World Bulletin of Public Health (WBPH)
Available Online at: https://www.scholarexpress.net
Volume-12, July 2022
ISSN: 2749-3644

COMPARISON BETWEEN SPINAL ANESTHESIA AND GENERAL ANESTHESIA FOR THE CAESAREAN SECTION: A PROSPECTIVE STUDY

HATAM FAAWY GHADHBAN[1][MBCHB]*, NASER MAHDI NASER[2] [MBCHB]
1. Karbala Health Department, Alhindia Hospital, Mousul University, Mousul, Iraq
2. Karbala Health Department, Alhusien Teaching Hospital, Karbala University, Baghdad, Iraq
Email id: alsafandia@gmail.com

Article history:

Received: May 1st 2022
Accepted: June 1st 2022
Published: July 6th 2022

Abstract:

The objective of the present study was to compare spinal and general anesthesia with respect to its neonatal outcomes in pregnant women undergoing elective cesarean section [CS]. The present study was a hospital-based prospective study conducted in Alhindia hospital, Iraq, between January 2020 to August 2020. The pregnant women [n=40] were operated on with two different types of anesthesia methods, *viz.* general anesthesia operated group [GAOG] and spinal anesthesia operated group [SAOG]. Mother health and neonatal outcome were recorded in both groups. Preoperative and post-operative blood was collected from individuals [mother]. The separated serum was analyzed for various parameters such as hemoglobin [Hb], hematocrit, platelet count, red blood count [RBCs], and total white blood count [TWBCs]. The body mass index was nonsignificantly different in GAOG and SAOG. In the GAOG group, postoperative hemoglobin content, percent hematocrit, haemogram were significantly decreased as compared to their preoperative parameters. The SAOG also showed similar findings. In the postoperative stage, SAOG showed a significantly decrease in the hemoglobin content [$p = 0.004$], hematocrit content [$p = 0.003$], platelet count [$p = 0.004$], and red blood cells value [$p = 0.004$] as compared to GAOG. In the postoperative stage, SAOG showed a nonsignificant increase in the systolic blood pressure [SBP] and decreases in the diastolic blood pressure [DBP] compared to GAOG. The newborn baby weight was found to be high in spinal anesthesia operated groups compared to GAOG. Apgar scores were higher in the SAOG individuals at 1st min and after a 5th min compared to GAOG. We can conclude that spinal anesthesia was better for the mother's health and higher Apgar score, which is a major evaluation of neonatal outcome.

Keywords: Anesthesia, Apgar score, Hemoglobin, Blood pressure

INTRODUCTION

Cesarean section (CS) is generally accomplished when normal childbirth is not possible [due to obstructed labor, cephalopelvic disproportion, antepartum hemorrhage, etc.] and the baby's or mother's life is at risk. It can save lives, but it is often performed without medical indications [1-3]. The CS mother has two choices, *i.e.,* A general anesthetic (complete body unconscious) and a regional anesthetic [numb the body from the waist down]. In general anesthesia, an amalgamation of various drugs is given intravenously and breathed to the mother [4]. Regional anesthesia has two types, *i.e.,* "epidural" and "spinal" anesthesia. An anesthetic is administered into the "epidural space" in the epidural. In the case of spinal, anesthetic is administered nearer to the spinal cord, i.e., cerebrospinal fluid in the "subarachnoid space".

In the last two decades, CS rates have been rising worldwide. A study conducted in 150 countries reported the average CS Most developed countries showed a higher rate than the least developed countries [5]. Several studies were published from various countries such as China [6, 7], Dubai [5,8], Egypt [9], Iraq [10-19], and other countries [20-28]. These reports are restricted to the study of different types of anesthesia used during CS. One important question arises here: the variation in the neonatal Apgar scores is affected by the use of general and regional anesthesia.

Scanty reports are available from Baghdad, Iraq, regarding the pros and cons of different anesthesia procedures. Also, the correlation between the neonatal outcome or maternal health and the types of anesthesia used is unclear. Similarly, further study is

World Bulletin of Public Health (WBPH)
Available Online at: https://www.scholarexpress.net
Volume-12, July 2022
ISSN: 2749-3644

needed to evaluate the association between the increasing rate of CS and private health sector expansion.
The present study may help practitioners and researchers choose the safer anesthesia method post-operative pain management. With this background, the present study aims to evaluate the effect of general and spinal anesthesia on maternal health and neonatal outcome in the Apgar score and baby weight.

