Obstetric trauma admissions in a Level-1 trauma centre in South Africa: A 5-year retrospective review

N B Moyo,[1,2] BSc, MB ChB, FCOG (SA), MMed (O&G)**; R E Mashayamombe,**[1,2] MB ChB, FCOG (SA), MMed (O&G)**; R B Nyakoe,**[1,2] MB ChB, FCOG (SA), Cert MFM (SA)**; G D Nethathe,**[1,3,4] MB ChB, DA (SA), MMed (Anaes), FCA (SA), FANZCA, Cert Crit Care (SA)

[1] *School of Clinical Medicine, Faculty of Health Sciences, University of the Witwatersrand, Johannesburg, South Africa*
[2] *Department of Obstetrics and Gynaecology, Chris Hani Baragwanath Academic Hospital, Johannesburg, South Africa*
[3] *Department of Anaesthesia and Peri-Operative Medicine, Royal Brisbane and Women's Hospital, Brisbane, Australia*
[4] *Mayne Academy of Critical Care, Faculty of Medicine, University of Queensland, Brisbane , Australia*

Corresponding author: *N B Moyo (brcm437@gmail.com)*

Background. The severity of injury and associated management determine maternal and fetal outcomes in pregnant trauma patients.
Objective. To describe the characteristics, mechanisms of injury, clinical interventions and maternal and fetal outcomes of obstetric trauma admissions at our institution.
Methods. This was a retrospective record review of pregnant trauma patients admitted to Chris Hani Baragwanath Academic Hospital over a 5-year period (*N*=800). Patient records from several departments were reviewed, including the intensive care unit (ICU). Data were collected on sociodemographics, mechanism of injury, clinical interventions, and maternal and fetal outcomes.
Results. The median maternal age and gestational age were 31.00 years and 26.00 weeks, respectively. Most patients were black African (*n*= 713; 89.1%) and the majority (70.3%; *n*=562) were single. More than half (n=484; 60.5%) were unemployed. Assault was the most frequent cause of trauma (*n*=330; 41.3%), followed by falls (*n*=265; 33.1%) and motor vehicle accidents (*n*=204; 25.5%). Almost a fifth of the patients (*n*=141; 18.0%) reported recent alcohol consumption. Four patients (0.5%) were admitted to ICU, of whom one died. Ten fetal deaths were recorded, of which three were delivered by patients admitted to ICU. Eleven neonates were delivered before 37 weeks.
Conclusion. Our results show that pregnant patients who are single and unemployed were at increased risk of obstetric trauma. Assaults, falls and motor vehicle accidents were the most common causes of maternal trauma in our sample. Implementing strategies to detect and prevent intimate partner violence and improve road safety may contribute to reduced maternal and fetal mortality.
Keywords. Trauma, pregnancy, gender-based violence, blunt abdominal trauma, penetrating abdominal trauma, pregnancy outcomes

S Afr J Obstet Gynaecol 2025;31(1):e1467. https://doi.org/10.7196/SAJOG.2025.v31i1.1467

Trauma complicates about 6 - 8% of pregnancies worldwide and is the leading cause of non-obstetric deaths.[1] It remains the most common cause of fetal demise worldwide.[2] Little is known about the impact of obstetric trauma in developing countries, as available literature is mostly from high-income countries.[3] A retrospective study conducted at the Pietermaritzburg Metropolitan Trauma Service, South Africa (SA), which included 1 075 female trauma patients, found that 4% (*n*=42) of female trauma patients were pregnant at the time of presentation.[4] The possibility of pregnancy should thus be considered in all injured females between the ages of 10 and 50 years.[5] Trauma in pregnant patients has been reported to increase the risk of spontaneous abortion, preterm labour, uterine rupture, placental abruption and stillbirth.[6]

In a systematic review of data, Mendez-Figueroa *et al.*[6] found that motor vehicle accidents and domestic violence accounted for most cases of trauma in pregnancy in the US;[6] burns, suicide, falls and homicide accounted for the remainder. As a mechanism of injury, falls account for 22% of trauma in pregnancy worldwide and are associated with 3% of fetal deaths.[7,8]

Notably, domestic violence is reported to occur in 4 - 8% of all pregnancies in the US.[1] Associated risk factors include a lower socioeconomic status, being single, classification as African-American or Hispanic, and being younger than 26.[9] Globally, head and neck injuries are the most common causes of trauma-related maternal death in pregnancy, with the most common aetiology for head injuries attributed to motor vehicle accidents.[10]

SA has one of the highest rates of interpersonal trauma; however, local institutional data on the prevalence, mechanisms of injury and outcomes of obstetric trauma remain limited. In this study, we describe clinical characteristics and the clinical management of obstetric trauma admissions at our institution.

