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EFFECTS OF DYSTOCIA, FETOTOMY AND CAESARIAN SECTIONS ON THE LIVER ENZYMES ACTIVITIES AND LEVELS OF SOME SERUM BIOCHEMICAL PARAMETERS IN CATTLE (With 8 Figures)

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**تأثير عسر الولادة ، تقطيع الحميل والعمليات القيصرية على نشاط أنزيمات
الكبد وبعض مستويات العناصر الحيوكيميائية في مصل الأبقار**

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هدف هذه الدراسة هو قياس مستوى أنزيمات الكبد والترايجليريد ومستوى الايض لبعض العناصر في السيرم للأبقار التي ولدت طبيعياً وحالات عسر الولادة. والهدف الثاني هو مقارنة التأثير المحتمل لتقطيع الجنين والعمليات القيصرية على هذه المقاييس. العدد الكلي للحيوانات في هذه الدراسة كان ٢٤ بقرة من السلالة المحلية وقسمت كالتالي:- ٨ حيوانات ولدت ولادة طبيعية، ٨ حيوانات تم تقطيع الحميل فيها، ٤ حيوانات أجريت لها عملية قيصرية بسبب عسر الولادة ٤ حيوانات أجريت لها عمليات قيصرية بسبب الالتفاف الرحمي. وقد جمع من كل حيوان خمس عينات دم وكان وقت أخذها كالتالي مباشرة قبل الولادة أو العملية، بعد الولادة مباشرة، وبعد ٢٤، ٤٨، ٧٢ ساعة من الولادة أو العملية. وقد تم قياس الآتي: انزيم اسبرتات أمينو ترانسفيراز (AST)، انزيم جلوتامات ديهيدروجيزاز (GLDH)، انزيم جاما جلوتاميل ترانسفيراز (γ GT)، انزيم الكرياتين فوسفوكيناز (CK)، بالإضافة الى الجلوكوز، البيلبروبين، الكوليسترول والترايجليريد والنتائج أوضحت الآتي: زيادة معنوية في نشاط كل من AST، GLDH، CK ($P < 0.001$)، (γ GT) (٠,٠١) قبل الولادة في مجموعة ذات العمليات القيصرية مقارنة بالمجموعات الأخرى. وبعد الولادة كان هناك فروق معنوية بين مجموعة الحيوانات الولادات الطبيعية والمجموعات الأخرى بالنسبة لـ AST، GLDH، CK ($P < 0.001$)، (γ GT) (٠,٠٥) والجلوكوز ($P < ٠,٠٥$) ولم يوجد أي فروق معنوية في مستوى البيلبروبين، الكوليسترول والترايجليريد في كل أوقات اخذ العينات. وبالنظر الى المجموعة ذات تقطيع الأجنة وجد أنه لم تسجل أي زيادات معنوية في نشاط أنزيمات الكبد ما عدا مستوى الجلوكوز الذي زاد معنوياً (٠,٠١) ($P < ٠,٠١$) وملخصاً لما سبق نجد ان الحيوانات التي اجريت لها عمليات قيصرية بسبب الالتفاف الرحمي بها خلل في وظائف

الكبد ومن ناحية اخرى ليس لتقطع الجنين اى تأثير على الخلايا الكبدية للام. ونوع الولادة ليس له اى تأثير على البيليروبين، الكوليسترول والترايجليرسيد قبل الولادة مباشرة حتى 3 أيام بعد الولادة.

