REVIEW ARTICLE DOI: https://doi.org/10.18502/fem.v6i4.10442

Management of pregnant trauma patients in emergency department: a narrative review to provide the most recent evidence

Roghayeh Mousazadeh , Mahnaz Dehdilani *

Department of Obstetrics and Gynecology, Faculty of Medicine, Tabriz University of Medical Sciences, Tabriz, Iran.

***Corresponding author:** Mahnaz Dehdilani; **Email:** Mahnazdehdilani@Gmail.com

Published online: 2022-08-14

Abstract: Evaluation of a pregnant trauma patient (PTP) in the emergency department (ED) is somehow challenging, as two patients should be managed simultaneously. Here, we reviewed recently published articles to provide up-to-date information on the management of PTPs. We examined 35 articles and categorized their topics as follows: trauma severity, management of trauma patients, general approach to pregnant women with trauma, primary evaluation of pregnant women with trauma, breathing and ventilation, airway, circulatory system evaluation simultaneous with bleeding control, uterine replacement, blood transfusion, uterine displacement, cardiovascular resuscitation, defibrillation, pneumatic anti-shock garment, and perimortem cesarean section. Concerning trauma during pregnancy, the basic principle should be successful maternal resuscitation, which is vital for fetus survival.

Keywords: Emergency Medical Services; Evidence-based Medicine; Multiple Trauma; Pregnancy; Wounds and Injuries

Cite this article as: Mousazadeh R, Dehdilani M. Management of pregnant trauma patients in emergency department: a narrative review to provide the most recent evidence. Front Emerg Med. 2022;6(4):e55.

1. Introduction

It is almost challenging to evaluate a pregnant trauma patient (PTP) in the emergency department (ED). The reason is that two patients should be managed simultaneously. Some studies have reported that although pregnancy alone does not change mortality and morbidity caused by trauma, it can affect the pattern of trauma-related injuries (1). Due to physiological and anatomical changes during pregnancy, management of PTPs requires considering specific issues such as the amount of radiation exposure, the need for assessing the health status of the fetus, and performing RH isoimmunization (2, 3). Several researchers have published review articles on trauma management during pregnancy, which needs to be revised according to the principles of evidence-based medicine (4). Therefore, we reviewed recently published articles to provide up-to-date information on the management of PTPs.

2. Evidence acquisition

In this narrative review, articles on treatment measures of adult PTPs published in English or Persian since 2015 were included. Dissertations, scientific reports, and case reports were excluded.

2.1. Search Strategy

Published studies according to the inclusion criteria were identified by searching the PubMed, Scopus, EMBASE, PEDro, LILACS, SciELO, Cochrane Library, Google Scholar, CINAHL, SID, and Iran Doc databases. The sources used in each article were also reviewed manually so that no article was left out. The complete strategy used to search PubMed was as follows: Trauma [MeSH] OR trauma OR Pregnancy [MeSH] OR Pregnant OR Pregnancy Trauma OR pregnancy trauma OR Pregnancy, Trauma OR Cardiopulmonary Resuscitation [MeSH] OR CPR OR Pregnancy CPR OR Cardiopulmonary Resuscitation, Pregnancy OR Cardiopulmonary Resuscitation, Pregnant OR Cardiopulmonary Resuscitation, Trauma, Pregnancy OR Emergency [MeSH].

2.2. Selection of studies and data extraction

In the first selection stage, two researchers independently evaluated the titles and summaries of the identified studies. All abstracts with sufficient information according to the inclusion and exclusion criteria were selected to evaluate the full texts of the articles. In the second stage, the same researchers independently evaluated the complete articles and selected the studies according to the inclusion and exclusion criteria. A third researcher resolved the researchers' disagreements over the selection stage and data extraction. The necessary information (e.g., publication year, first author, study design, sample size, and final results) were extracted from the

selected articles.

3. Results

Eventually, 35 articles were thoroughly reviewed, and their findings are categorized and summarized below.

3.1. Trauma intensity

According to the literature, there are various systems for scoring trauma severity, but most of them are complicated and have limited ability to make decisions. Classifying trauma into minor and major trauma helps better understand the optimal treatment principles of PTPs (5). If these indicators are applied, nine out of every ten PTPs are minor. However, 60-70% of fetal death are due to minor trauma because of its higher prevalence. Hence, healthcare providers should not underestimate minor maternal injuries, as at least placental abruption and maternal-fetal bleeding occur simultaneously in 5% of pregnancies. If any of the indicators listed below are observed, the trauma is major (6).