Methods

This was a retrospective review of data of all pregnant patients admitted to Chris Hani Baragwanath Academic Hospital (CHBAH) with a diagnosis of trauma. Patient records from the intensive care unit (ICU) and the obstetrics and gynaecology, general surgery, orthopaedics, and emergency departments between 1 January 2015 and 31 December 2019 were included.

A total of 823 patients records were identified from the hospital registry. Of these, 23 records were excluded because of incomplete data. Data from 800 patient records over the 5-year period were therefore reviewed.

Demographic data, as well as information about the mechanism of injury, injury severity, clinical management interventions, and

maternal and fetal outcomes, were collected. We excluded pregnant patients admitted for reasons other than trauma.

Data were captured and entered into REDCap (Research Electronic Data Capture) system and statistical analysis was conducted in consultation with a biostatistician. Categorical variables were described using frequencies and percentages. Continuous variables were described using means and standard deviations (SDs) or medians and associated interquartile ranges (IQRs).

Ethical considerations

Ethical approval was obtained from the Ethics Committee of the University of the Witwatersrand (ref. no. M210317). Institutional permission was obtained from the chief executive officer of CHBAH (GP_202011_030) and the respective heads of departments.

Results

Demographics

The median age was 31 years. The majority of patients were black (*n*=713; 89.1%), 562 (70.3%) were single and 484 patients (60.5%) were unemployed. Close to a fifth (*n*=141; 17.6%) reported recent alcohol consumption. Almost all patients (*n*=798; 99.8%) were aware of their pregnancy status on admission. Additional sociodemographic characteristics are listed in Table 1.

Presenting physiology

The presenting physiology is summarised in Supplementary Table 1 (http://coding.samedical.org/file/2344). The majority of patients were admitted with normal blood pressure (systolic: <120 mmHg; diastolic: <80 mmHg) and a normal pulse (60 - 100 bpm). Although the presenting blood pressure and pulse rates were statistically significantly different, the differences were not clinically significant.

Indications for admission and mechanism of injury

Assaults were the most frequent cause of traumatic injury (*n*=330; 41.3%), followed by falls (*n*=265; 33.1%) and motor vehicle accidents (*n*=204; 25.5%) (Table 2 and Supplementary Table 1; http://coding.samedical.org/file/2344). Sites of injury were as follows: head and neck region (*n*=228); limbs (*n*=551); thoracic region (*n*=264); abdominal region (*n*=350); and pelvic region (*n*=22). Six cases of uterine injuries were noted. The total number of injuries surpasses the total number of patients owing to some patients sustaining more than one injury (Supplementary Table 2; http://coding.samedical.org/file/2344).

Risk factors

The median (IQR) age of patients was 31 (27 - 37) years. Close to a fifth (*n*=141; 17.6%) reported alcohol consumption. The majority of patients self-identified as black African (*n*=713; 89.1%), followed by coloured (*n*=84; 10.5%) and white (*n*=3; 0.4%) patients. More than half of the patients (*n*=486; 60.5%) were unemployed (Table 3).

Investigations and clinical management

Investigations

Point-of-care ultrasounds were performed on 255 of 258 (99%) patients who were seen in the emergency department. Obstetrics ultrasounds were performed on all patients seen in the obstetrics department (*n*=542; 100%). Of the 127 radiographs performed, 22 were of the pelvis, three of the cervical spine, one of the skull, seven of the lumbar spine, 69 of lower extremities, 14 of upper extremities and 11 of the chest. Computed tomography was performed on 13 patients; 12 of these scans were of the head and one was of the head as well as the abdomen. Magnetic resonance imaging was performed on one patient.