SUMMARY

The aim of the present study was to determine the level of serum liver enzymes, triglyceride and some metabolites in cows with or without difficulties during parturition. The second goal was to compare between the possible effects of caesarian section and fetotomy on these parameters. A total number of 24 native breed cows at full term were included in this study. Out of these, 8 gave normal parturition, 16 cows were admitted for dystocia. The group of dystocia was subdivided into two groups: Fetotomy ($n = 8$) and caesarian ($n = 8$) group. In the caesarian group, 4 cows were with uterine torsion. Five blood samples were collected from each cow: directly prepartum, just after delivery and at, 24, 48 and 72 hrs postpartum. Serum samples were used for determination of aspartate amino transferase (AST, U/l), glutamate dehydrogenase (GLDH, U/l), gamma glutamyl transferase (γ GT, U/l), creatine phosphokinase (CK, U/l), glucose (mmol/l), total bilirubin (mmol/l), cholesterol (mmol/l) and triglyceride (mmol/l). The results showed that caesarian group revealed significant increase in serum activities of AST, GLDH and CK ($p < 0.001$) and γ GT ($p < 0.01$) in prepartum period than the other groups. There were significant differences between group with normal parturition and the other groups with regard to activities of AST and GLDH, ($p < 0.001$), γ GT and CK ($p < 0.05$) and glucose level ($p < 0.05$) post partum. There were no significant differences in the bilirubin, cholesterol and triglyceride levels in all tested groups at all times of sampling. Analysis of samples from fetotomy group revealed no significant increases in serum activities of all tested liver enzymes except the significant increase in glucose level ($p < 0.01$). In conclusion, cattle subjected to caesarian section and especially those with uterine torsion are suffer from hepatic dysfunction. On the other hand, fetotomy has no effect on hepatocellular damage. The type of parturition has no effect on the bilirubin, cholesterol and triglyceride concentration just before parturition to the 3rd day post partum.

Key words: Dystocia, fetotomy, caesarian section, liver enzymes, serum biochemical parameters cattle.

INTRODUCTION

Delivery occurs as a result of complex changes in maternal, fetal and placental sides, which lead to hematological and biochemical changes in the dam. The type of birth and other associated procedures as transport and obstetrical help affect the parturient animals (Cannon, 1914).

The aspartate amino transferase (AST) is considered to be a muscle- and liver-specific enzyme in cattle. It is one of the routine parameters measured to detect and diagnose liver failure and often appears in connection with puerperal disorders (Bostedt, 1974 and Füll, 1989, 2000). An elevation in AST level was detected in cows with dystocia, retained placenta and milk fever in comparison with healthy cows in the early postpartum period (Rummer and Eulenberger, 1981, West, 1989, Fritsche, 1998, Kleiser and Füll, 1998 and Kraft and Dürr, 2005).

Generally, the gamma glutamyl transferase (γ -GT) and glutamate dehydrogenase (GLDH) enzymes are considered as liver specific two and are used for the diagnosis of the hepatic and bile diseases (Füll, 1989, Kraft and Dürr 2005). It was found that the γ -GT activity was higher in cattle during puerperium than early and late pregnant animals (Unglaub *et al.*, 1973 and Bostedt, 1974). Bostedt (1974) and Birgei *et al.* (1997) found that there were no significant differences between the GLDH level during pre and post partum period.

The creatine phosphokinase (CK) activities in the uterine tissue are the third highest after skeletal and cardiac muscle. It was reported that there were significant alterations in plasma CK activities and bilirubin in periparturient cows compared with non-pregnant non-lactating cows (West, 1989 and Füll and Schäfer, 1992).

Vergara (1981) reported that there was an increase in the glucose level intra partum, followed by sharp decrease during the first 10 days p.p. It was found that glucose concentration was higher in cows with dystocia and gave dead new born than those with normal parturitions. Jessen (1981) and Fritsche *et al.* (2000) reported that the glucose concentration was lower in cows with retained placenta than those with normal drop of fetal membranes.

Lotthammer *et al.* (1971), West (1989) and (1990), Pedron *et al.* (1993) and Kim and Suh (2003) reported marked loss in the body condition near calving results in an increased occurrence of postpartum metabolic and reproductive diseases with decreased serum total

cholesterol concentrations at the first month of lactation. It was found that cholesterol and triglyceride level increased after parturition in normal healthy animals due to increase in the lipid metabolism during energy deficiency (Karsai and Gaal, 1987).

Studying of the effects of dystocia and caesarian section on the incidence and severity of post-parturient fatty liver in our native and cross breed cows was not fully performed. The aim of the present study was to determine the serum liver enzymes activities, triglyceride and some metabolites concentrations in cows with or without difficulties during parturition. The second goal was to investigate the possible effects of caesarian section and fetotomy on these parameters.

MATERIALS and METHODS

Animals:

A total number of 24 full term native and cross breed cows were subjected to the present study. These animals were presented to the Veterinary Teaching Hospital, Faculty of Veterinary Medicine, Assiut University, Egypt. All cows were pluripara and the age ranged between 4 and 7 years. All examined animals were under similar breeding system and feeding management. The animals were maintained indoor in small private farms. Egyptian clover (*Trifolium alexandrium*) was available from November till May (green season). The concentrate ration contained yellow corn, wheat bran, rice fiber, lime and sodium chloride salt.

