality ratio, antenatal care facilities and educational status, MMR shows great regional variation in Turkey. The rate is reported to be 7.4/100.000 in West Anatolia, whereas it was 68.3/100.000 in East Black Sea and East Anatolia reigon.[4] Higher ratios were reported in specific settlements. In a study conducted between 1994 and 2005, Kolusari et al found MMR of143.42/100.000 in Van district.[6] Considering only the women admitted to Dicle University Hospital, Yalinkaya et al found MMR of 1.100/100.000 in 3 year period in Diyarbakir.[7] Since this is a reference center of that district for complicated cases, the study is far from reflecting the real MMR of that population.[7] A similar study was conducted between 1998 and 2002 in Hacettepe University Hospital which is another reference center for the complicated cases and MMR was found to be 50/100.000.[8]

In our study, 33.3% of women died because of postpartum hemorrhage, which generally accounts for the 25% of direct maternal deaths.[4] Our findings concur with a previous study by Kolusari et al who detected this ratio as 32.3% in Van region.[6] Since our mortality ratio is lower than the mean average ratio of Turkey and postpartum hemorrhage is considered as a preventable cause of death to some extent, we believe that this ratio could have been lower. Prompt management of the hemorrhage may be delayed in facilities where the obstetrician in charge was not in attendance but on call. In our study, the occurrence of one case in district hospital and two cases in hospitals with on call system may have hindered prompt management. However, on call system is regulated by law in the facilities with inadequate number of obstetricians. The surgeon must keep in mind that early evaluation and when necessary, prompt decision for hypogastric artery ligation or hysterectomy may be life saving in complicated cases. After starting medical treatment, patient must be reevaluated regularly by a multidisciplinary team, and for unstable patients decision of surgery must be taken before the critical stage. As it was shown in National maternal mortality study, intervention time is crucial in postpartum hemorrhage and one third of the deaths occur in first 12 hours of delivery.[4] Hypertension, large for gestational age babies, grandmultiparity, multiple pregnancies may increase the likelihood of postpartum hemorrhage, therefore these patients should be directed to deliver in health centers providing continuous obstetrical care. Transportation of patients in emergency cases must be done under optimum conditions with accompanying health personnel.

Deaths due to hypertensive disease of pregnancy accounted for 11.1% of deaths in our series and this rate is lower than the mean value of Turkey (18.4%).[4] Although our population size is moderate, we think that active involvement of primary level health care centers is likely to have helped early detection of hypertensive disorders by routine antenatal follow-ups.

Amniotic fluid embolism is not a frequent situation but if it happens, mortality rate is between 61 to 86%.[9,10] Amniotic fluid embolism usually develops following delivery but may occur in anytime during pregnancy. It causes anaphylactic reaction secondary to closure of pulmonary vasculature with amniotic fluid and fetal cells.[11] Based on the clinical presentation, 33.3% of maternal deaths was attributed to amniotic fluid embolism in our study. This rate is higher than the rates of 2.3%

in United Kingdom, 10% in USA and 30% in Singapore.[6,8] The higher rate may be partly attributable to the fact that we identified the cases based on clinical findings without autopsy confirmation.

Based on the clinical findings, 22.2% of maternal deaths was attributed to pulmonary embolism in our series. This disorder was reported to be the main cause of maternal death in United Kingdom and South Africa.[12] Increased coagulability and venous stasis in pregnancy are predisposing factors for thromboembolism. Immobilization due to ankle fracture in one case and varicose veins in the other one were the known underlying risk factors in our patients.

Similar to Hacettepe study, the main cause of indirect maternal death in our population was cardiac problems.[8] Two patients had prosthetic valve replacement. Since pregnancy is a hypercoagulable state, 3 to 14% of patients with prosthetic valve show risk of a thromboembolic event despite optimal anticoagulation.[13] The second reason for indirect maternal death was cerebrovascular incidents in this study. 26-34 per 100.000 pregnancies are complicated by stroke. 40% of cerebrovascular incidents is seen during delivery, and 50% in postpartum period.[14,15] Risk of stroke increases over 35 years, in the presence of varicose veins, gestational hypertension and postpartum infection.[15]

There are a few limitations in our study. First, causes of maternal deaths were determined according to clinical findings in our study. In some situations such as pulmonary embolism and amniotic fluid embolism it is difficult to determine the cause of death solely based on the clinical findings, and confirmation by imaging studies or autopsy is necessary for accurate diagnosis. The lack of autopsy information and hence assumed cause of death is a major limitation in the analysis of death by cause. However, due to acute deterioration of patients imaging studies cannot be performed in most cases. Unless there is a medicolegal issue, autopsy is rarely performed because legal representatives of patients do not give consent due to reservations stemming from traditional or religious belief. Another limitation was that our study was conducted in three year period. The causes and rates of maternal mortality will be subject to change depending on the time period taken into the investigation.

In conclusion, maternal mortality is an important indicator of the quality of health system. Maternal mortality ratio in Denizli was lower than the mean value of our country but it is still higher than that of West Anatolia. Relatively preventable causes of death such as postpartum hemorrhage had an impact on this increased rate. Following future directions can be deduced from our study to reduce the MMR: 1) antenatal care system should be improved in order to detect high risk patients and plan the management of pregnancy and determine the site, mode and timing of delivery; 2) basic facilities should be optimized in district and private hospitals; 3) prompt decision for hypogastric artery ligation or hysterectomy may be life saving in postpartum hemorrhage; 4) multidisciplinary team approach is necessary in the management of high risk patients. We assume that the lessons learned from our study would improve standards in health care and decrease maternal mortality ratio.

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