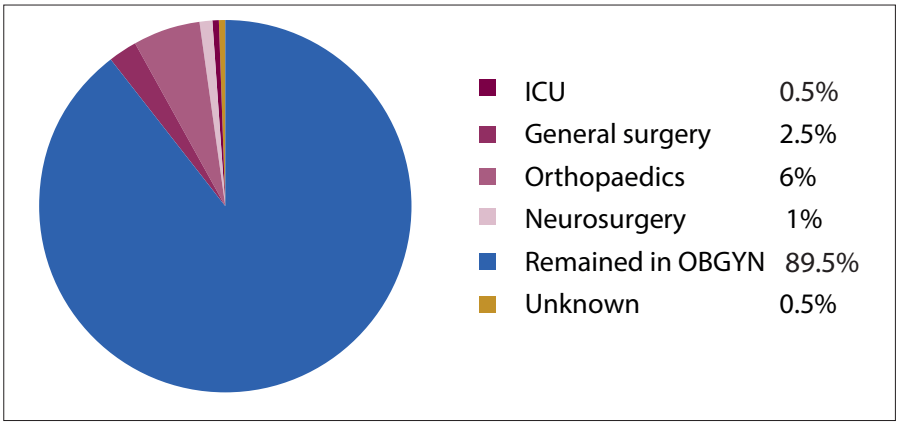

Fig. 1 Patients transferred to other departments (n=80).

Management

As shown in Fig. 1, 80 patients were transferred to other departments for further management. Of the total study sample (*N*=800), 20 (2.5%) were referred to the department of general surgery; none underwent a major operative procedure. Two patients (0.25%) were treated for human bite wounds, 15 (1.9%) had lacerations sutured and three (0.4%) were treated for haemopneumothorax.

Of the 48 patients (6%) referred to the orthopaedics department, 34 (*N*=800; 4.25%) were discharged without any operative management. Four patients (0.5%) had stable fractures of lower limbs and one (0.12%) had a stable fracture of the upper limb for which a plaster-of-Paris cast was applied. One patient (0.12%) had fractured phalanges of the hand, which were treated with K-wires. Two patients (0.25%) were managed with open reduction and internal fixation for humeral and femur fractures, respectively. The patient with a pelvic fracture underwent surgery while admitted to the ICU. One (0.12%) patient had a fracture of the patella, which was treated with K-wires. Five (0.6%) patients were treated for soft-tissue injuries of the ankle and knees, with back slab casts applied.

Eight patients were referred to the neurosurgery department for observation over a period of 24 - 48 hours, none of whom underwent an operative procedure. A breakdown of all procedures is listed in Supplementary Table 3 (http://coding.samedical.org/file/2344).

Four patients were admitted to ICU (*N*=800; 0.50%), of whom three were intubated and ventilated. One patient was admitted for observation after sustaining a head injury in a motor vehicle accident. Three patients were operated on: one had a caesarean section, caesarean hysterectomy and exploratory laparotomy after a gunshot wound to the abdomen; one patient had internal fixation of the pelvis, a caesarean section and exploratory laparotomy after being involved in a vehicle accident; and one patient had a laparotomy after sustaining a gunshot to the abdomen. The majority of patients (*n*=716; 89.5%) were cared for in

Table 1. Sociodemographic characteristics of obstetric trauma patients admitted at CHBAH between 1 January 2015 and 31 December 2019