Out of these animals, eight gave normal birth, while, sixteen cows were admitted with dystocia. This group was subdivided into two groups according to treatment: Fetotomy group (n = 8) where the dead fetuses were exteriorized through partial or total fetotomy under epidural anesthesia. Caesarian sections group (n = 8) where the operation was done through the left flank in standing position. In the caesarian group, 4 cows were with dystocia due to uterine torsion. All calves which delivered from cases with uterine torsion or fetotomy were freshly dead.

Samples and analytical methods:

Blood samples were collected from the jugular vein in plain vacutainer tubes for separation of serum. Five blood samples were collected from each animal: prepartum (at arrival to the hospital about an hour before delivery), and just after parturition (in the hospital), then at 24, 48 and 72 hrs postpartum (at owners dwelling). All blood samples were centrifuged at 3000 RPM for 10 minute and the harvested sera were

stored at -20 °C until analysis. All parameters including AST (U/l), GLDH (U/l), γ -GT (U/l), CK (U/l), glucose (mmol/l), total bilirubin (mmol/l), cholesterol (mmol/l) and triglyceride (mmol/l) were determined colorimetrically using commercial test kits supplied and by Digital Ultraviolet Spectrophotometer (Digital Ultraviolet Spectrophotometer, CE 292, series 2, Cecil instruments, Cambridge England, Series No. 52.232.).

Statistical analysis:

The results were expressed as the means \pm SD. Statistical analyses were undertaken using one-way ANOVA. Analysis was performed using Statistical Package for the Social Sciences for Windows (SPSS, version 10.0, 1999).

RESULTS

Prepartum, AST activity was higher in the group with Caesarian sections due to uterine torsion than the control and fetotomie groups, the difference was significant ($p < 0.001$). AST activities were significantly higher in all groups than control, directly after parturition and at 24, 48 and 72hrs postpartum ($p < 0.05$). There were no significant differences between fetotomy and dystocia group without uterine torsion (Fig. 1).

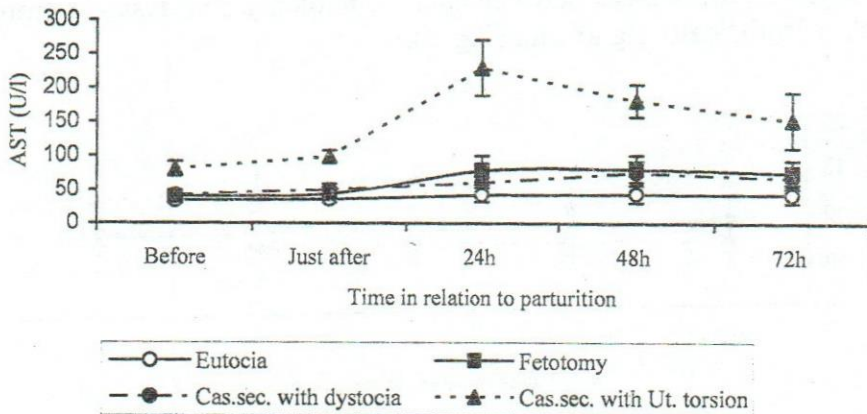


Fig. 1: AST activity in the serum of cows with eutocia, fetotomy and caesarian sections (Mean \pm SD)

GLDH activity was higher in the group with Caesarian sections due to uterine torsion than the control and fetotomie groups ($p < 0.001$). At 72 hrs post partum there were significant higher GLDH activities in

the dystocia group without uterine torsion than the normal parturition group ($p < 0.05$). There were no significant differences between control and fetotomy (Fig. 2).

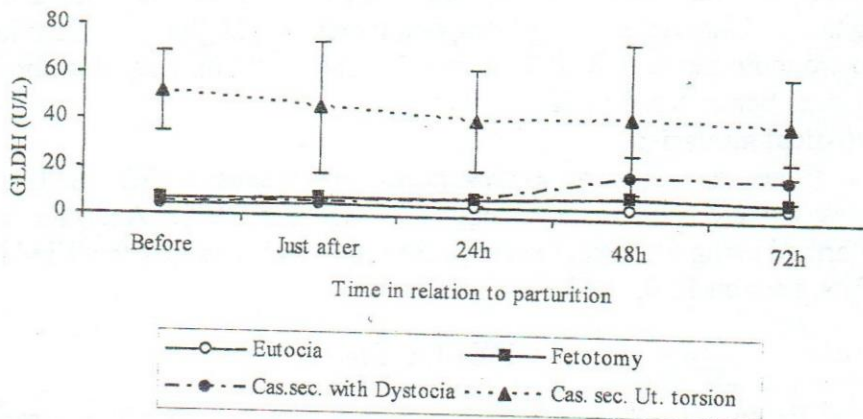


Fig. 2: GLDH activity in the serum of cows with eutocia, fetotomy and caesarian sections (Mean \pm SD)