MATERIAL AND METHODS

Ethical permission and individuals enrollment

The present study was a hospital-based prospective study conducted in Alhindia hospital, Iraq, between January 2020 to August 2020. The pregnant women [n=40] were operated on with two different types of anesthesia methods, *viz*. general and spinal anesthesia. These were considered two groups, *i.e.*, the general anesthesia operated group [GAOG, n=20] and the spinal anesthesia operated group [SAOG, n=20]. Inclusion criteria of the study were as follows: women should be ready to participate in the present study, and pregnancy period should be 38-40 wk. Women with high-risk pregnancies and refusal to give informed consent were excluded from the present study.

Surgery methods

The individuals were laid in the left lateral decubitus position with a left uterine displacement. During operation, the individuals were placed supine on the operating table. The operating table had a 15° left lateral tilt. Before anesthesia induction, general monitoring was carried out, including noninvasive blood pressure, bladder catheterization planning, pulse oximetry, and electrocardiogram [ECG]. The neonatal resuscitation team was also ready to receive and care for newborn. The radiological images of the enrolled individual at gestational age 23 work are depicted in Figure 1.

Figure 1: Radiological images of the enrolled individual at gestational age 23 weeks

A] General anesthesia

The individual's abdomen was draped before introducing anesthesia to reduce time in anesthesia induction and delivery. The lactated Ringer's solution was infused slowly with intravenous wide-pore catheter 18G. The preinduction oxygenation was done with 100% oxygen for about 5 min. Rapid-sequence crash introduction was done using cricoid pressure. Endotracheal tube [7–7.5 sized] was inserted using succinylcholine 1.5mg/kg and thiopentone [5 mg/kg]. Anesthesia was maintained using 0.75% isoflurane and O_2: N_2O [5–5]. The end-tidal CO_2 concentration was maintained at 32 mmHg [9]. Blood loss was measured. The anesthesia gastric tube was removed, and awake extubation was performed.

B] Spinal anesthesia

The Ringer's lactated solution [1200-1500 ml] was infused through an 18-G intravenous cannula for 15 min. The spinal anesthesia [hyperbaric bupivacaine and fentanyl] was given by intrathecal injection through a 25-G pencil-point needle. In case of hypotension, ephedrine was administered. In the case of bradycardia and shivering, Atropine [0.1 mg/kg] and pethidine [30 mg] were given, respectively [9].

C] Cesarean procedure

After applying the anesthesia, a typical lower-segment transverse uterine incision was made. All cesarean deliveries were done by the expert surgical obstetrician. Manual removal of the placenta was done. The visceral peritoneum layers were brought together with a uterine incision in a double-layer closure. Continuous suturing [1-0 polyglycolic acid] was performed.

Study parameters

World Bulletin of Public Health (WBPH)
Available Online at: https://www.scholarexpress.net
Volume-12, July 2022
ISSN: 2749-3644

Preoperative and post-operative blood was collected from individuals [mother], and serum was separated after centrifugation at 3000 rpm. The separated serum were analyzed for various parameters such as hemoglobin [Hb], hematocrit, platelet count, red blood count [RBCs], and total white blood count [TWBCs].

The newborn valuation was done by a single pediatrician. The pediatrician was kept unknown for the anesthetic technique used. After baby birth, its weight and sex; and 1st and 5th min Apgar scores were recorded. Both groups received the same postoperative treatment after complete recovery from anesthesia.

Statistical analysis

The statistical analyses were accomplished via GraphPad Prism 5 software [San Diego, CA]. All values were represented as mean ± SE [Standrad error]. The comparison was performed between general and spinal anesthesia group study parameters. The data were analyzed using a one-way analysis of variance [ANOVA] followed by Tukey kramer multiple comparison test. The p-value is less than $P<0.05$ were considered statistically significant.