Characteristic	2015 (n=142)	2016 (n=187)	2017 (n=157)	2018 (n=173)	2019 (n=141)	Total (N=800)	p-value*
Age (years), median (IQR)	33.00 (29.00 - 37.00)	34.00 (29.00 - 39.00)	32.00 (28.00 - 37.00)	29.00 (25.00 - 34.00)	29.00 (25.00 - 34.00)	31.00 (27.00 - 37.00)	< 0.01
Parity, median (IQR)	1.00 (0.00 - 2.00)	1.00 (0.00 - 2.00)	1.00 (0.00 - 2.00)	0.00 (0.00 - 2.00)	1.00 (0.00 - 2.00)	1.00 (0.00 - 2.00)	< 0.01
Gestational age (wk), median (IQR)	28.50 (23.00 - 33.00)	26.00 (22.00 - 29.00)	26.00 (22.00 - 32.00)	26.00 (23.00 - 30.00)	26.00 (24.00 - 30.00)	26.00 (23.00 - 31.00)	0.0034
Gestational age at ANC booking, median (IQR)	19.00 (16.00 - 22.000	17.50 (14.00 - 29.00)	18.00 (14.40 - 20.00)	18.00 (15.50 - 20.00)	18.00 (16.00 - 20.00)	18.00 (15.00 - 20.00)	0.235
Race, n (%)							
Black	133 (93.7)	163 (87.2)	139 (88.5)	152 (87.9)	126 (89.4)	713 (89.1)	
White	1 (0.7)	0 (0.0)	2 (1.3)	0 (0.0)	0 (0.0)	3 (0.4)	0.216
Coloured	8 (5.6)	24 (12.8)	16 (10.2)	21 (12.1)	15 (10.6)	84 (10.5)	
Marital status, n (%)							
Married	51 (35.9)	74 (39.6)	43 (27.4)	40 (23.1)	30 (21.3)	238 (29.8)	<0.001
Single	91 (64.1)	113 (60.4)	114 (72.6)	133 (76.9)	111 (78.7)	562 (70.3)	
Employment status, n (%)							
Unemployed	90 (63.4)	99 (52.9)	81 (51.6)	115 (66.5)	99 (70.2)	484 (60.5)	0.001
Employed	52 (36.6)	88 (47.1)	76 (48.4)	58 (33.5)	42 (29.8)	316 (39.5)	
Social habits, n (%)							
No adverse social habits	101 (73.7)	148 (82.2)	129 (83.8)	142 (82.1)	106 (76.3)	626 (79.9)	
Smoking	3 (2.2)	3 (1.7)	3 (1.9)	2 (1.2)	3 (2.2)	14 (1.8)	0.550
Alcohol use	32 (23.4)	29 (16.1)	21 (13.6)	29 (16.8)	30 (21.6)	141 (18.0)	
Recreational substance use	1 (0.7)	0 (0.0)	1 (0.6)	0 (0.0)	0 (0.0)	2 (0.3)	
ANC attendance, n (%)							
No	47 (33.1)	67 (35.8)	53 (33.8)	61 (35.3)	48 (34.0)	276 (34.5)	0.985
Yes	95 (66.9)	120 (64.2)	104 (66.2)	112 (64.7)	93 (66.0)	524 (65.5)	
Pregnant at admission, n (%)							
No	1 (0.7)	0 (0.0)	0 (0.0)	1 (0.6)	0 (0.0)	2 (0.3)	0.535
Yes	141 (99.3)	187 (100.0)	157 (100.0)	172 (99.4)	141 (100.0)	798 (99.8)	

*Kruskall–Wallis test used for numerical variables; chi-squared test or Fisher's exact test used for categorical variables.
CHBAH = Chris Hani Baragwanath Academic Hospital; IQR = interquartile range; ANC = antenatal care

Table 2. Mechanism of traumatic injury

Mechanism	2015 (*n*=142)	2016 (*n*=187)	2017 (*n*=157)	2018 (*n*=173)	2019 (*n*=141)	Total (*N*=800)	*p*-value*
Fall, *n* (%)	52 (36.6)	59 (31.6)	60 (38.2)	52 (30.1)	42 (29.8)	265 (33.1)	0.169
Motor vehicle accident, *n* (%)	36 (25.4)	56 (29.9)	36 (22.9)	49 (28.3)	27 (19.1)	204 (25.5)	
Assault, *n* (%)	53 (37.3)	72 (38.5)	61 (38.9)	72 (41.6)	72 (51.1)	330 (41.3)	

*Kruskall–Wallis test used for numerical variables; chi-squared test or Fisher's exact test used for categorical variables.

the obstetrics and gynaecology department. Supplementary Table 4 (http://coding.samedical.org/file/2344) outlines the investigations interventions in ICU.

Fetal and maternal outcomes

One maternal death and 10 fetal deaths were recorded. Of the fetal deaths, three were of patients admitted to ICU. The remaining seven were recorded in the obstetrics and gynaecology department; one was a macerated stillbirth and six were confirmed abruptio placentae at caesarean section. Threatened miscarriages were noted in seven cases and 11 preterm deliveries were recorded, four of these by caesarean section. All preterm deliveries survived (Supplementary Table 5; http://coding.samedical.org/file/2344). Caesarean sections were performed in eight deliveries at term (Supplementary Table 6; http://coding.samedical.org/file/2344).

Discussion

Gender-based violence is a social burden that predominantly affects women of poor socioeconomic status in SA.[11] Findings from our study reflect this too: 484 (60.5%) pregnant trauma patients were unemployed. Close to half of the total sample (*n*=330; 41.3%) presented with assault as a mechanism of traumatic injury, with 291 of cases being as a result of intimate partner violence; 39 cases were due to assaults by siblings, neighbours or strangers.