γ -GT activity was higher in the group with Caesarian sections due to uterine torsion than the control and fetotomie groups ($p < 0.01$). There were no significant differences between all groups just after delivery. The differences between control, fetotomy and dystocia group were not statistically significant (Fig. 3).

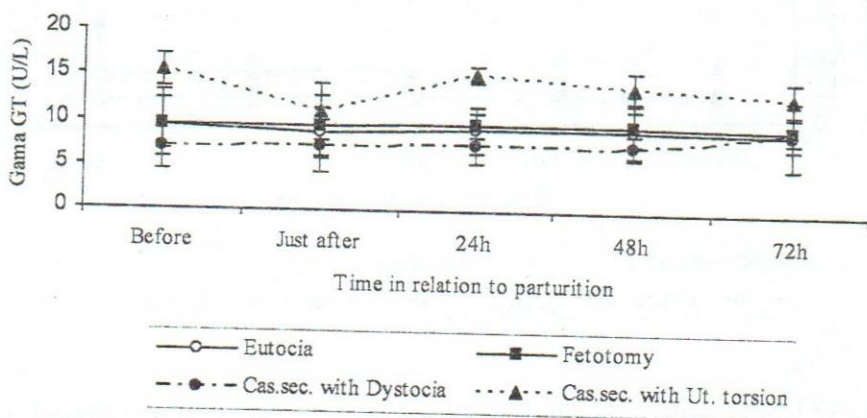


Fig. 3: γ -GT activity in the serum of cows with eutocia, fetotomy and caesarian sections (Mean \pm SD).

CK activities were higher in the group with Caesarian sections due to uterine torsion than control and fetotomy groups ($p < 0.001$). At 24, 48 and 72hrs after delivery there were significant differences between control, fetotomy and dystocia group without uterine torsion ($p < 0.05$). There were no significant differences between fetotomy and dystocia group (Fig. 4).

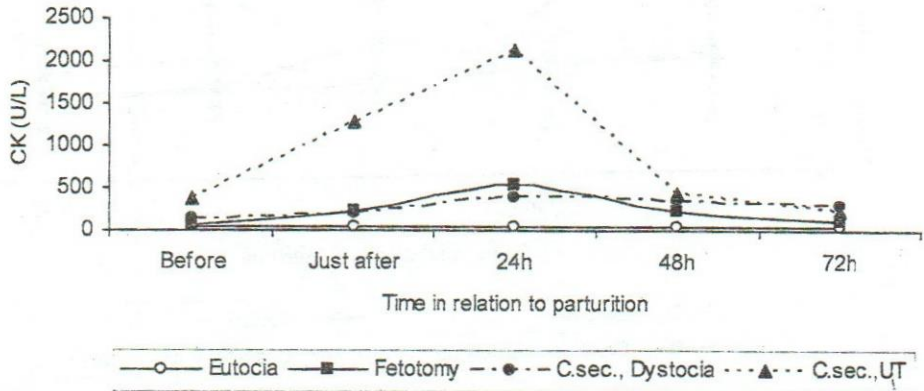


Fig. 4: CK activity in the serum of cows with eutocia, fetotomy and caesarian sections (Mean \pm SD).

Glucose level was significantly higher in the fetotomy group than the control and caesarian groups just before the operation ($p < 0.01$). After delivery the differences between the groups were not statistically significant (Fig. 5).