• Any changes in the level of consciousness
• A respiratory rate less than ten and more than 30 breaths per minute
• SPO2 less than 95%
• A heart rate less than 120 per minute
• Systolic blood pressure less than 90 mmHg

Indicators of damage pattern are as follows (7, 8):

• Explosive or intrusive injuries to the head, neck, chest, abdomen, pelvis, and axilla
• Significant slow trauma to the head, neck, chest, abdomen, pelvis, and axilla
• Above-ankle/wrist amputation
• Suspected spinal cord injury
• Burns more than 20% or other complications related to burns including head, face, genital system, and airways and respiratory burns
• Severe bruise
• Large combination casts or open displacement along with vascular compression
• Pelvic fracture
• Fractures related to two or more of the following organs: Femur, Tibia, and Humerus

Indicators related to injury mechanisms are as follows (9, 10):

• Being thrown from a vehicle
• Falling from a height of more than 3 meters
• Explosion
• Severe vehicle crash
• Vehicle rollovers
• Being in a road accident with fatalities
• Being trapped for more than 30 minutes
• Pedestrian accidents
• Motor vehicle accidents with speeds more than 30 km/h

It is worth noting that trauma severity is not a predictor of fetal outcome.

3.2. General approach

Optimal management of PTPs requires a coordinated approach of a team of health professionals such as emergency medicine specialists, surgeons, gynecologists, neonatologists, midwives, nurses, and other technicians (11). All members should consider that the primary goal of management is to stabilize the mother's condition. In addition, they should keep in mind that some women may be unaware of their pregnancy. A study reported that 3% of women admitted to the trauma unit were pregnant, and 11% noticed their pregnancy by chance. Thus, every woman with trauma should be considered pregnant at reproductive age and tested with a pregnancy test (12, 13).

3.3. Primary evaluation

The evaluation and primary care of injured PTPs, similar to non-pregnant patients, include ensuring openness of airways, stabilizing cervical vertebrae, and maintaining adequate blood supply and stability of the circulatory system. These measures may include pre-hospital care or services provided in an emergency trauma center. The evaluation and primary care of affected pregnant patients are as follows (14):

3.3.1. Airway, stabilizing of cervical vertebrae, breathing, and ventilation

Due to rapid anoxia effects in pregnant women, oxygen supplementation is necessary. During pregnancy, the mother's oxygen saturation (SaO2) should be more than 95 mmHg. In cases with a SaO2<95%, Pao2 must be evaluated (15). Pao2 > 70 mmHg indicates adequate oxygen transfer from mother to fetus. In case of insufficient oxygenation, oxygenation and early intubation are recommended. It is worth noting that PTPs have a more difficult intubation and an eight times higher intubation failure rate compared to non-pregnant women. Gaining weight, airway mucosal edema, decreased functional residual capacity, decreased respiratory compliance, increased airway resistance, and increased need for oxygen are among the pregnancy-related changes that put PTPs at increased risk of intubation failure. Hence, emergency intubation is recommended in cases of airway obstruction (16, 17). A PTP with airway obstruction is at risk of gastric contents aspiration due to decreased esophageal sphincter tone. Pregnancy may delay gastric emptying, and the pregnant woman's stomach should be considered full for up to 24 hours after the last meal. A smaller-sized endotracheal tube is recommended to reduce these risks. In addition, most guidelines emphasize applying pressure on the cricoid to prevent gastric content aspiration until the airway is protected by an endotracheal tube. This can reduce the risk of regurgitation of gastric contents to the pharynx and maintain laryngoscope vision. However, the amount of pressure applied to the cricoid is under investigation because there is evidence that pressure may disrupt gas exchange and ventilation. No randomized trial has evaluated the effectiveness of cricoid pressure in PTPs. However, if there is a problem with ventilation or intubation or if the visibility

is poor, adjustment or release of the pressure on the cricoid should be considered (18). In addition, early placement of a nasogastric tube or orogastric tube in the conscious patient is necessary to avoid aspiration caused by decreased gastric movements and upper gastrointestinal tube compression, increased gastric acidity, and decreased pH and loosening of the esophageal sphincter. Considering the displacement of the diaphragm during pregnancy, if chest tube tracheostomy is necessary, it should be placed 1 to 2 intercostal spaces above the landmark (intercostal space V) to prevent damage to the diaphragm (19). If there is no risk for the patient, the bed can be adjusted upward to reduce the effects of the uterus on the diaphragm and facilitate breathing. In general, due to the increased risk of intubation failure, use of short-handled laryngoscopes, pressure on the cricoids, and use of a smaller endotracheal tube due to laryngeal edema are recommended before intubation. Immediately after evaluating and establishing airway function, chest wall and diaphragm should be evaluated for threatening conditions such as pneumothorax, cardiac tamponade, flail chest, and tension pneumothorax (20).