This finding highlights the enormous burden of trauma and violence in SA. A case–control study from Ethiopia by E Berhanie *et al.*[12] similarly found that 389 of 954 (40.8%) pregnant women had experienced intimate partner violence.

About a third of the women in our study (*n*=276; 34%) did not attend antenatal visits prior to admission with trauma. Aboagye *et al.*[13]

Table 3. Risk factors associated with trauma in pregnancy

Risk factor	2015 (*n*=142)	2016 (*n*=187)	2017 (*n*=157)	2018 (*n*=173)	2019 (*n*=141)	Total (*N*=800)	*p*-value*
Age (years), median (IQR)	33.0 (29.00 - 37.00)	34.00 (29.00 - 39.00)	32.00 (28.00 - 37.00)	29.00 (25.00 - 34.00)	29.00 (25.00 - 33.00	31.00 (27.00 - 37.00)	<0.001
Race							
Black	133 (93.7)	163 (87.2)	139 (88.5)	152 (87.9)	126 (89.4)	713 (89.1)	0.216
White	1 (0.7)	0 (0.0)	2 (1.3)	0 (0.0)	0 (0.0)	3 (0.4)	
Coloured	8 (5.6)	24 (12.8)	16 (10.2)	21 (12.1)	15 (10.6)	84 (10.5)	
Marital status							
Married	51 (35.9)	74 (39.6)	43 (27.4)	40 (23.1)	30 (21.3)	238 (29.8)	<0.001
Single	91 (64.1)	113 (60.4)	114 (72.6)	133 (76.9)	111 (78.7)	562 (70.3)	
Employment status							
Unemployed	90 (63.4)	99 (52.9)	81 (51.6)	115 (66.5)	99 (70.2)	484 (60.5)	0.001
Employed	52 (36.6)	88 (47.1)	76 (48.4)	58 (33.5)	42 (29.8)	316 (39.5)	
Social habits							
No adverse social habits	101 (73.7)	148 (82.2)	129 (83.8)	142 (82.1)	106 (76.3)	626 (79.9)	0.550
Smoking	3 (2.2)	3 (1.7)	3 (1.9)	2 (1.2)	3 (2.2)	14 (1.8)	
Alcohol use	32 (23.4)	29 (16.1)	21 (12.6)	29 (16.8)	30 (21.6)	141 (18.0)	
Recreational substance use	1 (0.7)	0 (0.0)	1 (0.6)	0 (0.0)	0 (0.0)	2 (0.3)	

*Kruskall–Wallis test used for numerical variables; chi-squared test or Fisher's exact test used for categorical variables.
IQR = interquartile range

concluded that pregnant patients experiencing intimate partner violence are likely to have difficulty in accessing antenatal services and therefore often attend their first antenatal booking late in pregnancy. Alcohol-related injuries made up 18% of cases (*n*=141). This is consistent with findings from the randomised trial conducted by Davis *et al.*,[14] who found assault and motor vehicle accidents were associated with alcohol consumption.

Injuries related to falls were the second most common cause of injury, accounting for a third of all cases (*n*=265; 33.1%). However, injuries from falls were not fatal. Height >160 cm, advanced gestational age and maternal age >30 years are associated with falls in pregnancy.[8] The median age in our study was 31 years, which is not advanced maternal age. Height and weight data were not collected in this review.

Injuries related to vehicle accidents were the third most common cause of injury overall, accounting for 25.5% of cases (*n*=204), and the most common cause of poor fetal outcome, all of which were confirmed abruption of the placenta. There was no maternal mortality documented related to motor vehicle accidents; however, two patients were admitted to ICU (with head trauma and blunt abdominal trauma with pelvic fracture, respectively). In a retrospective study conducted in SA, Wall *et al.*[4] found that in 2 990 trauma patients who were admitted over a period of 6 years, polytrauma accounted for 40% of all cases. Notably, no maternal mortalities related to vehicle accidents were recorded.

Penetrating injuries affected 5.25% of patients(*n*=42), and resulted in two third-trimester pregnancy losses and one second-trimester pregnancy loss. The remaining 39 cases of penetrating injuries did not involve the abdomen. Injuries due to gunshot wounds were uncommon and contributed to only 0.25% of cases (*n*=2), although in one case the patient died and in the other the patient required admission to the ICU.