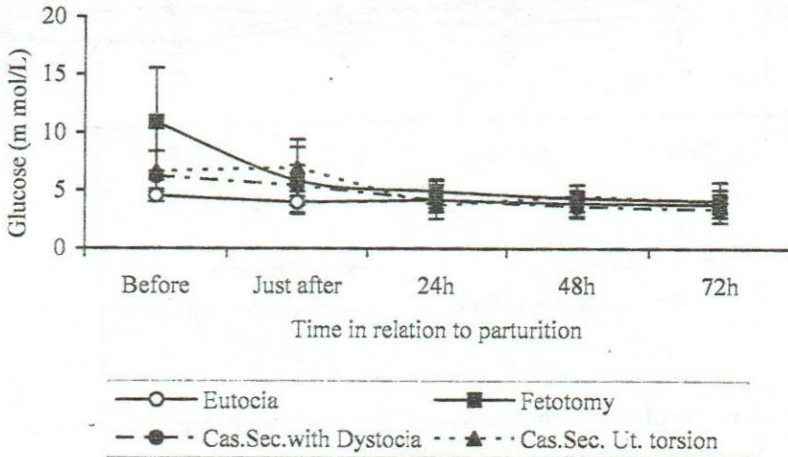


Fig. 5: Glucose level in the serum of cows with eutocia, fetotomy and caesarian sections (Mean \pm SD).

There were no significant differences in bilirubin, cholesterol and triglyceride concentrations between control, fetotomy and caesarian group. There were some elevations in the bilirubin and cholesterol levels in fetotomy group at 24 and 48hrs (Fig. 6, 7 and 8).

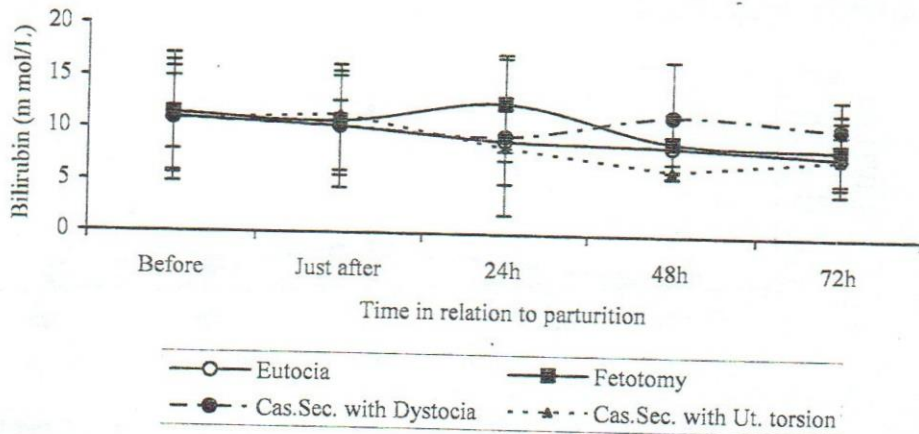


Fig. 6: bilirubin level in the serum of cows with eutocia, fetotomy and caesarian sections (Mean \pm SD).

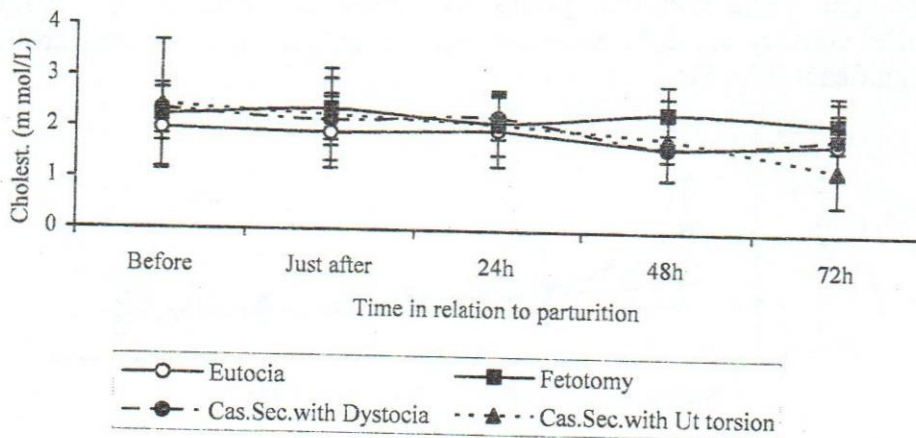


Fig. 7: Cholesterol level in the serum of cows with eutocia, fetotomy and caesarian Sections (Mean \pm SD).

