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Evaluation of Demographic, Clinical and Autopsy Data of Autopsied Maternal Deaths in Turkey

Türkiye'deki Otopsi Yapılmış Anne Ölümlerinin Demografik, Klinik ve Otopsi Verilerinin Değerlendirilmesi

Yiğit Sezer[1], İbrahim Üzün[2], İpek Esen Melez[2,3], Yaprak Engin Üstün[4], Sema Sanisoğlu[4]

[1]The Ministry of Justice Council of Forensic Medicine, Erzurum Branch Office, Erzurum, Turkey
[2]The Ministry of Justice Council of Forensic Medicine, Istanbul, Turkey
[3]Bezmialem Vakıf University, Faculty of Medicine, Department of Forensic Medicine, Istanbul, Turkey
[4]University of Health Sciences, Ankara Etlik Zübeyde Hanim Health Research Center for Gynecological Diseases, Ankara, Turkey

Abstract

Aim: Maternal mortality is an important public health issue. In this study, it is aimed to evaluate pregnancy related maternal deaths in a multi-dimensional manner, focusing on not only demographic and clinical characteristics but also autopsy results by including the maternal death cases having autopsy reports.

Material and Method: There were 1037 pregnancy related deaths in Turkey, between 2010 and 2014, and 17.3 % (n=180) of them had an autopsy report. Autopsied maternal deaths were evaluated in this sutdy. Data of autopsied pregnancy related deaths were obtained from the nationwide registration system of Woman and Reproductive Health Department of Turkish Ministry of Health and Turkish Ministry of Justice-Council of Forensic Medicine and evaluated retrospectively. Characteristics and cause of maternal deaths autopsied between 2010 and 2014 were evaluated. Age, cause of death, pregnancy state at the time of death, place of birth, mode of delivery, time of death, pregnancy outcomes, place of death, and delay-model were evaluated.

Results: In this study, 61.1% (n=110) of all pregnancy related deaths were ≥30 years of age. Direct maternal deaths were 35% (n=63) of the cases, such as hemorrhage 14.5% (n=26), embolus 6.7% (n=12), uterine rupture 5% (n=9), preeclampsia/eclampsia 4.4% (n=8) and others 4.4% (n=8). Indirect maternal deaths were 56.1% (n=101) of the cases, such as cardiovascular disease 37.2% (n=67), infection 7.8% (n=14), cerebrovascular disease 6.7% (n=12), and others 4.4% (n=8). In 8.9% (n=16) of the cases, the cause of death was not determined. Deaths occurred in the postpartum period in 61.1% (n=110) of the cases. Deaths occurred in a healthcare facility in 71.1% (n=128) of the cases. One or more delays were determined in 33.9% (n=61) of the cases.

Conclusion: According to the results of the present study, cardiovascular disease related to maternal mortality has been found to be an increasing, important public health concern to consider for maternal health routines. In addition, as a second outcome of this study, we can emphasize that, although, the exact cause of death could not be determined even after autopsy in 16 cases (8.9%), autopsy is still one of the most valuable assessment tools to highlight important possible clinical and administrative improvements to reduce maternal mortality.

Keywords: Maternal mortality, autopsy, cardiovascular disease.

Öz

Amaç: Anne ölümleri önemli bir halk sağlığı sorunudur. Bu çalışmada gebelikle ilişkili anne ölümleri demografik ve klinik özelliklerinin yanı sıra otopsi sonuçları da göz önüne alınarak çok yönlü olarak değerlendirilmiştir.

Gereç ve Yöntem: Türkiye'de 2010 ile 2014 yılları arasında, 1037 gebelikle ilişkili ölüm gerçekleşmiş olup, bunların %17,3'üne (n=180) otopsi yapılmıştır. Çalışmamızda otopsi yapılmış gebelikle ilişkili anne ölümleri değerlendirilmiştir. Otopsi yapılmış anne ölümleri verileri Sağlık Bakanlığı Kadın ve Üreme Sağlığı Daire Başkanlığı ve Adalet Bakanlığı-Adli Tıp Kurumundan temin edilmiştir. 2010 ile 2014 yılları arasında otopsi yapılmış olan gebelikle ilişkili anne ölümlerinin ölüm sebepleri ve özellikleri değerlendirilmiştir. Çalışma kapsamındaki olguların yaş, ölüm sebebi, ölüm anındaki gebelik durumu, doğum yeri, doğum şekli, ölüm zamanı, gebelik sonuçları, ölüm yeri, önlenebilirlik ve gecikme modeli değerlendirilmiştir.