Spinal precautions are necessary for all patients with spinal cord injury. A neck collar can be used to stabilize the vertebra (21).

3.3.2. Evaluation of circulatory system and bleeding control

Due to hyperlipidemia and hemodilution induced by pregnancy, hemodynamic instability may not present until a significant volume of blood (1.5 to 2 liters) is lost. Thus, the possibility of hypovolemia before presenting symptoms should be considered in PTPs. Even for normotensive ones and those receiving severe resuscitation, blood transfusion should be performed. Fetal distress is often considered the first symptom of maternal hemodynamic disorder. This can be attributed to the high sensitivity of uterine-placental tissue to maternal hypovolemia due to catecholamine receptors in the venous sinuses and placental and uterine walls. Also, severe trauma leads to the release of maternal catecholamine, causing the destruction of placental uterine vessels and impaired fetal circulation (22, 23). In general, the resuscitation of the cardiovascular system and circulation should be performed under the following guidelines.

Injection of fluids and blood during resuscitation should be performed according to the standard resuscitation protocols. Rapid replacement of crystalloids and severe transfusion of blood products are necessary to restore lost blood volume and increase oxygen transfer. Crystalloids, in the form of ringer lactate or normal saline, should be administered at a ratio of 3 to 1 per blood lost volume in the first 30 to 60 minutes of acute resuscitation. Despite the reduction of oncotic pressure due to physiological anemia in pregnancy, adequate evidence is not available to support the preferential role of colloids or albumin in the early stages of resuscitation (24, 25).

The following principles should be considered when resuscitating PTPs:

• It is recommended to use a larger needle (by two times) for all PTPs with severe injuries to facilitate rapid crystalline infusion and increase intravascular volume and blood transfusion (26, 27).

• Two large intravenous routes should be found.

• Femoral vein should be avoided due to the compression of the uterus during pregnancy.

• Fluid replacement should be attempted because in some cases, patients may not present any symptom until the loss of 15 to 20% of the amount of fluid in the body. However, excessive infusion of fluids, often more than two liters, can lead to pulmonary edema due to relatively low oncotic pressure during pregnancy.

• Volume replacement is preferred to vasopressors to maintain blood pressure because placental uterine vessels react to vasopressors, and their use leads to reduced placental perfusion. Hence, vasopressors should not be used, except in cases of rogue hypotension where the patient does not respond to intravascular volume replacement and fluid resuscitation.

• Caution should be taken when using bicarbonate because rapid modification of maternal acidosis may reduce compensatory hyperventilation.

3.3.3. Blood transfusion

In case of acute loss of fluids, immediate transfusion of O-blood is recommended until determining blood group and cross-matching. It should be performed similar to that in non-pregnant patients, except that a Fibrinogen level of > 200 mg is desirable in pregnant women because they have a higher level of Fibrinogen. In addition to requesting full blood, other blood factors such as fresh frozen plasma and cryoprecipitate should also be ordered due to the possibility of diffuse intravascular coagulation in pregnant women. Several studies have recently reported the role of factor VII in managing shock in pregnant patients.

3.4. Uterine displacement

After 20 weeks of pregnancy, care should not be provided in the supine position because the pressure on the inferior vena cava not only leads to a 30% reduction in cardiac extraversion but also reduces the efficiency of cardiac massage. Displacing the uterus from the inferior vena cava and abdominal aorta improves the venous and cardiac exogenous return and increases the efficiency of cardiac massage (28). Therefore, uterus displacement should be considered throughout the resuscitation process and even before surgeries unrelated to midwifery. It can be achieved by placing the mother in the supine position or manually moving the uterus. The third option is to create a lateral tilt. For manual displacement of the uterus, while the patients' hands are placed around the body, the uterus should gently be dragged toward the side where the physician is located (29).

3.5. Cardiovascular resuscitation

Chest massage is complicated during pregnancy due to decreased chest compliance. Besides, it may not be effective during the second and third trimesters of pregnancy, as aorta compression in the supine position may decrease the heart output significantly, even despite the uterus displacement (30).

3.6. Defibrillation

There is no difference between pregnant and non-pregnant women concerning defibrillation because it has limited risks for the fetus, especially in cases where fetal monitoring is not performed (31).