Blunt trauma was a frequent cause of traumatic injury in pregnancy (*n*=418; 52.25%) in our review sample. Although we did not identify associated maternal mortality, it was associated with increased fetal mortality (0.9%; *n*=7) and 11 (1.4%) preterm births. Direct trauma to the abdomen and the subsequent need for surgery are associated with pregnancy loss.

Advanced gestational age tends to be associated with poor fetal outcome,[15] as reflected also in our results. There were three fetal losses among patients admitted to the ICU: at 23 weeks, 30 weeks and 32 weeks, respectively; mean gestational age was 28 weeks. The principle of obstetric resuscitation is to prioritise the management of the pregnant patient. Following successful resuscitation and management of the mother, attention can be given to the fetus.

Strengths and limitations

This was a large retrospective data review conducted at low cost. Results of this review may help inform the design of future retrospective studies; however, findings may be limited owing to cases of missing data.

Conclusion

We identified single, unemployed pregnant patients having an increased risk of obstetric trauma. Assaults and falls were the most frequent mechanisms of injury. Only 0.5% of obstetric trauma admissions required ICU care.

Declaration

Acknowledgements. None.

Author contributions. GDN was responsible for conceptualisation of the study and contributed, along with NBM, to developing the methodology. NBM was further responsible for conducting the investigation and writing the manuscript All authors reviewed and contributed to editing the manuscript.

Funding. None.

Conflicts of interest. None.

1. Huls CK, Detlefs C. Trauma in pregnancy. Semin Perinatol 2018;42:13-20.
2. Say L, Chou D, Gemmill A, Tunçalp Ö, Moller AB, Daniels J, et al. Global causes of maternal death: A WHO systematic analysis. Lancet Glob Health 2014;2(6):e323-e333.
3. Battaloglu E, Battaloglu E, Chu J, Porter K. Obstetrics in trauma. Trauma 2015;17:17-23.
4. Wall SL, Figueiredo F, Laing GL, Clarke DL. The spectrum and outcome of pregnant trauma patients in a metropolitan trauma service in South Africa. Injury 2014;45:1221-1223.
5. Petrone P, Asensio JA. Trauma in pregnancy: Assessment and treatment. Scand J Surg 2006;45:383-392.
6. Mendez-Figueroa H, Dahlke JD, Vrees RA, Rouse DJ. Trauma in pregnancy: An updated systematic review. Am J Obstet Gynecol 2013;209:1-10.
7. Garg N, Sharma A, Khanna P, Goel V. Trauma in pregnancy – A brief review. Trauma Emerg Care 2017;2:1-4.
8. Weiss HB, Songer TJ, Fabio A. Fetal deaths related to maternal injury. J Am Med Assoc 2001;286:1863-1868.
9. Alhusen JL, Ray E, Sharps P, Bullock L. Intimate partner violence during pregnancy: maternal and neonatal outcomes. J Womens Health (Larchmt) 2015;24:100-106.

10. Kuczkowski KM. Trauma during pregnancy: A situation pregnant with danger. Acta Anaesthesiolo Belg 2005;56:13-18.
11. Abrahams N, Jewkes R, Mathews S. Guns and gender-based violence in South Africa. S Afr Med J 2010;9:586-588.
12. Berhani E, Gebregziabher D, Berihu H, Gerezgiher A, Kidane G. Intimate partner violence during pregnancy and adverse birth outcomes: A case control study. BMC Reprod Health 2019;16:22.
13. Aboagye RG, Seidu A-A, Asare BY-A, Adu C, Ahinkorah BO. Intimate partner violence and timely antenatal care visits in sub-Saharan Africa. Arch Public Health 2022;80:2-11.
14. Davis EC, Rotheram-Borus MJ, Weichle TW, Rezai R, Tomlinson M. Patterns of alcohol abuse, depression, and intimate partner violence among township mothers in South Africa over 5 years. AIDS Behav 2017;21:174-182.
15. Chibber R, Al-Harmi J, Fouda M, El-Saleh E. Motor-vehicle injury in pregnancy and subsequent feto-maternal outcomes: Of grave concern. J Matern Neonatal Med 2015;28:399-402.

Received 13 October 2024. Accepted 16 October 2024.