RESULTS

In the present study, women undergoing CS delivery were enrolled. They were given two types of anesthesia treatment, i.e., general anesthesia and spinal anesthesia. The mean ages of enrolled women were 28.15±0.90 yr and 27.8±0.77 yr for general and spinal anesthesia operated groups. The body mass index was not significantly different in GAOG [25.80±0.91] and SAOG [24.73±0.56]. Both the groups showed nonsignificant changes in gestational age [wk], i.e., 38.4±0.27 for GAOG and 38.1±0.22 for SAOG. GAOG and SAOG showed about 1.25±0.21 and 1.5±0.27 parity, respectively. Gravidity was found to be 3.2±0.33 and 2.9±0.3 in GAOG and SAOG, respectively. The mother's age and her BMI, gestational age, parity, and gravidity are depicted in Table 1.

Preoperative and postoperative maternal hemodynamics in GAOG and SAOG are depicted in Table 2. In the GAOG, postoperative Hb content (12.76±0.27 g/dl) was decreased as compared to preoperative Hb content (11.19±0.22 g/dl). In the spinal anesthesia operated group, postoperative Hb content (12.94±0.19 g/dl) was decreased as compared to preoperative Hb content (9.94±0.22 g/dl). Preoperative Hb content was comparable in both groups. In the postoperative stage, SAOG showed a significant decreased ($p = 0.004$) in the Hb content as compared to GAOG.

In the GAOG, postoperative percent hematocrit (32.16±0.82) was decreased as compared to preoperative percent hematocrit content (38.30±0.72). In the spinal anesthesia operated group, postoperative percent hematocrit (35.1±0.62) was nonsignificantly decreased compared to preoperative percent hematocrit (37.74±0.78). Preoperative hematocrit content was comparable in both groups. In the postoperative stage, SAOG showed a significant increase ($p = 0.003$) in the hematocrit content as compared to GAOG.

In both the group, postoperative platelet count was nonsignificantly decreased compared to preoperative platelet count. The preoperative platelet count in GAOG (241.6±11.39 × 10^9/L), was high compared to the SAOG (176.5±3.47 x 10^9/L). In the postoperative stage, SAOG showed a significant decrease ($p = 0.004$) in the platelet count compared to GAOG.

In both anesthesia operated group, postoperative Red blood counts value was significantly decreased as compared to preoperative value. The preoperative RBCs value in GAOG (4.38±0.12 x 10^{12}/L) was nonsignificantly lower than the SAOG (4.77±0.12 x 10^{12}/L). In the postoperative stage, SAOG showed a significant increase ($p = 0.004$) in the RBCs value compared to GAOG.

In the GAOG and SAOG, postoperative [TWBCs] was increased as compared to preoperative percent TWBCs parameters. In the spinal anesthesia operated group, postoperative TWBCs (10.47±0.39 x 10^9/L) was nonsignificantly decreased compared to preoperative TWBCs (10.39±0.40 x 10^9/L). Preoperative TWBCs were comparable in both groups. In the postoperative stage, SAOG showed a nonsignificant decrease in the TWBCs as compared to GAOG.

The systolic and diastolic blood pressure (DBP) of GAOG and SAOG shown in Figures 2 and 3. In the , postoperative systolic blood pressure (SBP) (104.3±2.59) was decreased as compared to preoperative SBP (103.3±2.11). In the spinal anesthesia operated group, postoperative SBP (117.35±2.90) was increased as compared to preoperative SBP (107.7±2.18). Preoperative SBP was comparable in both groups. In the postoperative stage, SAOG showed an increase in the SBP compared to GAOG.

In the spinal anesthesia operated group, postoperative (DBP] [68.54±1.80) was decreased as compared to preoperative DBP (69.51±1.29). In the GAOG, postoperative DBP (72.75±1.23) was significantly decreased ($p<0.001$) as compared to preoperative SBP (63.85±1.08). A significant difference ($p<0.05$) was observed between preoperative DBP in GAOG (63.85±1.08) and SAOG (69.51±1.29). In the postoperative stage, SAOG showed decreases in the DBP compared to GAOG.

The neonatal outcome in terms of baby weight and Apgar score (1st and 5th min) is depicted in Table 3.

