

**Assessment Of Anesthesia-Related Maternal Deaths In Turkey:
A Population Based Study****Türkiye'deki Anestezi İlişkili Anne Ölümlerinin Değerlendirilmesi:
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Ministry of Health, Ankara, Turkey**ABSTRACT**

Aim: Anesthesia-related complications, especially secondary to difficult or failed tracheal intubation can result in severe outcomes, including the death of the mother and the baby. Endotracheal intubation mostly required in emergency cesarean sections during which a detailed preoperative assessment is impossible due to the nature of emergency.

Material And Methods: Case files of maternal deaths between years 2012-2014 were reviewed by the Preliminary Investigation Committee for Maternal Deaths retrospectively. The deaths related to anesthetic complications were evaluated. The age, parity, gestational age, body mass index (BMI), risk factors, delivery route, delivery outcome, history of anesthesia, anesthesia provider, urgency of case, preoperative airway assessment and cause of death were recorded and any existing delay and preventability of maternal death were assessed.

Results: There were 4 anesthesia-related maternal deaths between years 2012-2014. All of the deaths were associated with difficult or failed tracheal intubation. The mean age of the cases was 29.5±8.3 years. Only 1 woman was nulliparous, the other 3 were multiparous and had cesarean section in their previous deliveries. The gestational age was greater than 37 weeks in all of the cases and all of them resulted as live births. The risk factors were scoliosis in 2 women, chronic pulmonary obstructive disease and congenital hip dislocation in 1 woman. The last case had no risk factor. Three of the cesarean sections were emergency procedures. One woman with scoliosis had Mallampati score of 4 which shows difficult intubation. While there was no delay in 3 women, phase 3 delay was found in one case. According to the results of delays, only 1 maternal death was identified as preventable.

Conclusion: Difficulty in airway management occurs more in obstetric patients due to the anatomical and physiological changes of pregnancy. In order to reduce the anesthesia-related mortality secondary to difficult airway, preoperative airway assessment and prediction of difficult airway is important as this will highlight the need for specific equipment and experienced anesthetist. Regional anesthesia techniques should be the first choice of anesthesia in cesarean sections.

Keywords: Maternal Death, Turkey, anesthesia, difficult airway

ÖZ

Amaç: Gebelerde özellikle zor veya başarısız endotrakeal entübasyona ikincil olarak gelişen anestezi ilişkili komplikasyonlar, anne ve bebeğin ölümü ile sonuçlanabilecek ciddi sonuçlar doğurur. Endotrakeal entübasyon en sık acil sezaryen operasyonlarında gerekir ve durumun aciliyeti nedeniyle genellikle bu hastalarda preoperatif hasta ve havayolu değerlendirilmesi yapılamaz.

Gereç ve Yöntemler: 2012-2014 yılları arasında gerçekleşen anne ölüm 2 lerine ait dosyalar "Anne Ölümleri Ön İnceleme Komisyonu" tarafından retrospektif olarak değerlendirildi. Anestetik komplikasyonlara ait ölümler incelendi. Yaş, parite, gestasyonel yaş, beden kitle indeksi, risk faktörleri, doğum şekli, doğum sonucu, önceye ait anestezi hikayesi, anestezi uygulayıcısı, aciliyet durumu, preoperatif havayolu değerlendirilmesinin yapıp yapılmadığı, ölüm nedeni kaydedildi ve gecikme olup olmadığı ve önlenebilirlik komisyon tarafından değerlendirildi.

Bulgular: 2012-2014 yılları arasında anestezi ilişkili 4 anne ölümü tespit edildi. Tüm ölümler zor veya başarısız trakeal entübasyona bağlı gerçekleşmişti. Vakaların yaş ortalaması 29.5±8.3 yıldır. Bir hasta nullipar, diğer 3 hasta multipardı ve önceki doğumları sezaryen ile gerçekleşmişti. Tüm hastaların gebelik yaşı 37 haftadan büyük ve hepsi canlı doğum ile sonuçlanmıştı. Risk faktörü olarak 2 hastada skolyoz, 1 hastada kronik obstrüktif akciğer hastalığı ve doğuştan kalça çıkığı olduğu belirlendi. Son hastada herhangi bir risk faktörü saptanmadı. Sezaryen operasyonlarının 3'ü acil olarak gerçekleştirilmişti. Skolyozu olan bir hastada zor entübasyonu gösteren Mallampati skoru 4 olarak saptanmıştı. 3 hastada gecikme modeli olmadığı, 1 hastada ise 3. gecikme modeli olduğuna karar verildi. Gecikme modellerine göre 4 anestezi ilişkili anne ölümünden birinin önlenebilir olduğu belirlendi.

