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REPRODUCTIVE DISORDERS IN EGYPTIAN BUFFALOES AND THEIR RELATIONSHIP TO CHANGES IN SOME BLOOD COMPONENTS

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ABSTRACT: This study was conducted to identify the main causes of reproductive disorders in buffalo in some villages in Menoufia Governorate. The relationship between these disorders and changes in some blood components was also studied. A total of 77 female buffaloes with delayed postpartum pregnancy for more than 90 days were examined by rectal palpation. The concentrations of calcium, phosphorus, glucose, insulin, follicle-stimulating hormone (FSH), luteinizing hormone (LH), progesterone (P4), and estrogen (E2) were assessed in the blood serum. The findings showed that ovarian disorders were the most prevalent, occurring at a rate of 56.4%, followed by endometrial disorders (43.65%). Calcium and insulin levels were notably affected by the seasonal variations throughout the year. Calcium concentration exhibited a significant increase during the colder months, measured at 8.07 ±0.37, in contrast to the lower levels recorded during the hotter months, which stood at 7.16 ±0.34. The opposite trend was recorded for insulin without a significant difference. The examined reproductive disorders had a significant impact ($P > 0.01$) on calcium, insulin, and phosphorus levels, while their effect on glucose was negligible. The serum calcium concentration of buffaloes with endometriosis (8.72±0.33) was significantly higher compared to those with persistent corpus luteum (6.90±0.52) and non-significantly higher than those with smooth ovaries (7.23±0.43). Phosphorus was not significantly affected by season, while it was significantly higher in the blood serum of buffaloes with persistent corpus luteum (5.88±0.43) compared to those suffering from smooth ovary (4.90±0.35) or endometritis (4.60±0.28). The Ca:P ratio is calculated in the blood serum of buffaloes with the presented corpus luteum. During the cold months (1.57) or hot months (1.39), or those whose ovaries were smooth during the hot months (1.20), the Ca:P ratio may be less than the minimum required for effective reproduction. The blood glucose level was not significantly affected by either the season of the year or the type of reproductive disorder, the lowest value (35.33±3.70 g/dl) was recorded in buffaloes suffering from endometriosis, while the largest value (49.23±5.23 g/dldl) was recorded in those suffering from persistent corpus luteum without significant difference. FSH and LH levels were significantly affected by seasonal variations, while P4 and E2 remained unaffected. The general average of P4 concentration tended to rise during the summer months compared to what was recorded during the winter months. The studied reproductive disorders significantly affected P4 ($P>0.01$), LH, E2, and non-significantly on FSH. Progesterone was significantly higher in buffaloes with persistent CL (3.78 ± 0.28) than in buffaloes with endometriosis (1.55 ± 0.26) or smooth ovaries (1.90 ± 0.33) without significant differences between the latter two averages. In conclusion, the present study shows that the most common form of reproductive infertility in buffalo among small farmers in some villages in Menoufia Governorate, Egypt is attributed to ovarian disorders, followed by endometrial disorders.
In addition, changes in some components of buffalo blood serum have been associated with these reproductive disorders.

Key words: Buffaloes, Reproductive Disorders, Season.

INTRODUCTION

Buffaloes contribute greatly to the agricultural economy in Egypt, contributing about 70% of milk production in addition to meat production. Menoufia Governorate is considered one of the governorates of the Republic that raises buffaloes intensively, as it contains about 10% of the total number of buffaloes in Egypt, about 95 % of this

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number is in the possession of small breeders, whose livelihood depends largely on the dairy and meat products of these animals. However, most of these buffaloes have poor productive and reproductive performance, resulting in high animal husbandry costs and increased economic losses for breeders. Reproductive performance is a key factor in figuring out dairy farmers' profitability. Reproductive disorders such as ovarian inactivity, endometritis, anoestrus, repeat breeding, and seasonality of breeding are the major problems affecting adversely the productive and reproductive performance of cows, and resulting in great economic losses to dairy farmers (Dutta *et al.*, 1988; Wiltbank *et al.*, 2002).

It is suggested that normal blood levels of various biochemical components and minerals are important for maintaining the reproductive performance of animals; changes in the biochemical components of the blood lead to reproductive failure (El-Azab *et al.*, 1993; Balakrishnan and Balagopal, 1994; Qureshi, 1998).