The newborn baby weight was found to be nonsignificant high in the spinal anesthesia operated groups (3176.35±33.46gm) compared to GAOG (2801.55±115.72gm). Apgar scores were found to be high in the SAOG individuals at 1st min and after a 5th min compared to GAOG.

The data regarding post-operative follow-up of enrolled individuals are depicted in Table 4. Hospital stay, post-operative pain intensity, post-operative pain, the prevalence of pain 6 wk, and ability to do work normally after delivery was recorded until 6 wk. In both groups, pain prevalence was not reported after 6 wk.

Table 1. Demographic data of the GAOG and SAOG

Variables	General anesthesia	Spinal anesthesia	p-value
Age [yr]	28.15±0.90	27.8±0.77	0.2157
BMI [kg/m^2]	25.80±0.91	24.73±0.56	0.3691
Gestational age [wk]	38.4±0.27	38.1±0.22	0.3496
Parity	1.25±0.21	1.5±0.27	0.4800
Gravidity	3.2±0.33	2.9±0.3	0.5266

Data presented as mean ± SE. BMI: Body mass index

Table 2. Preoperative and postoperative maternal hemodynamics in GAOG and SAOG

Variables	GAOG		SAOG		p-value
	Preoperative	Postoperative	Preoperative	Postoperative	
Hemoglobin [g/dl]	12.76±0.27	11.19±0.22	12.94±0.19	9.94±0.22	0.004
Hematocrit [%]	38.30±0.72	32.16±0.82	37.74±0.78	35.1±0.62	0.003
Platelet count [x 10^9 /L]	241.6±11.39	217.45±8.01	176.5±3.47	177.1±1.28	0.004
RBCs [x 10^12 /L]	4.38±0.12	3.02±0.06	4.77±0.12	3.66±0.05	0.004
TWBCs [x 10^9 /L]	10.58±0.49	11.75±0.56	10.39±0.40	10.47±0.39	0.000

Data presented as mean±SE. RBCs: Red blood count; TWBCs: Total white blood count; GAOG: General anesthesia operated group SAOG: Spinal anesthesia operated group

Table 3. The neonatal outcome of the GAOG and SAOG

Variables	General anesthesia	Spinal anesthesia	p-value
Neonatal body weight [g]	2801.55±115.72	3176.35±33.46	0.0036
Apgar scores at 1st min	5.5±0.25	7.2±0.23	0.0006
Apgar scores [5th min]	6.7±0.24	8.15±0.27	0.0002

Data presented as mean±SE.

Table 4. Post-operative follow-up of enrolled individuals

Variables	General anesthesia	Spinal anesthesia
Hospital stay	3-4 days	5-6 days
Post-operative pain intensity	Moderate	less
During the post-operative pain	3-4 wk	2-3 wk
Prevalence of pain 6 weeks	No	No
Ability to do work normally after delivery	Yes, after 4 wks	Yes, after 3 wk

World Bulletin of Public Health (WBPH)
Available Online at: https://www.scholarexpress.net
Volume-12, July 2022
ISSN: 2749-3644