Bulgular: Çalışma kapsamında incelenen olguların %61,1'i (n=110) 30 yaş ve üzerindedir. Olguların %35'i (n=63) doğrudan anne ölümü (%14,5'i (n=26) kanama, %6,7'si (n=12) emboli, %5'i (n=9) uterus rüptürü, %4,4'ü (n=8) preeklampsi/eklampsi ve %4,4'i (n=8) diğer doğrudan nedenler), %56,1'i (n=101) dolaylı anne ölümü (%37,2'si (n=67) kardiyovasküler hastalıklar, %7,8'i (n=14) enfeksiyon, %6,7'si (n=12) serebrovasküler hastalıklar ve %4,4'ü (n=8) diğer dolaylı nedenler) olarak belirlenmiştir. Olguların %8,9'unda (n=16) ölüm nedeni belirlenememiştir. Olguların %61,1'i (n=110) pospartum dönemde ölmüştür. Ölüm, olguların %71,1'inde (n=128) bir sağlık kuruluşunda gerçekleşmiştir. Olguların %33,9'u (n=61) üç gecikme modeline göre önlenebilir ölüm olarak değerlendirilmiştir.

Sonuç: Kardiyovasküler hastalıklara bağlı anne ölümleri rutin anne sağlığı uygulamalarını gözden geçirmemize neden olacak önemli bir halk sağlığı sorunudur. Her ne kadar 16 olguda (%8,9) otopsi yapılmasına rağmen ölüm sebebi belirlenememiş olsa da, otopsi halen anne ölümlerinin azaltılması için gerekli klinik ve idari reformların belirlenebilmesi için çok değerli bir araştırma aracıdır.

Anahtar Kelimeler: Anne ölümleri, otopsi, kardiyovasküler hastalık.

Corresponding *(İletişim)*: Yiğit Sezer, The Ministry of Justice Council of Forensic Medicine, Erzurum Branch Office, Erzurum, Turkey
E-mail *(E-posta)*: sezeryigit@gmail.com
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INTRODUCTION

According to World Health Organisation (WHO), there were 295000 maternal deaths globally in 2017. And global maternal mortality ratio (MMR) was estimated at 211 maternal deaths per 100000 live births in 2017. Global MMR declined by 2.9% every year between 2000-2017 period. MMR was high (542 per 100000 live births) in Sub-Saharan Africa region while it was 10 in the Europe subregion and 7 in Australia and New Zealand subregion. In Turkey, the number of maternal deaths was 220, the lifetime risk of maternal death was 1 in 2800 in 2017. And maternal mortality ratio declined from 42 in 2000 to 17 in 2017.[1]

Maternal deaths were analyzed in different regional studies in Turkey.[2-4] Melez et al. analyzed 51 pregnancy related deaths autopsied in the Council of Forensic Medicine, Istanbul between 2003-2009.[5] One of the most comprehensive and reliable data presented in Turkey was National Maternal Mortality Study (NMMS) 2005-2006. The Maternal Mortality Review Committee was formed by the Ministry of Health for maternal deaths in Turkey in 2007 and analyzed all maternal deaths to reduce the number of maternal deaths in Turkey.[6]

There are very few studies evaluating maternal death data of Turkey in the literature. We aimed to evaluate maternal deaths in a multi-dimensional manner, focusing on not only demographic and clinical characteristics but also autopsy findings by including the maternal death cases having autopsy reports.

MATERIAL AND METHOD

We conducted a retrospective study using 2010–2014 data from the Turkish Ministry of Health Maternal Mortality Review Committee registration system and Turkish Ministry of Justice-Council of Forensic Medicine. Data were obtained from all cities of Turkey and included all autopsied maternal deaths which occurred during pregnancy or within 42 days of the postpartum period.

According to WHO, maternal death was defined as the death of a woman during pregnancy or within 42 days of a postpartum period which was caused by a direct complication of pregnancy or the unrelated condition's aggravation by the physiologic effects of pregnancy but not by unintentional or incidental causes. Direct maternal death was defined as resulting from obstetric complications of the pregnancy state (pregnancy, labour and puerperium), interventions, omissions, incorrect treatment, or a chain of events resulting from any of the above. Indirect maternal death was defined as resulting from a previous existing disease or disease which developed during pregnancy and not due to direct obstetric causes but aggravated by the physiologic effects of pregnancy.[1] Delay models were defined as 1st delay; the decision to seek care, 2nd delay; arrival at a health facility, and 3rd delay; the provision of adequate care.[8]

In the light of these definitions, age, cause of death, pregnancy state at the time of death, place of birth, mode of delivery, time of death, pregnancy outcomes, place of death, preventability parameters and delay models were evaluated. In addition, the distribution of sociodemographic and clinical parameters was summarized using descriptive statistics, such as frequencies and rates through SPSS 21 (IBM Corp., Armonk, NY, USA).