3.7. Pneumatic anti-shock garment

Anti-shock inflatable pants sedate lower limbs and control bleeding in pregnant patients. The abdominal part of these pants should not be inflated in pregnant patients to avoid pressure on uterine blood flow (32).

3.8. Perimortem Cesarean delivery

After 20 weeks of pregnancy, the uterus discharge by cesarean section (C-section) probably leads to increased effectiveness of cardiovascular resuscitation and can save the mother's life even if the fetus does not benefit from it. The mortality rate and neurological consequences of neonates depend on the interval between C-section and maternal cardiac arrest. If the delivery is on-time, the fetus will survive and develop normal neurological consequences in more than 60% of cases (33, 34). Our literature review revealed that the most desirable maternal and neonatal outcomes were in cases where the C-section was performed within 4 minutes after the mother's cardiac arrest. Fetal survival rates decrease to 5% after 15 minutes, and survived infants are at increased risk of neurological complications. The American Heart Association suggests that if resuscitation fails after 4 minutes, C-section should be performed, which is named the "five-minute rule" (21). The American College of Obstetricians and Gynecologists (ACOG) also supports C-sections in ongoing maternal death and acknowledges that this method will be effective if performed within 5 to 10 minutes of maternal cardiac arrest (35-37). However, there are neat differences concerning gestational age for performing C-sections in ongoing maternal death. ACOG mentioned a gestational age of 25 weeks, while it is mentioned to be 22 to 27 weeks in some studies (Holse et al.). Also, the Eastern Associations guidelines reported a gestational age of 24 weeks, and Queensland (Australia) mentioned it to be 20 weeks. The National Guideline of Obstetrics and Gynecology Services, published by the Ministry of Health (MoH), also considered a gestational age > 25 weeks, which is consistent with ACOG (24, 38). This technique should start first with a wide vertical abdominal incision and then with a horizontal or vertical incision on the uterus. Our literature review also revealed that the C-section should not be delayed because of protocols on sterling or evaluating the survival chance of the fetus. In addition, the cardiovascular resuscitation process should continue during and after this procedure (39).

4. Discussion

This review investigated the latest principles on the management of PTPs in ED. We found articles and comprehensive instructions concerning managing trauma during pregnancy. There is a national guideline for managing trauma during pregnancy and providing midwifery and obstetric services, which is used to evaluate the performance of healthcare providers in Iran. However, as this guideline is structured and contains a summary of the evidence, many healthcare providers have questioned its appropriateness (14, 40, 41). In addition, several studies on the management of PTPs have been published in recent years, and new articles on this subject are continually published. However, according to the principles of evidence-based care, guidelines should continuously be updated (11).

Based on the currently available guidelines, studies, and instructions, optimal trauma management during pregnancy requires a team approach of obstetricians and gynecologists, emergency medicine specialists, and neonatologists. In addition, all the identified articles emphasized saving the mother's life as the primary priority of care because improving maternal outcomes often leads to decreased morbidity and mortality of the fetus (18). The primary assessment of PTPs is similar to that of non-pregnant women, including ensuring the openness of airways and normal respiratory rate and maintaining blood supply and stability of the circulatory system. However, providers should consider physiological and anatomical changes related to pregnancy before performing any intervention (42, 43).

Simultaneous with performing the measures mentioned above, there may be a need for C-section to increase the mother's and fetus's survival. According to the guidelines developed by ACOG and MoH, the gestational age must be at least 25 weeks. Delivery increases intravenous and cardiac output by 25-30%. Hence, C-section in ongoing maternal death may be used to resuscitate the mother. Some studies reported mothers' survival after a failed resuscitation. After stabilizing the mother's vital signs, secondary evaluation begins with an emphasis on evaluating fetal status and managing pregnancy complications (12).

Preterm labor, placental abruption, fetal-maternal bleeding, and uterine rupture are the most common complications of trauma during pregnancy. PTPs who experience these complications have symptoms such as contraction, vaginal bleeding, and abdominal pain in the initial assessment. For instance, in placental abruption cases, the number of uterine contractions increases while their amplitude decreases and the base tone of the uterus increases. In addition to what was mentioned before, all the reviewed articles emphasized the necessity to develop preventive and treatment strategies due to the high prevalence of trauma during pregnancy, which

should be considered in future studies.

5. Declarations

5.1. Acknowledgement

None.

5.2. Authors' contribution

Both the authors met the criteria for authorship in accordance with the recommendations of international committee of medical journal editors.