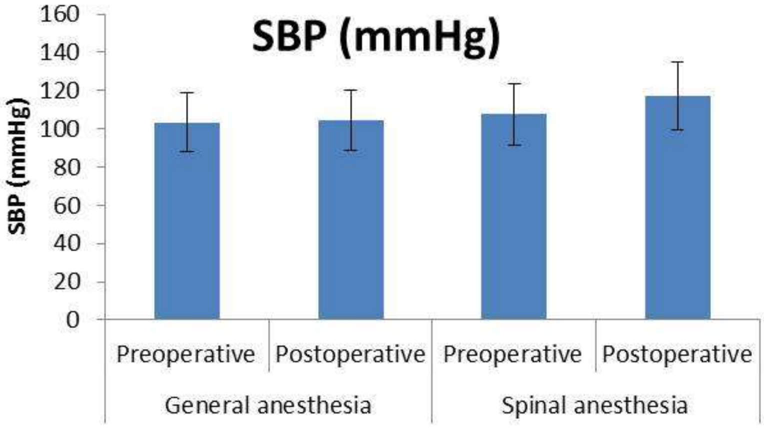

Figure 2. SBP of GAOG and SAOG

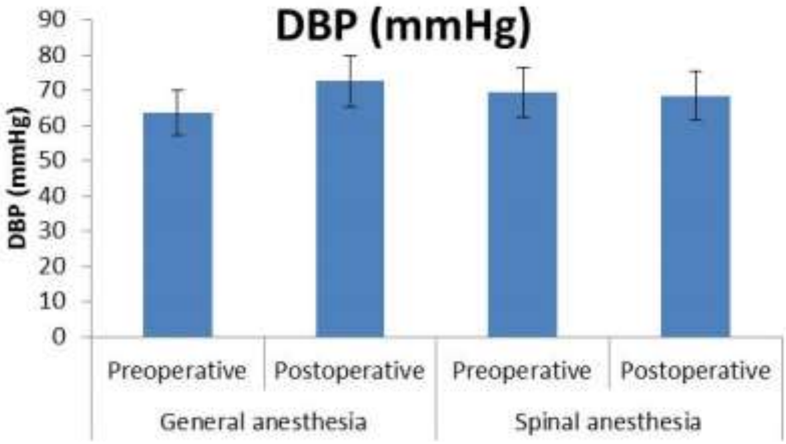

Figure 3. DBP of GAOG and SAOG

DISCUSSION

Several reports are available to compare the general anesthesia and spinal or epidural anesthesia [29-36]. A study conducted between 2008 and 2012 in Center-South and Kurdistan Region and various governorates of Iraq reveals that the cesarean sections rate increased from 18.0% in 2008 to 24.4% in 2012. Also, this rate was remarkably higher in private hospitals (77.9%) as compared to in public hospitals (29.3%) [18]. Some reported no significant difference in the Apgar score depending on the anesthesia used [37]. Study [38] suggested the need for a multidimensional approach to explore regional cesarean birth rates and a qualitative study to investigate the factors affecting birth process choice in specific cultures [38]. Various reports are available to increase the white blood count [WBCs] in the general anesthesia used [39-42]. In the present study, both groups showed an increment in the WBC after the Caesarean section. While general anesthesia group were showed more increase than the spinal anesthesia treated group. This can be treated as a general side effect, which might be due to direct infusion in blood.

Similarly, RBC was also decreased after the Caesarean section in the present study. The GAOG showed a significantly lower red blood cells count than SAOG. The reason might be the same as for white blood count.

The combination of spinal–epidural anesthesia group was reported to show more Apgar score at 1st and after 5th min of birth compared to general anesthesia used women group [43]. The combination of the spinal–epidural anesthesia group showed significantly high 3 and low tachycardic levels compared to the general anesthesia used group. Our results are in accordance with these reports. Some studies reported that the 5th min Apgar score in the general anesthesia and spinal anesthesia treated women is similar [44-46]. Some study reported 25.9% of general anesthesia operated neonates and 1.1% spinal anesthesia operated neonates showed 1at min Apgar scores less than 7 [45]. Then, the Apgar score was around nine at 5th min in both groups. Our study contradicts these reports. In our study, the newborn baby's weight was nonsignificant high in the spinal anesthesia operated groups (3176.35±33.46 gm) compared to GAOG

World Bulletin of Public Health (WBPH)
Available Online at: https://www.scholarexpress.net
Volume-12, July 2022
ISSN: 2749-3644

[2801.55±115.72 gm]. Apgar scores were found to be high in the SAOG individuals at 1st min and after a 5th min compared to GAOG.
Various authors reported the meta-analysis reports on diverse anesthesia types used and concluded that spinal anesthesia was not safer for the fetus than general anesthesia [47-50]. Our results are contradictory to these results. In our study, spinal anesthesia was safer than general anesthesia. Some author reported that the spinal anesthesia used women had less intraoperative blood loss than general anesthesia used women. Spinal anesthesia was also associated with more than 7 Apgar scores at 1st-min. However, there was a non-significant difference in both groups 5th min Apgar score. Our results are in accordance with this report [46].
Through the spinal anesthesia was found to be safer for neonates and mothers. More emphasis should be given to reducing post-operative pain management. Further, the study can be conducted on the significant scale levels with an increased number of individuals for a deeper understanding the anesthesia use and its outcome.