Sonuç: Gebeliğe bağlı anatomik ve fizyolojik değişiklikler nedeniyle obstetrik hasta grubunda zor havayolu ile daha sık karşılaşmaktadır. Zor havayoluna sekonder gelişen anestezi ilişkili mortalitenin azaltılması için, hastalarda zor havayolu preoperatif havayolu değerlendirilmesi yapılarak belirlenmeli ve özel ekipman ve tecrübeli anestezi uzmanı ihtiyacı saptanarak buna yönelik hazırlıklar yapılmalıdır. Ayrıca sezaryen operasyonları için rejyonel anestezi teknikleri ilk seçenek olarak tercih edilmelidir.

Anahtar Kelimeler: Anne ölümü, Türkiye, anestezi, zor havayolu

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INTRODUCTION

Maternal mortality due to anesthetic complications is rare. Despite advances in anesthesia practice, complications leading to death still occur (1). The main causes of anesthesia-related maternal deaths can be classified as airway problems, inexperienced staff and inadequate equipment (2).

The anatomical and physiological changes occurring during pregnancy, especially the edema of the airway structures and weight gain, are the major contributing factors that make the airway management more difficult. The incidence of difficult intubation in obstetric population is estimated to be eight times higher than non-obstetric population (3). Failed tracheal intubation can result in severe outcomes, including the death of the mother and the baby.

Here we report anesthesia-related maternal deaths seen between years 2012-2014 in Turkey.

MATERIAL AND METHODS

Preliminary Investigation Committee for Maternal Deaths reviewed the case files of maternal deaths between years 2012-2014. The deaths related to anesthetic complications were evaluated. We recorded age, parity, gestational age, body mass index (BMI), risk factors, delivery route, delivery outcome, history of anesthesia, anesthesia provider, urgency of case, preoperative airway assessment and cause of death. Any existing delay according to three delays system and preventability of maternal death were assessed.

A death was classified as preventable by consensus of the expert committee. An event was considered preventable if one of the three delays was reported: Phase 1 delay; delay in deciding to seek appropriate medical help for an obstetric emergency, phase 2 delay; delay in reaching an appropriate health facility, phase 3 delay; delay in receiving adequate emergency obstetric care when a facility is reached.

Data were expressed as mean \pm SD and in percentages.

RESULTS

There were 4 anesthesia-related maternal deaths between years 2012-2014. All of the deaths were associated with difficult or failed tracheal intubation. The mean age of the cases was 29.5 ± 8.3 years. Only 1 woman was nulliparous, the other 3 were multiparous and had cesarean section in their previous deliveries. The gestational age was greater than 37 weeks in all of the cases and all of them resulted in live births. BMI of the cases were below 30 kg/m². The risk factors were scoliosis in 2 women, chronic pulmonary obstructive disease (COPD) and congenital hip dislocation in 1 woman. The last case had no risk factor. General anesthesia was administered in all cases for cesarean section. Three of the cesarean sections were emergency procedures. Preoperative airway assessment was done in 3 cases. Difficult intubation was anticipated in two women with scoliosis. Reasons for general anesthesia were noted as fetal distress, post-term pregnancy and history of cesarean section in previous pregnancy. Anesthesia was provided by an anesthesia doctor in 3 cases and by an anesthesia nurse in one case. In case of failed intubation laryngeal mask airway (LMA) and face mask ventilation were used as rescue procedures. In one case tracheostomy was performed. While there was no delay in 3 women, phase 3 delay was noted in one case. According to the results of delays, only 1 maternal death was identified as preventable.

DISCUSSION

Difficulty in airway management occurs more in obstetric patients due to the anatomical and physiological changes of pregnancy (4). It is sometimes difficult to anticipate a difficult intubation in a pregnant woman. Obstetric population as being a particular group of patients, deserve a specific anesthetic practice (5). Preoperative assessment for evaluation and prediction of difficult airway is important to improve application of general anesthesia. The trachea should be intubated without delay because obstetric patients are more prone to develop hypoxia. The reduced functional residual capacity and the effect of supine position at induction of anesthesia contributes to development of hypoxia (4). General anesthesia is mostly performed in emergency cesarean sections during which a detailed preoperative assessment is impossible due to the nature of emergency.