5.3. Conflict of interest

The authors declare that they have no conflict of interest regarding the publication of this study.

5.4. Funding

This study was not sponsored by any organization.

References

1. Zachariah SK, Fenn M, Jacob K, Arthungal SA, Zachariah SA. Management of acute abdomen in pregnancy: current perspectives. Int J Womens Health. 2019;11:119.
2. Vieira F, Guimaraes JV, Souza MC, Sousa PM, Santos RF, Cavalcante AM. Scientific evidence on perineal trauma during labor: Integrative review. Eur J Obstet Gynecol Reprod Biol. 2018;223:18-25.
3. Huls CK, Detlefs C, editors. Trauma in pregnancy. Seminars in perinatology; 2018: Elsevier.
4. Watson K, White C, Hall H, Hewitt A. Women's experiences of birth trauma: A scoping review. Women and Birth. 2020.
5. Bastani P, Hajebrahimi S, Mallah F, Chaichi P, Ghiasi FS. Long-term outcome of synthetic mesh use in Iranian women with genital prolapse. Urol J. 2020;17(1):73-7.
6. Oxford CM, Ludmir J. Trauma in pregnancy. Clin Obstet Gynecol. 2009;52(4):611-29.
7. Raptis CA, Mellnick VM, Raptis DA, Kitchin D, Fowler KJ, Lubner M, et al. Imaging of trauma in the pregnant patient. Radiographics. 2014;34(3):748-63.
8. O'Leary J. The trauma of ultrasound during a pregnancy following perinatal loss. J Loss Trauma. 2005;10(2):183-204.
9. Flik K, Kloen P, Toro JB, Urmey W, Nijhuis JG, Helfet DL. Orthopaedic trauma in the pregnant patient. J Am Acad Orthop Surg. 2006;14(3):175-82.
10. Huth-Bocks AC, Krause K, Ahlfs-Dunn S, Gallagher E, Scott S. Relational trauma and posttraumatic stress symptoms among pregnant women. Psychodyn Psychiatry. 2013;41(2):277-301.
11. Atashkhoei S, Abedini N, Pourfathi H, Znoz AB, Marandi PH. Baricity of bupivacaine on maternal hemodynamics after spinal anesthesia for cesarean section: a randomized controlled trial. Iran J Med Sci. 2017;42(2):136-43.
12. Abedzadeh-Kalahroudi M. Approach to trauma during pregnancy. Arch Trauma Res. 2013;2(2):61-2.
13. Laplante DP, Barr RG, Brunet A, Du Fort GG, Meaney ML, Saucier JF, et al. Stress during pregnancy affects general intellectual and language functioning in human toddlers. Pediatr Res. 2004;56(3):400-10.
14. Tsuei BJ. Assessment of the pregnant trauma patient. Injury. 2006;37(5):367-73.
15. Van Hook JW. Trauma in pregnancy. Clin Obstet Gynecol. 2002;45(2):414-24.
16. Thim T, Krarup NHV, Grove EL, Rohde CV, Løfgren B. Initial assessment and treatment with the Airway, Breathing, Circulation, Disability, Exposure (ABCDE) approach. Int J Gen Med. 2012;5:117-21.
17. Sakamoto J, Michels C, Eisfelder B, Joshi N. Trauma in pregnancy. Emerg Med Clin. 2019;37(2):317-38.
18. Lavecchia M, Abenhaim HA. Cardiopulmonary resuscitation of pregnant women in the emergency department. Resuscitation. 2015;91:104-7.
19. Cox TR, Crimmins SD, Shannon AM, Atkins KL, Tesoriero R, Malinow AM. Liver lacerations as a complication of CPR during pregnancy. Resuscitation. 2018;122:121-5.
20. Kaplan S, Paschen HR. The Pregnant Trauma Patient. Prehospital Trauma Care. 2001 (pp. 475-494). CRC Press.
21. Sadro CT, Zins AM, Debiec K, Robinson J. Case report: lethal fetal head injury and placental abruption in a pregnant trauma patient. Emerg Radiol. 2012;19(2):175-80.
22. Atta E, Gardner M. Cardiopulmonary resuscitation in pregnancy. Obstet Gynecol Clin North Am. 2007;34(3):585-97.
23. Nedeff N, Hakala P. Anesthetic management of the pregnant trauma patient. Essentials of Trauma Anesthesia. 2012:288.
24. Hull SB, Bennett S. The pregnant trauma patient: Assessment and anesthetic management. Int Anesthesiol Clin. 2007;45(3):1-18.
25. McAuley DJ. Trauma in pregnancy: anatomical and physiological considerations. Trauma. 2004;6(4):293-300.
26. Stone IK. Trauma in the obstetric patient. Obstet Gynecol Clin North Am. 1999;26(3):459-67.
27. Greco PS, Day LJ, Pearlman MD. Guidance for evaluation and management of blunt abdominal trauma in pregnancy. Obstet Gynecol. 2019;134(6):1343-57.
28. Madden A, Meng M. Cardiopulmonary resuscitation in the pregnant patient. BJA Educ. 2020;20(8):252-8.
29. Reddy SV, Shaik NA, Gunakala K. Trauma during pregnancy. J Obstet Anaesth Crit Care. 2012;2(1):3-9.
30. Hill CC, Pickinpaugh J. Trauma and surgical emergencies in the obstetric patient. Surg Clin North Am. 2008;88(2):421-40.
31. Jain V, Chari R, Maslovitz S, Farine D, Bujold E, Gagnon R, et al. Guidelines for the management of a pregnant trauma patient. J Obstet Gynaecol Can. 2015;37(6):553-71.
32. Soar J, Perkins GD, Abbas G, Alfonzo A, Barelli A, Bierens