CONCLUSION

In the postoperative stage, SAOG showed a significant decrease in the Hb content, hematocrit content, platelet count, and RBCs value as compared to GAOG. While, after the operation, SAOG showed a nonsignificant decrease in the TWBCs as compared to GAOG. A significant difference was observed between preoperative SBP and DBP in GAOG and SAOG. In the postoperative stage, SAOG showed a significant increased in the SBP and decreases in the DBP compared to GAOG. Apgar scores were found to be higher in the SAOG individuals at 1st min and after a 5th min as compared to GAOG. We can conclude that spinal anesthesia was better for the mother's health and higher Apgar score, which is a major evaluation of neonatal outcome.

Author Contributions

HFG designed the study. HFG and NMN conducted the research. HFG monitored, evaluated, and analyzed the result of the study. Further, HFG and NMN reviewed the article. All authors approved the final manuscript and take responsibility for the integrity of the data.

Conflict of Interests

None.

Ethical Issues

The study protocol was approved by the Ethics Committee of Karbala University [EC: KU/2019/12/227]. Oral informed consent was obtained from all participants.

Financial Support

None.

Acknowledgments

The authors thankfull to Ms. Teba Dhahir Mansour [Ministry of Health, Iraq] and Dr. Pallavi Chandrakant Mandave [Assistant professor, Yashavantrao Chavan Institute of Science, India] for their valuable inputs in manuscript completion.

REFERENCES

1. Zakerihamidi M, Latifnejad Roudsari R, Merghati Khoei E. Vaginal Delivery vs. Cesarean Section: A Focused Ethnographic Study of Women's Perceptions in The North of Iran. Int J Community Based Nurs Midwifery. 2015; 3[1]:39-50.
2. Ugwa E, Ashimi A, Abubakar MY. Caesarean section and perinatal outcomes in a sub-urban tertiary hospital in North-West Nigeria. Niger Med J. 2015; 56: 180-184.
3. Byamugisha J, Adroma M. Recent advances in cesarean delivery, Edited by Georg Schmolzer, 2020.
4. Yeoh SB., Leong SB., Heng AS. Anaesthesia for lower-segment caesarean section: Changing perspectives. Indian J Anaesth. , 2010, 54]: 409-414.
5. Khawaja M, Choueiry N, Jurdi R. Hospital-based caesarean section in the Arab region: an overview. East Mediterr Health J. 2009; 15: 458-469.
6. Lei H, Wen SW, Walker M. Determinants of caesarean delivery among women hospitalized for childbirth in a remote population in China. J Obstet Gynaecol Can. 2003; 25: 937-943.
7. Feng XL, Xu L, Guo Y, et al. Factors influencing rising caesarean section rates in China between 1988 and 2008. Bull World Health Organ. 2012; 90: 30–39, 39A.
8. Jarjees YT. Cesarean section rates at Al-Batool maternity teaching hospital. Al-Kindy Col Med J. 2011;7[1]:1–4.
9. Madkour NM, Ibrahim SA, Ezz GF. General versus spinal anesthesia during elective cesarean section in term low-risk pregnancy as regards maternal and neonatal outcomes: a prospective, controlled clinical trial. Research and Opinion in Anesthesia & Intensive Care. 2019, 6:119–124.
10. Al-Obaidi, M, Abbas A., Kamal A., Salloom D. Salloom, Bayan S. Understanding of cesarean section operations [CSO] causes in Baghdad province, Iraq. The 5th International Scientific

World Bulletin of Public Health (WBPH)
Available Online at: https://www.scholarexpress.net
Volume-12, July 2022
ISSN: 2749-3644