An optimum Ca and p concentration are required for reproduction; Calcium affects an animal's ability to utilize other trace elements; regulates the neuronal circuitry for GnRH pulsatile secretion (Van *et al.*, 2000), involved in GnRH-stimulated LH and FSH secretion from pituitary (Simpson *et al.* 1989), have a role in ovarian steroidogenesis (Veldhuis and Klase., 1982). Phosphorus is closely related to reproductive hormones (Chaurasia *et al.*, 2010); Its deficiency causes weak ovarian activity, irregular estrous, low pregnancy rate, high incidence of cystic follicles, and decreased fertility in general (El-Wishy, 2007;). In addition, the serum Ca:P ratio should be between 1.5:1 and 2.5:1 for effective reproduction (Carnahan., 1974); Low levels of P or Ca levels lead to an imbalance of Ca and P (McClure 1965); Changes in the Ca/P ratio can affect ovarian activity by blocking the pituitary gland and this leads to a prolongation of the ovulation period and thus the estrous cycle (Kumar *et al.*, 2015); Therefore, disturbances in the blood Ca/P ratio have been associated with the appearance of anestrus cases (Chaurasia *et al.*, 2010; Kumar *et al.*, 2010).

True anestrus cases in buffaloes accompanied by smooth (inactive) ovaries, absence of corpus luteum, and low progesterone concentration, (Agarwal, *et al.*, 2003); lower blood levels of both estradiol and antioxidant enzymes (El-Bayomi *et al.*, 2018).

This study was conducted to identify the main causes of reproductive disorders in buffalo in some villages in Menoufia Governorate. The relationship between these disorders and changes in some blood components was also studied.

MATERIALS AND METHODS

This study focused on female buffaloes raised by small farmers in some villages in Menoufia Governorate. These buffaloes suffer from some reproductive problems and are delayed in pregnancy post-parturition for more than 90 days.

Seventy-seven female buffaloes with delayed postpartum pregnancy for more than 90 days were examined by rectal palpation to diagnose any change or disorder in the various organs of the reproductive system (ovaries, oviducts, uterus, uterine horns, and vagina).

Ten ml of blood was collected from each buffalo immediately after this examination by jugular venipuncture into a test tube. The Collected blood samples were centrifuged at 3000 rpm for 10 minutes. The serum was carefully separated and stored at -20 until further analysis. The stored serum samples were analyzed for (calcium - phosphorus - glucose insulin- FSH – LH- progesterone -estrogen).

The biochemical constituents of blood were identified in blood plasma as follows:

Glucose as per Braham and Trinder (1972), phosphorus as per Goldenberg (1966), calcium as per Gindler (1972), insulin as per Echternkamp *et al*. (1990), progesterone as per Anderson and Day (1994), FSH as per Voller *et al.* (1979), LH as per Voller *et al.* (1979), estrogen as per Ratcliffe *et al.* (1988).

To evaluate the extent of applying artificial insemination in buffaloes in some villages in Menoufia Governorate, two types of questionnaires were used:

- The first one was for farmers who raise different types of farm animals.

The second questionnaire was intended for those who practice artificial insemination (veterinarians

Statistical analysis

Data was statistically analyzed through two-way ANOVA using the General Models procedure of SAS (2007).

RESULTS AND DISCUSSION

I- The frequency of reproductive disorders in female buffaloes suffering from delayed pregnancy post-parturition more than 90 days

Rectal palpation of the reproductive tract of 77 female buffaloes used in our study, suffering from delayed pregnancy post parturition more than 90 days showed that the most common reproductive disorders were ovarian disorders at a rate of 56.4%, which included smooth ovaries (40.0%) and ovaries with persistent corpus luteum (16.4%), followed by endometrial disorders at 43.65%. Consistent with El-Wishy's (2007) findings, ovarian inactivity persists as one of the most prevalent reproductive disorders in this species. On the other hand, (Azawi *et al.,* 2008a) showed that postpartum metritis is considered one of the most important disorders in buffaloes. The incidence of endometritis incidence of in Egyptian buffalo ranged from 22.4% to 38.9%, as recorded by Ghanem *et al.;* 2002 and Serur *et al.,* 1982, respectively.

