Clinico-laboratory studies on pregnancy toxemic ewes in Beni-Suef province.

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Abstract

Pregnancy toxemia (PT) is a metabolic condition resulting from inability of the animal to maintain an adequate energy balance and commonly affecting older ewes carrying multiple fetuses during late pregnancy. The study was carried on eighteen pregnant ewes their age range was 5-8 years old (4^{th} -8^{th} parity) and their body weights range was 40-45kg. The ewes were divided into two groups; group I consists of nine clinically healthy ewes at 18^{th} week pregnancy belonged to Seds-Research-farm, Beba, Beni-Suef provion, which acts as control group, and group II consists of nine ewes at late gestation period (about 17-19^{th} week pregnancy), admitted to our clinic, and suffering from anorexia, dullness and disincline to move and suspected to be a case of pregnant toxemia. Biochemical analysis of serum from these animals indicated a significant decrease of glucose, cholesterol, LDL-C, triglyceride and phosphorus levels, while there was significant increase of insulin concentration, AST and ALT activities. There was insignificant changes in serum calcium, HDL-C, urea and creatinine concentrations.

Introduction

Pregnancy toxemia is a metabolic disease of small ruminants, caused by abnormal metabolism of carbohydrates and fats occurred at the last stage of pregnancy **(Brozos et al. 2011)**. Its occurrence is related to state of negative energy balance due to increase energy demands of rapid fetal growth in late gestation concurrents with insufficient energy intake of the dam **(Smith, 2002)**. The disease has a significant economic impact on sheep and goats enterprises due to loss of fetuses,

veterinary costs and loss of the dam balance (**Rook, 2000**). The disease is associated with low plasma concentrations of glucose and greatly increased plasma concentrations of keton bodies **(Van Saun, 2000)**. The aetiopathogenesis of pregnancy toxemia has still not been clarified completely. It is believed that the disease is caused by inability of pregnant ewe to meet the increased glucose demand of the uteroplacental unit **(Rook, 2000)**. Energy requirements for pregnant ewes markedly increased during the last two months of gestation because 70-80% of foetal growth occurs during this time **(Albay et al. 2014)**. Therefore, the higher the number of lambs carried by the ewe, the higher the fetal glucose demands **(Sargison et al., 1994)**. The clinical findings of pregnancy toxemia in ewes include separation from the flock, decreased appetite, disinclination to move and apparent blindness **(Joseph and Rook, 1999).** In the later stages, another signs are recorded, including marked drowsiness, tremors and spasms of the head, face and neck muscles with the head pulled back or sideways, abnormal postures, elevation of chin (star-gazing), falling, convulsions and coma until death, 2-6 days after onset of signs **(Singh et al., 1992; and Jordan, 2002).**

The aim of this study was to evaluate the clinical picture of pregnancy toxemia in ewes and alterations in some serum biochemical parameters in pregnant ewes in Beni-Suef governorate.

Material and methods

1-Animals

The study was carried on eighteen pregnant ewes their age range was 5-8 years old (4^{th} -8^{th} parity) and their body weights range was 40-45kg. The ewes were divided into two groups; group I consists of nine clinically healthy ewes at 18^{th} week pregnancy belonged to Seds-Research-farm, Beba, Beni-Suef province, which acts as control group, and group II consists of nine ewes at late gestation period (about

17-19th week pregnancy), admitted to our clinic, and suffering from anorexia, dullness and disincline to move and suspected to be a case of pregnant toxemia.

2- Methods:

2-1) Clinical examination: Traditional clinical examination of selected ewes under the study was carried out according to **Radostits et al. (2007)**.

2-2) Biochemical profile: Paired blood samples were obtained from each ewe via jugular vein puncture, and were centrifuged at 3000 rpm for 10 min. Blood sera were used for estimating concentrations of glucose, total cholesterol, high density lipoprotein–cholesterol (HDL-C), law density lipoprotein-cholesterol (LDL-C), triglyceride, urea, creatinine, inorganic phosphorus and aspartate aminotransferase activity (AST) and alanine aminotransferase activity (ALT) using commercially available diagnostic kits according to the method described by **Glick et al.(1986)**, **Richmond (1973), Burstein et al., (1970), Steinberg (1981), Fossati and Prencipe (1982), Patton and crouch (1977), Young DS.(2001) , Daly JA et al. (1972), Reitman and Frankel (1957)** , respectively. Blood concentration of serum ionized calcium could be estimated by using electrolyte analyzer by estimation of electrical activity (ST-200Plus electrolytes analyzer Sensa Core medical instrumentation Put. Ltd. Plot No: 3'EPIP, Pashamylaram; Medak (Dist).502307,Telangana, India and estimating serum insulin level by using an enzyme-linked immune-sorbent assay(Elisa) kit.