Conference of Medical and Health SpecialtiesAt: Middle Technical University [MTU] / Medical Technology Institute / Baghdad, 2021
11. Al-Naimy MM, Yassin BG, AL-Kazzaz HB. Comparison of Rate of Caesarean Section between Governmental and Private Hospitals in Baghdad City. The Iraqi Post graduate Medical Journal. 2013; 12 [2]: 288-295.
12. Habib HA, Abdulla MM, Yacoub SE. Knowledge and preference of mothers delivering at AL-Kadhumyia teaching hospital regarding caesarean section and normal vaginal delivery. Iraqi Postgrad Med J. 2011; 10: 512–518.
13. Byamugisha J , Adroma M. Caesarean Section in Low, Middle and High Income Countries. In Recent Advances in Cesarean Delivery, 2020.
14. Hassain GS. Cesarean section in Babylon Province. Int. Journal Medicine Sci. 2015; 3 [4]: 113-115.
15. Mohammad EM, AL-Ghabban SI, AL-Alak MM. Indications of primary caesarean sections among Iraqi women in Karbala city. International Journal of Current Pharmaceutical Research. 2018; 11 [6]: 123-125
16. Anthony CR, Moore M, Hilborne LH, et al. Health sector reform in the Kurdistan Region-Iraq: financing reform, primary care, and patient safety. Rand Health Q. 2014; 4: 2
17. Shabila NP. Provider-induced demand in healthcare market: the case of Iraqi Kurdistan region. Zanco J Med Sci. 2013; 17[3]: 482-493.
18. Shabila NP. Rates and trends in cesarean sections between 2008 and 2012 in Iraq. BMC Pregnancy and Childbirth. 2017; 17: 22. doi.org/10.1186/s12884-016-1211-6
19. Mehedi S, Al-Diwan J, Al-Hadithi T. Cesarean section rate in a sample of primigravida women in the public maternity hospital in Erbil city, Iraq. Int J Women's Health Reprod. Sci. 2018, 6: 150–153.
20. Mossialos E, Allin S, Karras K, et al. An investigation of caesarean sections in three Greek hospitals: the impact of financial incentives and convenience. Eur J Public Health. 2005; 15: 288–295.
21. Althabe F, Sosa C, Belizán J, et al. Caesarean section rates and maternal and neonatal mortality in low-, medium- and high-income countries: an ecological study. Birth. 2006; 33: 270–277.
22. MacDorman MF, Declercq E, Menacker F, et al. Infant and neonatal mortality for primary caesarean and vaginal births to women with "no indicated risk," United States, 1998–2001 birth cohorts. Birth. 2006; 33:175–182.
23. Stanton C, Holtz S. Levels and trends in caesarean birth in the developing world. Stud Fam Plann. 2006; 37: 41–48.
24. Villar J, Valladares E, Wojdyla D, et al. Caesarean delivery rates and pregnancy outcomes: the 2005 WHO global survey on maternal and perinatal health in Latin America. Lancet. 2006; 367: 1819–1829.
25. Oladapo TO, Lamina MA, Sule-Odu AO. Maternal morbidity and mortality associated with elective caesarean delivery at a university hospital in Nigeria. Aust N Z J Obstet Gynaecol. 2007; 47: 110–114.
26. Tollånes MC. Increased rate of caesarean sections - causes and consequences. Tidsskr Nor Laegeforen. 2009; 129: 1329–1331.
27. Betrán AP, Ye J, Moller AB. The increasing trend in caesarean section rates: Global, regional and national estimates: 1990–2014. PLoS One. 2016;11: e0148343.
28. Ye J, Zhang J, Mikolajczyk R, et al. Association between rates of caesarean section and maternal and neonatal mortality in the 21st century: a worldwide population-based ecological study with longitudinal data. BJOG. 2016; 123: 745–753.
29. Bourke DL, Smith TC. Estimating allowable hemodilution. Anesthesiology. 1974; 41: 609–611.
30. Kolås T, Saugstad OD, Daltveit AK, et al. Planned cesareanversus planned vaginal delivery at term: comparison of newborn infant outcomes. Am J Obstet Gynecol. 2006; 195: 1538–1543.
31. Ronsmans C, Graham WJ. Maternal mortality: who, when, where, and why. Lancet. 2006; 368: 1189–1200.
32. Liu S, Liston RM, Joseph KS, et al. Maternal mortality and severe morbidity associated with low-risk planned cesarean delivery versus planned vaginal delivery at term. CAMJ. 2007, 176: 455–460
33. Bucklin BA, Hawkins JL, Anderson JR, et al. Obstetric anesthesia workforce survey: twenty-year update. Anesthesiology. 2009, 103: 521–551.
34. Reynolds F. General anesthesia is unacceptable for elective cesarean section. Int J Obstet Anesth. 2010; 19: 212–217.
35. Wong CA. General anesthesia is unacceptable for elective cesarean section. Int J Obstet Anesth. 2010; 19: 209–212.
36. Saygı Aİ, Özdamar Ö, Gün İ, et al. Comparison of maternal and fetal outcomes among