JJ, et al. European Resuscitation Council Guidelines for Resuscitation 2010 Section 8. Cardiac arrest in special circumstances: electrolyte abnormalities, poisoning, drowning, accidental hypothermia, hyperthermia, asthma, anaphylaxis, cardiac surgery, trauma, pregnancy, electrocution. Resuscitation. 2010;81(10):1400-33.
33. Morris Jr JA, Rosenbower TJ, Jurkovich GJ, Hoyt DB, Harviel JD, Knudson MM, et al. Infant survival after cesarean section for trauma. Ann Surg. 1996;223(5):481.
34. Aghamohamadi D, Gol MK. An Investigation Into the Effects of Magnesium Sulfate on the Complications of Succinylcholine Administration in Nulliparous Women Undergoing Elective Cesarean Section: A Double-Blind Clinical Trial. Int J Womens Health Reprod Sci. 2019;7(4):1123-32.
35. Alvandfar D, Alizadeh M, Khanbabayi Gol M. Prevalence of pregnancy varicose and its effective factors in women referred to gynecology hospitals in Tabriz. Iran J Obstet Gynecol Infertil. 2019;22(9):1-7.
36. Hasanzadeh M, Rastin Z, Babapour N. Term Natural Delivery without Complications in a Pregnant Woman with Bladder Exstrophy: A Case Report. Iran J Obstet Gynecol Infertil. 2018;21(3):103-8.
37. Sadrzadeh SM, Mousavi SM, Rezvani Kakhki B, Deldar K, Rahmani S. Trauma in Pregnancy: A Case Series and Literature Review. Iran J Obstet Gynecol Infertil. 2018;21(6):92-9.
38. Schreiner L, Crivelatti I, de Oliveira JM, Nygaard CC, Dos Santos TG. Systematic review of pelvic floor interventions during pregnancy. Int J Gynecol Obstet. 2018;143(1):10-8.
39. Bilehjani E, Fakhari S, Farzin H, Yaghoubi A, Mirinazhad M, Shadvar K, et al. The correlation between preoperative erythrocyte sedimentation rate and postoperative outcome in adult cardiac surgery. Int J Gen Med. 2017;10:15-21.
40. Nazari B, Amani L, Ghaderi L, Khanbabayi Gol M. Effects of probiotics on prevalence of ventilator-associated pneumonia in multitrauma patients hospitalized in neurosurgical intensive care unit: a randomized clinical trial. Trauma Mon. 2020;25(6):262-8.
41. Pooransari P, Ebrahimi A. Evaluation of Mother and Fetus after a Traumatic Event: An Overview. Front Emerg Med. 2021;5(1):e14.
42. Azmoude E, Ashrafizaveh A, Tara F, Dinpanah H, Azmoude H. Management of Trauma in Pregnancy: A Practical Approach to Evidence Based Care. Iran J Obstet Gynecol Infertil. 2018;21(9):101-17.
43. Hashemzadeh K, Dehdilani M, Gol MK. Study of the effects of simple exercise with or without physiotherapy on prevention of deep vein thrombosis among postmenopausal women requiring coronary artery bypass graft surgery. Int J Womens Health Reprod Sci. 2021;9(1):69-74.