II- The effect of reproductive disorders and season of the year on the concentration of calcium, phosphorus, glucose, and insulin in buffalo blood.

The data presented in Table 1show that some biochemical blood components were estimated in buffaloes suffering from different reproductive disorders such as endometriosis, inactive ovary, and persistent corpus luteum during hot and cold months. Seasons of the year significantly affected the overall average concentration of calcium ($P < 0.05$), Insulin ($P < 0.01$), and non-significantly phosphorus and glucose in the blood serum of buffalo that suffer from some reproductive disorders.

Calcium concentration was significantly higher during cold months (8.07 ±0.37) than that analyzed during hot months (7.16±0.34). Insulin levels were significantly higher (4.85 ±0.65) during hot months compared to cold months (1.99 ±0.70), indicating an opposite trend. On the other hand, the studied reproductive disorders (endometritis, smooth ovary, persistence corpus luteum) significantly affected the overall average concentration of calcium ($P < 0.01$), Insulin ($P < 0.05$), phosphorus ($P < 0.05$) and insignificant glucose in the blood serum of those buffaloes. In this regard, the serum calcium concentration of buffaloes suffering from endometriosis (8.72 ±0.33) was significantly higher than those suffering from persistent corpus luteum (6.90 ±0.52) and insignificantly than those suffering from smooth ovaries (7.23 ±0.43).

The normal required levels of calcium for optimum production and reproduction as recorded by Merck Veterinary Manual; 2005 were 8.0-11.4 mg/dl, and they were stated that the levels of calcium were marginally low in anestrus (7.96±0.079 mg/dl) and low in cows suffering with silent estrus (7.45±0.15 mg/dl); Which is consistent with the findings of Singh *et al.*, 2006, and Chaurasia *et al.,* 2010 who reported that serum Ca levels were recorded at lower concentrations in anestrus buffaloes as compared to normal cyclic animals. Explaining our findings of decreased calcium concentration in those anestrous buffaloes suffering from smooth ovaries during cold or hot months (7.65 ±0.64; 6.81 ±0.57), those suffering from persistent C.L (4.08 ±0.57; 3.53 ±0.28, respectively), or those suffering from endometritis inflammation during the hot season (7.97 ±0.42) compared to normal levels of calcium required for optimal reproduction as recorded by evidence (Kahn, and Line, 2005**)**.

Table 1: Concentration of calcium, phosphorus, glucose, and insulin in the blood serum of buffalo that suffer from reproductive disorders during the cold and hot months of the year.

Item	Season	Reproductive Disorder			Overall mean
		Endometritis	Smooth ovary	Persis. CL	
Calcium, (mg/dl)	**Cold**	9.47 ±0.52^{a}	7.65 ±0.64^{ab}	7.10 ±0.74^{b}	**8.07 ±0.37^{A}**
	Hot	7.97 ±0.42^{ab}	6.81 ±0.57^{b}	7.70±0.74^{b}	**7.16±0.34^{B}**
	Overall mean	**8.72 ±0.33^{A}**	**7.23 ±0.43^{AB}**	**6.90 ±0.52^{B}**	
Phosphorus, (mg/dl)	**Cold**	5.10 ±0.43^{ab}	4.15 ±0.53^{b}	6.10±0.61^{a}	**5.11 ±0.30**
	Hot	4.10±0.35^{b}	5.66±0.47^{ab}	5.66 ±0.61^{ab}	**5.14 ±0.28**
	Overall mean	**4.60±0.28^{B}**	**4.90 ±0.35^{B}**	**5.88 ±0.43^{A}**	
Ca/P ratio	**Cold**	1.85	1.84	1.16	**1.57**
	Hot	1.94	1.20	1.36	**1.39**
	Overall mean	**1.89**	**1.47**	**1.17**	
Glucose, (g/dl)	**Cold**	35.33±3.70	41.97±4.53	49.23 ±5.23	**42.18±2.61**
	Hot	44.83±3.02	36.86±4.05	48.90 ±5.23	**43.53 ±2.42**
	Overall mean	**40.08 ±2.39**	**39.41±3.04**	**49.06±3.70**	
Insulin, (ng/m)	**Cold**	1.47±0.98^{b}	3.27 ±1.23^{ab}	1.24 ±1.41^{b}	**1.99 ±0.70^{B}**
	Hot	3.26 ±0.81^{ab}	6.81 ±1.09^{a}	4.49 ±1.41^{ab}	**4.85 ±0.65^{A}**
	Overall mean	**2.37±0.64^{B}**	**5.04 ±0.82^{A}**	**2.86 ±0.99^{C}**	

a, b, c: Values in the same column or row for each trait with different superscripts are significantly differed at P<0.05.A, B: values with different letters on the same row are significantly differed at P<0.05.
A, B: values with different letters on the same column significantly differed at P<0.05.