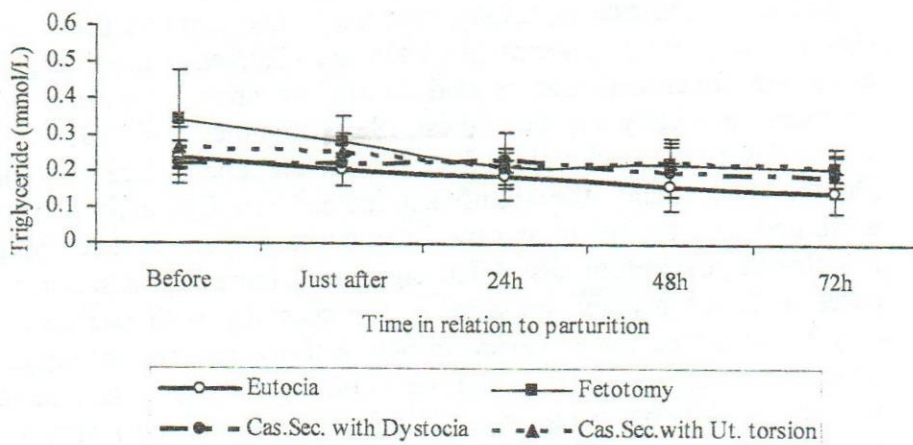


Fig. 8: Triglyceride level in the serum of cows with eutocia, fetotomy and caesarianm (Mean \pm SD).

DISCUSSION

In the present study, there were significant increases in serum activities of all measured liver enzymes. AST is widely distributed in many tissues being especially abundant in the liver, myocardium and skeletal muscles. The present results in regard to AST activity were coincident to that reported by Bostedt (1974), Birgel *et al.* (1997), and Nauruschat and Frll (2002).

GLDH has been considered as one of the best enzymes for detecting hepatocellular damage (Braun *et al.*, 1986). It was reported that serum GLDH was significantly elevated in cases of hepatic abscesses and hepatic lipidosis (Križanović *et al.*, 1997 and West, 1997) and significantly increased parallel to liver fattening in cattle (Bogin *et al.*, 1986). The recorded results here are in agreement with that reported from Bostedt (1974), Sattler and Frll (2002), in which there were no significant differences between the GLDH level during pre and post partum period in normally calved cows.

In the present study γ -GT activity showed significant increase during all periods of sampling in the caesarian group due to uterine torsion. That may be attributable to severe hepatic dysfunction. The liver is the major contributor of γ -GT to plasma and it is localized both in the hepatocytes and in the biliary tree and its richest distribution in the epithelium of the bile ductules (Mullen, 1976, Bouda *et al.*, 1980,

Pearson, 1990 and Blei, 1994). It was reported that γ -GT is a sensitive indicator for cholestasis, biliary hyperplasia and hepatocellular damage (Craig *et al.*, 1991). It seems likely that the changes in the liver in dairy cows are functional and related to the metabolic demands of late pregnancy and early lactation (West, 1989, Bremmer *et al.*, 1999).

CK is released mainly from the skeletal and myocardial muscle. On the other hand, the significant increase in CK activity may be attributed to exertion of muscle in prepartum cases and to injury of muscles in postpartum cases. The significant increases in serum CK in cases of foetotomy and caesarian group specially with uterine torsion may be attributed to the severe muscle activity and may be originated either from the dam or from the foetus during foetotomy and caesarian with uterine torsion. Birgel *et al.* (1997) recorded similar results of CK activities in cattle suffered from dystocia. The significant increase in glucose level in fetotomy group in the peripartum period may be attributed to the death of the foetus, which result in decrease glucose assimilation. It was found that the glucose concentration lower in cows with retained placenta than those with normal drop of the fetal membranes (Jessen, 1981). West (1990) reported that animal with glucose concentration of 2.25 mmol/l had fatty liver. It was found that there were highly positive correlation between glucose concentration and endotoxins effect after dystocia in cows (Fritsche *et al.*, 2000). West (1989) reported that there were significant alterations in plasma total bilirubin., total ketone body and urea concentrations in periparturient cows compared with non-pregnant non-lactating cows. The results recorded in the current study disagree with those reported by West (1989) and Karsai and Gaal (1987).

In conclusion, cattle with uterine torsion and subjected to caesarian section are associated with hepatocellular damage. On the other hand, fetotomy has no effect on hepatic function. The type of parturition has no effect on the bilirubin, cholesterol and triglyceride concentration just before parturition until the 3rd day post partum.

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