Although it is designed as a retrospective study with no identification data or human/animal subjects, and thus it is out of the scope of the informed consent doctrine; all procedures in the study were performed after obtaining ethical and scientific approval from The Ministry of Justice-Council of Forensic Medicine dated 17/02/2015, No.21589509/226 in accordance with the 2008 Helsinki Declaration including its later amendments.

RESULTS

There were 1037 pregnancy related deaths recorded between 2010 and 2014 in Turkey, and 17.3 % (n=180) of them had an autopsy report. A total of 180 autopsied maternal death reports analyzed by the Maternal Mortality Review Committee between 2010-2014 were included in the present study. It was determined that 61.1 % of all pregnancy related deaths were ≥30 years of age (**Table 1**).

Table 1. The characteristics of the cases (n =180)

	Frequency % (n)
Maternal age	
15-19	3.3 (6)
20-24	13.9 (25)
25-29	21.7 (39)
30-34	27.8 (50)
35+	33.3 (60)
Mode of delivery	
Normal spontaneous delivery	20 (36)
Caesarean section	41.7 (75)
Perimortem caesarean	3.9 (7)
Instrumental delivery	1.1 (2)
Not delivered/abortion	33.3 (60)
Time of death	
0-12 w	3.3 (6)
13-21 w	5 (9)
22-36 w	18.9 (34)
>37 w	10 (18)
During delivery	1.7 (3)
After abortion	2.8 (5)
In 48 h after delivery	28.3 (51)
48 h- 1 w	8.9 (16)
1 w- 42 days	21.1 (38)
Pregnancy outcomes	
Live birth	53.9 (97)
Still birth	12.8 (23)
Abortion	2.8 (5)
Not delivered	30.5 (55)
Place of death	
Secondary healthcare facility	36.7 (66)
Tertiary healthcare facility	34.4 (62)
Home	25 (45)
Transportation	3.9 (7)

Direct maternal deaths were 35% of the cases, and 56.1% of the cases were indirect maternal deaths. The cause of death was not defined by clinic and autopsy findings and could not be classified as direct or indirect maternal death in 8.9% of the cases (**Table 2**).

Table 2. The cause of maternal death (n =180)

	Frequency % (n)
Direct	35 (63)
Hemorrhage	14.4 (26)
Embolism	6.7 (12)
Uterine rupture	5 (9)
Preeclampsia/Eclampsia	4.4 (8)
Infection	2.8 (5)
Ectopic pregnancy	1.1 (2)
Other	0.6 (1)
Indirect	56.1(101)
Cardiovascular	37.2 (67)
Infection	7.8 (14)
Cerebrovascular	6.7 (12)
Other	4.4 (8)
Unexplained	8.9 (16)

Delivery (live birth+still birth) was occurred 66.7% (n=120) of all cases. Mode of delivery was caesarean section in 68.3% ($n_{caesarean}$+$n_{perimortemc/s}$=75+7=82) of these cases (n=120). Normal spontaneous vaginal delivery was occurred in 30% (n=36) of the cases gave delivery, and 2 cases gave instrumental delivery (**Table 1**).

Death in the postpartum period occurred in 61.1% (n=110) of the cases, and 30% of the cases (n=54) died during delivery or within 48 hours after delivery (**Table 1**).

Death after a live birth occurred in 53.9% (n=97) of the cases; 12.8% (n=23) died after stillbirth; 2.8% (n=5) died after abortion; 30.6% died without delivery (live birth, stillbirth, or abortion) (**Table 1**).

Death in a healthcare facility occurred in 71.1% (n=128) of the cases; 36.7% (n=66) of all cases died in a secondary health care facility; 34.4% (n=62) died in a tertiary healthcare facility; 25% (n=45) died at home and 3.9% (n=7) died during transfer of patient. (**Table 1**).

According to the WHO's three delay model of emergency care, in 8.9% (n=16) of the cases, there were no data about delay model. There was no delay in 57.2% (n=103) of the cases. There were one or more delays in 33.9% (n=61) of the cases. The first delay was determined in 17.2% (n=31) of the cases; 11.1% of the cases had only a third delay (**Table 3**).

Table 3. Three delays model analysis of the cases (n =180)

	Frequency % (n)
No delay	57.2 (103)
1st delay	17.2 (31)
2nd delay	0.6 (1)
3rd delay	11.1 (20)
1st and 2nd delay	1.1 (2)
1st and 3rd delay	3.3 (6)
1st, 2nd and 3rd delay	0.6 (1)
Unexplained	8.9 (16)

DISCUSSION

To our knowledge, this study is one of the very few studies about Turkey's maternal death sociodemographics including "three delays model".