Regarding the average concentration of total phosphorus in the blood serum of buffaloes suffering from some reproductive disorders, Table 1 shows that phosphorus levels are very similar during the cold months (5.11 ± 0.30) or the hot months (5.14 ± 0.28) without a significant difference, while it was significantly higher in the blood serum of buffaloes infected with C.L. (5.88±0.43) compared to those suffering from smooth ovary (4.90±0.35) or endometrities inflammation (4.60±0.28). Newar *et al.* (1999) reported that the levels of phosphorous were non-significantly lower in silent estrus (5.14±0.147 mg/dl) and anestrus (5.11±0.058 mg/dl) animals in comparison to normal cyclic (5.66±0.17 mg/dl); however, Kekan and Shirbhate (2015); Modi *et al.* (2017) and Kumar *et al.* (2022) reported that phosphorous levels were significantly (P<0.01) low in repeat breeder cows affected with endometritis (5.00±0.070 mg/dl) and cows which were showing metestrual bleeding (MEB) (4.70±0.145 mg/dl) in comparison to normal cyclic (5.66±0.017 mg/dl) cow

In general, the overall average stated in Table; 1 for calcium or phosphorus in the blood serum of buffaloes that suffer from some reproductive disorders during months of the cold or hot season falls within the normal range as recorded by Blood and Radostits, 1989 (7.16±0.16 to 9.19±0.29 mg/100ml) for calcium; and Jayachandran, *et al.* (2007) (4.39 to 6.09 mg/dl) for phosphorus. In addition, Jayachandran, *et al.* (2007) indicated that the phosphorus level was significantly (P<0.01) higher in regular breeding buffaloes (6.09 mg/dl) compared to that recorded for irregular breeding buffaloes (4.39 mg/dl). Earlier, Morrow (1969) reported that phosphorus-deficient heifers showed reduced fertility and needed more services per conception. In the same direction, El-Wishy (2007) and Abraham (2017) pointed out that phosphorus deficiency causes impaired ovarian activity, irregular estrus,

anestrus, low pregnancy rate, high incidence of cystic follicles, and decreased fertility in general.

In addition, our results in Table 1 indicate that the buffalo do not suffer from a severe calcium or phosphorus deficiency, whereas their calcium and phosphorus concentrations are still lower than those recorded in the blood serum of normal buffalo. On the other hand, Yadav *et al.* (2006), Kumar *et al.* (2010a), and Kumar *et al.* (2015) reported a non-significant difference in calcium levels between cyclic and anestrus buffaloes, while Chaurasia *et al.* (2010) observed a significantly lower calcium level in the cyclic buffalo compared with that in the anestrus buffalo.

Ca / P ratio

Moreover, results in Table 1also show that the calculated Ca:P ratio in the blood serum of buffaloes that suffer from presented C.l. during the cold months (1.57 or hot months (1.39) or those whose ovaries were smooth during the hot months (1.20) was lower than the minimum Ca:P ratio (1.57) needed for effective reproduction reported by Carnahan., 1974 who stated that the ratio of serum Ca:P should be between 1.5:1 and 2.5:1 for efficient reproduction. Simultaneously, Luca *et al.* (1976) proved that a Ca:P ratio of approximately 2:1 was necessary for cattle to exhibit high fertility. Nematu-Allah *et al.* (1983) reported that a calcium and phosphorus ratio of 1.34:1 in non-cyclic animals was significantly lower than that of 1.70: 1 in cyclic animals. These results are consistent with them. They also reported that the ratio of calcium and phosphorus 1.52:1 has adverse effects on the fertility of buffaloes. This may be due to a low level of phosphorus resulting in an imbalance in the Ca / P ratio causing decreased fertility or infertility (McClure, 1965).