Most airway related mortality can be accomplished by appropriate preoperative preparation. Recommendations were expressed in the studies concerning anesthesia-related maternal death. El Daba et al. emphasized the administration of neuroaxial anesthesia for both vaginal and operative delivery (3). Maternal mortality has been decreasing by the increased use of regional anesthetic techniques. Regional anesthesia techniques should be the first choice of anesthesia in cesarean sections. D'Angelo suggested early placement of epidural catheter for patients at high risk for emergent cesarean delivery. Use of algorithms for difficult airway management, planning of elective fiberoptic intubation and use of supraglottic devices to facilitate ventilation in patients with anticipated difficult intubation were the additional recommendations (3,6). Bougie guided technique can also be used to facilitate endotracheal intubation.

Anesthesia-related maternal mortality occurred mostly in patients undergoing cesarean section (7). In the present study, 4 anesthesia-related maternal deaths were evaluated. In these cases difficult airway or failed intubation were the causes of maternal mortality. In one case a woman with scoliosis was assessed preoperatively, she had a Mallampati score of 4 and a short neck. She was undergone an emergency cesarean section. The trachea could not be intubated during three attempts. Video laryngoscopy also was not successful. LMA was placed and emergency tracheostomy was performed but during tracheostomy she had a cardiac arrest. She responded to cardiopulmonary resuscitation, then she was admitted to intensive care unit with a diagnosis of hypoxic ischemic encephalopathy. The second woman had COPD and congenital hip dislocation. She had a fatal cardiac arrest during mask ventilation. She died as a result of failed intubation. The third woman had an operation for correction of scoliosis before. The trachea could not be intubated, operation was completed by mask ventilation. She was desaturated and had a fatal cardiac arrest at awakening from anesthesia. These all three women were assessed preoperatively. An anesthesia doctor provided the general anesthesia. Even though difficult intubation was anticipated in 2 of them and there was a preparation for this condition, outcome of patients were poor. The fourth woman had no structural risk factor, she had a full stomach before cesarean section. She was not assessed before the operation and an anesthesia nurse provided general anesthesia. She was ventilated by LMA because of failed intubation. At the end of the surgery, her abdomen was over distended, she had a cardiac arrest at awakening from anesthesia. Aspiration of gastric content was also noted. This was an elective surgery but the anesthesia nurse did not choose to awaken the patient. In cases of failed intubation use of supraglottic airway devices and continuation of general anesthesia is preferred recently instead of awakening the patient (8). Aspiration of gastric content is still one

of the major causes of death in obstetric patients during general anesthesia (9). Although Bercker et al reported that the LMA was effective in preventing lungs from the aspiration of fluid, a pregnant woman should receive aspiration prophylaxis especially before general anesthesia (10,11).

Difficult or failed intubation seems to be the most common factor in anesthesia-related maternal mortality. The laryngeal mask airway is the most used rescue device but sometimes patients can not be ventilated via LMA. It was not defined why in most cases it failed to ventilate the patients. It may be related to anatomical reasons, edema of the airway structures and bronchospasm. Halaseh et al studied the use of supraglottic airway devices in a large number of patients undergoing cesarean section. They recommend the usage of these devices in selected patients with antacid prophylaxis and supraglottic airway devices which let positive pressure ventilation and gastric aspiration (12).

In the present study anesthesia was provided by anesthesia doctors, all specialists, in three cases. Only in one case anesthesia provider was an anesthesia nurse. Two of the cases were undergone surgery out of working hours. Factors like time of surgery, experience of staff and the equipment present in hospital contribute to unsafe anesthesia especially for women undergoing cesarean section. Chau-in et al found that lack of experience and inadequate knowledge of health providers, inadequate care, and patient conditions were the major contributory factors (13). Anesthetists with limited skills often experience complications in obstetric patients (14). In a study it was reported that there is a 2.5 fold increase in failed intubation risk for trainee compared to consultant anesthetist (9). As the airway problems are the leading causes in anesthesia related maternal mortality, simulation of airway management techniques are becoming popular. These methods can effectively teach managing difficult airway problems (15).

In the present study we analyzed the causes of the anesthesia-related maternal deaths to improve anesthetic safety for the parturients. All anesthesia-related maternal mortality is potentially preventable (15, 16). In order to decrease the anesthesia-related maternal mortality secondary to difficult airway, preoperative airway assessment and prediction of difficult airway and determination of preexisting comorbidities are important as this will highlight the need for specific equipments and experienced anesthetist. We conclude that complications of anesthesia in obstetric population would be prevented if more experienced staff provides the anesthesia with appropriate equipments and techniques in the light of guidelines.

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