Results:

Table (1): Mean glucose, insulin, cholesterol, HDL-C, LDL-C and triglycerides concentrations in pregnant toxemic and control ewes (means ± S.D).

Parameter	Pregnant Toxemic ewes	Control group
Glucose (mg/dl)	39.13±0.85[b]	59.36±0.84[a]
Insulin (IU/ml)	11.4±1.49	8.0±1.53
Cholesterol (mg/dl)	74.47±0.81[a]	86.50±0.78[b]
HDL-C (mg/dl)	36.87±1.83	38.44±1.42
LDL-C (mg/dl)	33.81±1.35[a]	65.53±1.55[b]
Triglycerides (mg/dl)	19.20±0.85[b]	36.63±0.60[a]

Table (2): Mean urea ,creatinine concentrations, AST and ALT activities in pregnant toxemic and control ewes (means ± S.D.).

Parameter	Pregnant Toxemic ewes	Control group
Urea (mg/dl)	34.00±2.29	35.67±2.29
Creatinine (mg/dl)	0.63±0.09	0.66±0.09
AST(U/l)	49.37±0.86b	18.33±1.73a
ALT(U/l)	39.37±0.86b	19.22±2.22a

Table (3) Mean calcium and phosphorus concentrations in pregnant toxemic and control ewes (means ± S.D.).

Parameter	Pregnant toxemic ewes	Control group
Ca (mmol/l)	0.97 ± 0.12^{b}	0.70 ± 0.14^{a}
P (mmol/l)	1.74 ± 0.38^{b}	2.22 ± 0.61^{a}

Discussion:

The clinical findings in pregnant toxemic ewes were anorexia, depression, disinclination to move and stargazing. Temperature, pulse and respiration rates were (38.5-40^{0}c), (70-90 pulse rate/minute) and (20-30 respiration cycle/minute), respectively and these ranges were in accordance with normal physiological ranges recorded by **Radostits, et al. 2007** in both groups. These clinical signs were in accordance with those recorded by **El-Sherief *et al.* (1978), El-Sebaie *et al.* (1992), Nasser *et al.* (1998) and Smith (2002).**

Serum glucose levels for pregnant toxaemic and control ewes are shown in Table (1). Serum glucose levels were significantly ($P < 0.05$) decreased in pregnant toxemic ewes compared with those of control group. Hypoglycemia in pregnant toxaemic ewes might be partly as a result of high requirements of glucose for the developing fetus and partly due to lower liver glycogen reserves (an impaired hepatic gluconeogenesis) **(Nagamani*et al.*, (1996), Rook,(2000), Schlumbohm and Harmeyer, (2004))**. Results of the current study were in accordance with papers published by **El-Sebaie*et al.*, (1992), Nasser *et al.* (1998)** who reported that, suspected pregnant toxaemic ewes had marked drop of glucose. Moreover, **Duehlmeier et al. (2011)** noted that ewes suffering from subclinical or clinical pregnancy toxaemia had a low plasma glucose values during late pregnancy.

Concerning serum insulin, the obtained results in Table (1), revealed that serum insulin concentrations in the ewes suspected to be affected with pregnancy toxemia (11.4±1.49 IU/L) were significantly higher ($P < 0.05$) than those in the control group (8±1.53 IU/L). This finding may attributed to the high plasma ketone bodies and cortisol levels in case of pregnancy toxemic ewes **(Radostits, 2007)** as the synthesis and release of insulin are response to an excess of fuel particularly an increase level of glucose, fatty acids, hormones e.g: ACTH, cortisol, estridiol and ketone bodies **(Yves ,1991)**.

Serum total cholesterol levels were significantly lower ($p < 0.05$) in ewes suspected to be affected with pregnancy toxemia than that of healthy ewes at the 2^{nd} week pre-partum. Serum total cholesterol level was 74.47±0.81 mg/dl in suspected pregnant toxemic ewes and 86.50±0.78 mg/dl in healthy ewes at the 2^{nd} week pre-partum. These results are in agreement with **El-Deeb, (2012)** who noted that serum concentrations of cholesterol in the pregnant toxemic ewes were significantly lower than in healthy ones. Reduced cholesterol levels in pregnant toxaemic ewes may be attributed to hepatic insufficiency **(Kaneko et al, 1997)**. On the other hand, **Singh *et al.*, (1992) and Singh *et al.*, (1996)** observed that, there was a significant increase in cholesterol in ewes with pregnancy toxemia.