It can be concluded that calcium and phosphorus play an important role in the reproductive process in animals (Little, 1970), and some relationships between them affect animal reproduction. In this concern, Kumar *et al.* (2015) reported that serum calcium concentration alone does not directly affect the reproductive functions of animals, while changes in the Ca/P ratio can affect ovarian activity by blocking the pituitary gland, and this leads to prolongation of the ovulation period and consequently the period of estrous cycle; in addition, Marginal phosphorus insufficiency may prompt anestrus condition due to the close association between P and reproductive hormones (Chaurasia *et al.*, 2010).

The data presented in Table 1 indicate that the blood glucose level of the intended buffalo was not significantly affected by either the season of the year or the type of reproductive disorder.

It was found that glucose concentrations in buffalo cows with various reproductive disorders range from the lowest value of 35.33±3.70 g/dl recorded in buffaloes suffering from endometriosis to the largest value of 49.23±5.23 g/dl recorded in those suffering from persistent C.L (Table, 1) without significant difference. In general, the minimum glucose level of 60-40 mg/ml is required to maintain the physiological processes of the body (Duke, 1970)., in buffaloes, Jayachandran, *et al.* (2007) reported that plasma glucose levels ranged from 40 mg/ dl to 86 mg/ dl. This could indicate that the glucose level estimated in the present study for buffaloes suffering from various reproductive disorders during hot or cold months is less than the optimal concentration required for efficient reproduction.

The data presented in Table 1 showed that the average blood glucose of buffaloes suffering from different reproductive disorders such as endometriosis (40.08 ± 2.39), smooth ovary (39.41 ± 3.04) and firm C.L. (49.06 ± 3.70) or during cold (42.18 ± 2.61) or hot (43.53 ± 2.42) months were lower than that in normal buffaloes (74.52 ± 1.3) recorded by Mourad, (2011). Dowin and Gilman (1976) concluded that low blood glucose may be associated with infertility.

Nadiu and Rao (1982) and Dutta *et al.* (1988) reported significantly lower serum glucose levels in an-estrus than in normally cycling animals. However, Awasthi and Karche (1987) found no significant difference in blood glucose levels between the regular and repeat breeding groups.

III- The effect of reproductive disorders in buffaloes and the seasons of the year on the concentration of the hormones

FSH, LH, estrogen, and progesterone in the blood serum.

Table 2indicates that the levels of the FSH and LH hormones were significantly affected by the season of the year in agreement with that of Janakiraman *et al.* (1980); Razdan and Kaker (1980); Rao and Pandey (1982) who reported that peripheral FSH and LH concentrations were influenced by climate. In this regard, Rao and Pandey (1982) demonstrated that peak LH levels are higher on the day of oestrus in cooler compared to those in the hotter months, which may be due to the inability of the hypothalamo-hypophyseal axis to produce a sustained increase in LH release in response to estradiol; in addition, Aboul-Ela and Barkawi (1988) found that the frequency and amplitude of pulses during the follicular phase have been reported to be significantly higher during winter (frequency: 3.6 pulses/8 h, amplitude: 3.7 ng/ml) than during summer season (2.8 pulses/8 h, 2.5 ng/ml. Values of FSH in buffalo's blood during the estrous cycle ranged from the baseline of 0.63 ± 0.29 to 1.23 ± 0.14 ng/ml increased to a peak concentration of 4.13 ± 0.53 ng/ml, which was accompanied by the appearance of the estrus signs as recorded by Kanai and Shimizu (1986), who also added that the peak of LH concentration ranged from 61 to 126 mg/ml. This may indicate that the levels of FSH and LH hormones recorded in the blood of the buffaloes of the current study are considered less than sufficient concentrations for appearance signs of estrus.

Table 2: Concentration of the hormones FSH, LH, estrogen, and progesterone in the blood serum of buffalo that suffer from some reproductive disorders in different seasons of the year.