According to Turkish NMMS 2005-2006, 25.2% of the cases were 35 and over 35 years of age.[7] According to Melez et al., 25.5 % of the cases over 35 years of age in autopsied maternal death cases between 2003-2009 in Istanbul. In our study, 33.3% of the cases were ≥35 years of age. Advanced maternal age (age 35 and over) is still an important risk factor.

According to NMMS, 78.8% of the cases died due to direct causes, 21.2% of the cases died due to indirect causes of maternal deaths.[7] Engin-Üstün et al. showed direct maternal deaths declined from 59.5% in 2012 to 45% in 2015 and indirect maternal deaths increased from 45% in 2012 to 55% in 2015 in Turkey.[8] In our study, 35% of the cases died due to direct causes, 56.1% of the cases died due to indirect causes. Thus, indirect maternal deaths seem to be increasing in Turkey.

According to NMMS, 25.3% of the cases died due to antepartum-intrapartum-postpartum hemorrhage, and 11% died due to cardiovascular disease. According to Sencan et al., 19.2% of all pregnancy related deaths in Turkey were due to hemorrhage, and 20.7% of the cases died due to cardiovascular disease in 2014.[9] Creanga et al. stated that for both 2006-2010 and 2011-2013 periods, cardiovascular conditions were responsible for 26% of all pregnancy related deaths in the US.[10] In our study, 37.2% of the cases died due to cardiovascular disease as an indirect cause of maternal mortality, while 14.4% died due to hemorrhage. Hemorrhage is still an important cause of maternal death as a direct cause of maternal mortality. Prevention of maternal mortality due to hemorrhage requires improved management of acute-onset severe hemorrhage and adequate, immediate and proper supply of blood as well as improvement in the educational status of women. In the point of cardiovascular disease related deaths, advanced maternal age is more likely to be associated with an underlying undiagnosed cardiovascular disease. This underlines the importance of improving the pre-natal, ante-natal and post-natal care for all pregnancies and especially for women with advanced maternal age. The marked increase in cardiovascular disease related deaths is a major current public health issue in Turkey. Highlighting the risk factors, initiation of multidisciplinary collaboration and implementation of guidelines for handling pregnancies with cardiovascular risk factors are important goals for health authorities in reducing maternal mortality.

According to NMMS, 60% of the cases gave birth in a healthcare facility, 10% gave birth during transport.[7] In the study by Melez et al., 63% of the cases gave birth in a healthcare facility, 19% gave birth during transport in 2003-2009.[5] In our study, 71.1% of the cases gave birth in a healthcare facility from 2010-2014. The birth rate in

a healthcare facility reached 98% in 2016, in Turkey.[11] Maternal death cases have a lower ratio of "delivering birth in a healthcare facility". This may highlight the importance of the development of antenatal, natal and postnatal care infrastructure in the point of accessibility of the healthcare services.

Thaddeus and Maine's "three delays" model has been introduced as an important tool to evaluate circumstances about access to and appropriateness of emergency obstetric care in 1994.[12] This model has been useful for undeveloped and developing countries to evaluate their maternal and neonatal healthcare systems. Only a few studies in the literature analyzed the 'Three delays model' in maternal mortality in Turkey.[3,7,13] We demonstrated that one or more delays were present in 33.9% (n=61) of the cases. The first delay was the most commonly experienced delay. The primary healthcare system, antenatal care programs and public awareness should be improved in recognising the problems and deciding to seek appropriate medical help for the first delay. Analysis of maternal deaths from the point of three delay models and extensive application of clinical guidelines by healthcare professionals may help to reduce the maternal mortality rate favorably in the future.

CONCLUSION

According to the results of the present study, cardiovascular disease related to maternal mortality has been found to be an important public health issue. Only 17.3% (n=180) of all pregnancy related deaths had an autopsy. Even in 8.9% (n=16) of them, the exact cause of death could not be determined. Autopsy is still one of the most valuable assessment tools to determine the cause of death. All maternal deaths should be autopsied to highlight the possible clinical improvements in reducing maternal mortality.

ETHICAL DECLARATIONS

Ethics Committee Approval: The study was carried out with the permission of The Ministry of Justice Council of Forensic Medicine Ethics Committee (Date: 17.02.2015, Decision No: 21589509/226).

Informed Consent: Because the study was designed retrospectively, no written informed consent form was obtained from patients.

Referee Evaluation Process: Externally peer-reviewed.

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