Serum high density lipoprotein-cholesterol (HDL-C) levels showed no significant changes between the two groups. The levels of serum HDL-C were 36.87±1.83 mg/dl and 38.44±1.42 mg/dl in suspected pregnant toxemic ewes and in healthy ewes respectively.

Concentrations of serum law density lipoprotein-cholesterol (LDL-C) and serum triglycerides (Table,1) were significant decreased ($P < 0.05$) in suspected pregnant toxemic ewes as compared with those in control group. Serum triglycerides

concentrations in ewes with pregnancy toxemia were 19.20±20.85 mg/dl while in healthy pregnant ewes were 36.63±0.60 mg/dl. Our results were in accordance with **Mazur et al. (2009)** who found that exacerbated lipomobilisation during late pregnancy in ewes is accompanied by alterations in lipid and lipoprotein profiles as well as by a reduced triglyceride secretion. Contrarily, **Marteniuk et al , (1988) , Kaneko et al, (1997) and El-Deeb, (2012)** reported that, there was a significant increase in the triglyceride in ewes with pregnancy toxemia when compared to healthy pregnant ewes.

Serum urea and creatinine levels are shown in Table (2), the obtained results showed that there were insignificant changes ($p < 0.05$) in serum urea and creatinine levels in both pregnancy toxemic ewes and control ones. These results are opposite to those obtained by **Judith and Thomas, 1988; Singh *et al.*, 1992 and Sotillo *et al.*, 1994** who reported that, there was a significant increase in serum urea and creatinine in pregnant toxemic ewes. Increased serum urea and creatinine in pregnant toxaemic animals may be attributed to severe metabolic acidosis which developed in sheep, renal failure with terminal ureamia and dehydration **(Radostits, 2007)**. In our study, insignificant changes in serum urea and creatinine might be attributed to that the collection of the blood samples from suspected pregnant toxaemic ewes were occurred at early stage of the disease before severe acidosis and renal failure to be occurred.

Serum AST and ALT levels were 49.37±0.86 U/L , 39.37±0.86 U/L and 18.33±1.73 U/L and 19.22±2.22 U/L in suspected pregnant toxaemic and in healthy ewes, respectively. The obtained results showed significant ($p < 0.05$) increases in serum AST and ALT activities in suspected pregnant toxemic ewes as compared with those in healthy pregnant ewes. Elevated enzymatic activities in pregnant toxaemic animals might be a result of fatty infiltration of the liver and hepatic insufficiency **(Nagamani*et al.*, 1996)**. The increased level of AST in

ketotic ewes could be attributed to the fatty liver changes associated with the negative energy balance occurring in the peripartum period (**Ghanem and El-Deeb,2010, Radostits et al., 2007; Smith and Sherman, 2009 and Kaneko et al,1997)**. These results were in accordance with **El-Sebaie*et al.*, 1992 ,Nagamani*et al.*, 1996 and El-Deeb, (2012).**

Results of serum ionized calcium levels are present in Table (3), there were no significant changes ($p < 0.05$) in serum ionized calcium levels in suspected pregnant toxemic ewes as compared with those in healthy pregnant ones. The levels of serum ionized calcium in suspected pregnant toxemic ewes were 0.97±0.12 mmol/l while, in healthy ewes were 0.70±0.14 mmol/l. These results are in line with those of **Akhtar et al. (2007) and Khan (2007)**. On the other hand, **Hallford and Sanson, 1983; Judith and Thomas, 1988 and Nasser *et al.*, 1998** observed that a significant decrease in serum calcium levels in pregnant toxemic ewes.

Results of serum inorganic phosphorus levels showed a significant decrease ($p < 0.05$) in suspected pregnant toxemic ewes as compared with those in healthy pregnant ones. The levels of serum inorganic phosphorus in suspected pregnant toxemic ewes were 1.47±0.38 mmol/l while, in healthy ewes were 2.22±0.2 mmol/l. The obtained results in the current study are in accordance with those published by **Egan *et al.*, 1973; Magat *et al.* 1974; Terashima *et al.*, 1982; Hallford and Sanson, 1983; Judith and Thomas, 1988 and Nasser *et al.*, 1998.**

Conclusion:

Clinical signs and blood glucose levels can be considered indicators for pregnancy toxemia in ewes during late pregnancy period as well as, blood serum cholesterol,

triglyceride, AST, AlT, urea and creatinine may be used for diagnosis of clinical pregnancy toxaemia in ewes.

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