Item	Season	Reproductive Disorder			Overall mean
		Endometritis	Smooth ovary	Persis. CL	
Progesterone, (ng/ml)	**Cold**	1.29 ±0.40^{c}	1.64 ±0.49^{c}	4.08 ±0.57^{a}	**2.32 ±0.28**
	Hot	1.81±0.30^{c}	2.16 ±0.28^{bc}	3.53 ±0.28^{ab}	**2.50 ±0.26**
	Overall mean	**1.55 ±0.26^{B}**	**1.90 ±0.33^{B}**	**3.78 ±0.28^{A}**	
LH, (ng/ml)	**Cold**	1.72 ±0.66^{ab}	1.77 ±0.80^{ab}	0.25 ±0.93^{b}	**1.25±0.46^{B}**
	Hot	3.75±0.53^{a}	2.59 ±0.72^{ab}	0.72 ±0.93^{b}	**2.35 ±0.43^{A}**
	Overall mean	**2.74±0.42^{A}**	**2.18 ±0.54^{A}**	**0.48 ±0.66^{B}**	
FSH, (ng/ml)	**Cold**	2.12 ±1.13	1.46±1.38	0.31 ±1.59	**1.30 ±0.79^{B}**
	Hot	3.49 ±0.92	2.61 ±1.23	4.63 ±1.59	**3.57 ±0.74^{A}**
	Overall mean	**2.81±0.72**	**2.03 ±0.92**	**2.47 ±1.13**	
Estrogen, (Pg/ml)	**Cold**	19.8 ±3.14^{ab}	13.42±2.73^{b}	14.10±4.44^{b}	**15.76 ±2.20**
	Hot	20.84 ±2.56^{a}	11.22 ±3.44^{b}	12.80±4.44^{b}	**14.95±2.05**
	Overall mean	**20.31±1.47^{A}**	**12.32±1.50^{B}**	**13.45±3.14^{B}**	

a, b, c: Values in the same column or row for each trait with different superscripts are significantly differed at P<0.05.A, B: values with different letters on the same row are significantly differed at P<0.05.
A, B: values with different letters on the same column significantly differed at P<0.05.

However, levels of progesterone (P4) and estrogen hormones were not significantly affected by the season of the year (Table 3), as the overall average of P4 concertation increased insignificantly during the summer months in the blood of the buffaloes compared to that recorded during winter months. However, Mondal *et al.* (2001 and 2004) found that the P4 level was significantly higher during the summer than in the winter.

Regarding the effect of reproductive disorders on the hormones of FSH, LH, P4, and estrogen in the blood of buffaloes, the data listed in Table 3indicate that the studied reproductive disorders significantly affected P4 (P>0.0004), LH (P>0.02), estrogen (P>0.04), and non-significantly on FSH.

The concentration of progesterone was significantly higher in serum samples of buffaloes

suffering from persistent corpus luteum (3.78±0.28) compared to samples of buffaloes suffering from endometriosis (1.55±0.26) or smooth ovaries (1.90±0.33), and the differences between the latter two averages were not significant. Ahmad, *et al.* (2004) and Akhtar, *et al.* (2010) reported that Animals with smooth inactive ovaries demonstrated a significant decrease in serum progesterone values which agrees with the results of many other workers. The interaction between RD and Season was highly significant for progesterone ($P > 0.01$), significant for LH and estrogen ($P > 0.01$), and not significant for FSH.

Conclusion

In conclusion, the current study demonstrates that ovarian disorders (smooth ovary and persistence CL) are the most common cause of reproductive infertility in buffalo raised by smallholders in some villages of Menoufia Governorate in Egypt, followed by endometrial disorders. Changes in some components of buffalo blood serum were associated with these reproductive disorders, where calcium, phosphorus, insulin, progesterone, luteinizing hormone, and estrogen were significantly affected by reproductive disorders, while FEH and glucose were not affected. Therefore, it was recommended that studies be conducted to find the critical levels of minerals in buffalo blood needed for effective reproduction.