patients undergoing cesarean section under general and spinal anesthesia. Sao Paulo Med J 2015; 133: 227–234.
37. Solangi SA, Siddiqui SM, Khaskheli MS, et al. Comparison of the effects of general vs spinal anesthesia on neonatal outcome. Anaesth Pain Intens Care. 2012, 16: 18-23
38. Jadoon B; Mahaini R; Gholbzouri K. Determinants of over and underuse of caesarean births in the Eastern Mediterranean Region: an updated review. East Mediterr Health J. 2019, 25: 837–846.
39. Lemke KA, Runyon CL, Horney BS. Effects of preoperative administration of ketoprofen on whole blood platelet aggregation, buccal mucosal bleeding time, and hematologic indices in dogs undergoing elective ovariohysterectomy. J Am Vet Med Assoc. 2002, 220: 1818-1822.
40. Ismail ZB, Jawasreh K, Ahmad Al-Majali A. Effects of xylazineketamine- diazepam anesthesia on blood cell counts and plasma biochemical values in sheep and goats. Comp Clin Pathol. 2010, 19: 571–574.
41. Al-Mashhadani HA, Saleh KA. Electro-polymerization of poly Eugenol on Ti and Ti alloy dental implant treatment by micro arc oxidation using as Anti-corrosion and Anti-microbial. Research Journal of Pharmacy and Technology. 2020;13(10):4687-96.
42. Khalaf FH, AL-Zuhairi AH, Al-Mutheffer EA. Clinical and hematological effect of Acepromazine, Midazolam, Ketamine as general anesthesia protocol in rabbits. I.J.S.N. 2014, 5: 328-331.
43. Alnour TM, Shaktur AT, Ayyad RA, et al. Comparison between the side effects of spinal and general anesthesia during caesarean section in Tripoli-Libya. J Anesth Clin Res. 2015, 6: 560 9.
44. Abdallah MW, Elzayyat NS, Abdelhaq MM, et al. A comparative study of general anesthesia versus combined spinal–epidural anesthesia on the fetus in cesarean section. Egypt J Anaesth. 2014, 30, 155-160.
45. Korkmaz F, Eksioglu B, Hanci A,. Comparison of combined spinal epidural block and general anesthesia for cesarean section. Reg Anesth Pain Med. 2004; 29: 77.
46. Mancuso A, De Vivo A, Giacobbe A, et al. General versus spinal anesthesia for elective caesarean sections: effects on neonatal short-term outcome: a prospective randomized study. J Matern Fetal Neonatal Med 2010; 23: 1114–1118.
47. Obi VO, J. Umeora OU. Anesthesia for emergency cesarean section: A comparison of spinal versus general anesthesia on maternal and neonatal outcomes. Afr J Med Health Sci 2018; 17: 31-34.
48. AlMashhadani HA. Study the effect of punica granatum as oral antifungal on the corrosion inhibition of dental amalgam alloy in saliva. Journal of Materials and Environmental Science. 2018;9(2):662-71.
49. Dyer RA, Els I, Farbas J,. Prospective, randomized trial comparing general with spinal anesthesia for cesarean delivery in preeclampsia patients with a non-reassuring fetal heart trace. Anesthesiology. 2003; 99: 561–569.
50. Petropoulos G, Siristatidis C, Salamalekis E,. Spinal and epidural versus general anesthesia for elective cesarean section at term: effect on the acid-base status of the mother and newborn. J Matern Fetal Neonatal Med. 2003; 13: 260–266.
51. Reynolds F, Seed PT. Anesthesia for caesarean section and neonatal acidbase status: a meta-analysis. *Anaesthesia.* 2005; 60: 636–653.
52. Mazzoni A, Althabe F, Liu NH, et al. Women's preference for caesarean section: a systematic review and metaanalysis of observational studies. *BJOG.* 2011; 118: 391–399.