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الإضطرابات التناسلية في الجاموس المصري وعلاقتها بالتغيرات في بعض مكونات الدم

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الملخص العربي

أجريت هذه الدراسة للتعرف على الأسباب الرئيسية للإضطرابات التناسلية في الجاموس ببعض قرى محافظة المنوفية، كما تمت دراسة العلاقة بين هذه الإضطرابات والتغيرات التي تحدث في بعض مكونات الدم. تم فحص ٧٧ أنثى جاموسية تعاني من تأخر الحمل بعد الولادة لأكثر من ٩٠ يومًا عن بواسطة الجس المستقيمى كما تم تقدير مستوى الكالسيوم والفوسفور والجلوكوز والأنسولين وFSH وLH والبروجستيرون والإستروجين في مصل الدم. وقد أظهرت النتائج أن اضطرابات المبيض كانت الأكثر شيوعاً (٥٦,٤%)، تليها اضطرابات بطانة الرحم (٤٣,٦٥%). تأثر الكالسيوم والأنسولين بشكل ملحوظ بفصول السنة، حيث كان تركيز الكالسيوم أعلى وبدرجة معنوية خلال الأشهر الباردة (٨,٠٧ ± ٠,٣٧) منه خلال الأشهر الحارة (٧,١٦±٠,٣٤)، وحدث العكس بالنسبة للأنسولين بدون فروق معنوية. أثرت الإضطرابات الإنجابية المدروسة وبدرجة معنوية على مستويات الكالسيوم، الأنسولين والفوسفور وبدرجة غير معنوية على الجلوكوز. كان تركيز الكالسيوم في مصل الدم في الجاموس المصاب بالإلتهاب الرحمي (٨,٧٢ ± ٠,٣٣) أعلى بشكل ملحوظ مقارنة مع أولئك الذين يعانون من استدامة الجسم الأصفر (٦,٩٠ ± ٠,٥٢) وأعلى بشكل غير ملحوظ من ذوات المبايض الملساء (٧,٢٣ ± ٠,٤٣). لم يتأثر الفوسفور معنوياً بالموسم، بينما كان أعلى معنوياً في مصل الدم للجاموس المصاب باستدامة الجسم الأصفر (5.88±0.43) مقارنة بتلك الحيوانات ذات المبايض الملساء (٤,٩٠±٠,٣٥) أو بالإلتهاب الرحمي (٤,٦٠±٠,٢٨). كانت نسبة Ca:P المحسوبة في مصل الدم للجاموس التي تعاني من مرض استدامة الجسم الأصفر خلال الأشهر الباردة بمقدار ١,٥٧ أو الأشهر الحارة بقيمة ١,٣٩ أو تلك التي كانت مبايضها ناعمة خلال الأشهر الحارة (١,٢٠) قد تكون أقل من الحد الأدنى لنسبة Ca:P (1.57) اللازمة للإنجاب الفعال. كما لم يتأثر مستوى السكر في الدم بشكل معنوي بموسم السنة أو بنوع الإضطراب التناسلي، وقد سجلت أقل قيمة للجلوكوز (٣,٧٠±٣٥,٣٣ جم/ديسيلتر) في الجاموس المصابة بمرض بالإلتهاب الرحمي ، بينما سجلت أكبر قيمة (٥,٢٣±٤٩,٢٣ جم/ديسيلتر) في تلك الجاموس الذين يعانون من مرض استدامة الجسم الأصفر دون فرق معنوي. تأثرت مستويات FSH وLH بشكل كبير بفصول السنة، في حين لم يتأثر هرمون البروجسترون والأستروجين. وكان تركيز P4 يميل إلى الإرتفاع خلال أشهر الصيف مقارنة بما تم تسجيله خلال أشهر الشتاء. بينما أثرت الإضطرابات الإنجابية المدروسة بشكل كبير على P4، LH والإستروجين وبشكل غير ملحوظ على FSH. كان البروجسترون أعلى بشكل ملحوظ في الجاموس المصاب بإستدامة الجسم الأصفر (٣,٧٨ ± ٠,٢٨) مقارنة بالجاموس المصاب بإلتهاب بطانة الرحم (١,٥٥ ± ٠,٢٦) أو المبايض الملساء (١,٩٠ ± ٠,٣٣) مع عدم وجود فروق معنوية بين المتوسطين الأخيرين. ويستخلص من هذه الدراسة أن أكثر أشكال العقم التناسلي شيوعًا في الجاموس لدى صغار المزارعين في بعض قرى محافظة المنوفية بمصر هو إضطرابات المبيض، تليها إضطرابات بطانة الرحم. وقد رافقت هذه الإضطرابات التناسلية تغيرات في بعض مكونات مصل دم الجاموس.

الكلمات المفتاحية: الجاموس، الإضطرابات التناسلية، الموسم.