MENOUFIA JOURNAL OF ANIMAL, POULTRY AND FISH PRODUCTION

https://mjapfp.journals.ekb.eg/

REPRODUCTIVE DISORDERS AND THE DYNAMIC PATTERN OF OVARIAN FOLLICLE GROWTH IN EGYPTIAN BUFFALOES

Nebar, A. F.; Omar, S. S.; Asmaa A. F; Soliman, Mervat M; and Mourad, Reem S.

Animal Production Department, Faculty of Agriculture, Menoufia University

Received: Aug. 11, 2025 Accepted: Aug. 27, 2025

ABSTRACT: This study investigated the incidence of reproductive disorders and their impact on ovarian follicular dynamics in 172 Egyptian buffaloes examined at least 60 days postpartum. Overall, ovarian disorders were most prevalent (54.7%), followed by uterine disorders (45.3%). Incidence of reproductive disorders was significantly higher during hot months (63.4%) compared with cold months (36.6%), in milking buffaloes (73.8%) versus dry ones (26.2%), and in animals under rural management (61.0%) compared with semi-intensive systems (39.0%). Disorders were most frequent in the 2nd (28.5%) and 5th parities (23.3%), while the lowest rates were observed in the 3rd parities (12.2%). Buffaloes with prolonged calving-to-conception intervals ≥180 days showed the highest disorder rates (29.7%) compared with those examined at 60 days postpartum (9.9%). Ultrasound assessment of 67 buffaloes revealed that smooth ovaries were dominated by small follicles (60.8%), persistent corpus luteum and endometritis cases by medium follicles (61.0% and 57.7%, respectively), whereas large follicles were consistently scarce (≤6.6%) and failed to ovulate. These findings indicate that reproductive disorders in Egyptian buffaloes are strongly influenced by season, production status, management conditions, parity, and postpartum interval, and are associated with altered follicular dynamics characterized by impaired development of large ovulatory follicles.

Key words: Egyptian buffaloes, reproductive disorders, ovarian dysfunction, uterine disorders, follicular dynamics.

INTRODUCTION

Overall, buffalo contribute approximately 10–15% of total global milk production (FAO, 2020). The Egyptian buffalo population is approximately 3.4 million heads, contributing approximately 45% and 37% of the country's milk and red meat production, respectively, representing approximately 1.7% and 10.9% of global milk and meat production, respectively (FAOSTAT, 2019). The Egyptian buffalo is a fundamental part of the national agricultural economy. The productive and reproductive performances of these buffaloes remain low, limiting the profitability of dairy farmers and leading to significant economic losses (Pandey *et al.*, 2013; Singh *et al.*, 2018). Buffaloes suffer from several reproductive problems, such as seasonal breeding, delayed puberty and sexual maturity, repeat breeding, prolonged post-partum anestrus, silent heat coupled with poor expression of estrus, and low conception rate (Singh *et al.*, 2000; Nanda *et al.*, 2003; Barile, 2005; Das and Khan, 2010 and Terzano *et al.*, 2012).

Reproductive problems such as ovarian disorders, including smooth ovaries, persistent CL ovaries, and endometritis, are central lesions that negatively affect the productive and reproductive performances of cows (Dutta *et al.*, 1988; Wiltbank *et al.*, 2002). The incidence of ovarian dysfunction (El-wishy *et al.*, 1971) and uterine infection (Azawi, 2006, and Azawi, 2008) is more pronounced among buffaloes than cattle. Uterine infection reduces the conception rate, increases calving to conception interval, and contributes to increased culling rate (Sheldon *et al.*, 2009).

It is thought that sub-clinical uterine inflammations may be part of the cause of reduced ovarian activity during the postpartum period in buffaloes (Presicce *et al.*, 2005). In this regard, Serur *et al.* (1982) reported an endometritis rate of

* Corresponding author: solimanmervat611@gmail.com

38.9% in cows, and Ghanem *et al.* (2002) reported a rate of 22.4% in Egyptian buffaloes.

Summer significantly affects follicle growth and dynamics (Takuma *et al.*, 2010); it reduces the number of small ovarian follicles in cattle (Wilson *et al.*, 1998; Payton *et al.*, 2004). Poor oocyte quality during summer is also responsible for poor reproductive efficiency in buffaloes (Nandital, 2001). Ultrasonic studies conducted by Rohilla *et al.* (2005) showed the presence of CL in some summer anestrus buffaloes, suggesting the possibility of silent/unobserved oestrus. However, in most cases, they found a smaller population of follicles followed by anovulation of the preovulatory follicle. Monitoring and studying the impact of such reproductive disorders on changes in the pattern of ovarian follicle dynamics is crucial for understanding and improving breeding strategies in such buffaloes. However, information on follicular dynamics and their relationship to reproductive disorders such as ovarian and uterine lesions may be relatively scarce in buffalo.

This study was conducted to investigate the effect of season, production status, management system, number of parities, and interval from calving to examination day on the incidence of the most common reproductive disorders in late-pregnant buffalo cows more than 60 days postpartum. Additionally, the extent of changes in the pattern of ovarian follicle dynamics occurring during these reproductive disorders was also investigated.

MATERIALS AND METHODS

1- The animals

In this study, a total of 172 cow buffaloes suffering from some reproductive problems and delayed pregnancy post parturition for a period of not less than 60 days were examined to determine the most common reproductive disorders and the association between their frequency and season, production status, management system, calving, and time from calving to examination day.

These buffaloes included 105 heads owned by small farmers (smallholder buffaloes), which were managed in villages in the Berket El Sabaa and Quesna districts of Menoufia Governorate. In comparison, the remaining 67 heads were part of the buffalo herd at the Animal Production Department, Faculty of Agriculture, Menoufia University. The experimental period started in November 2020 and continued until April 2024.

2- Management

a- Concerning the buffaloes of smallholders

Each farmer owns an average of 2-3 animals that stay indoors at night and graze in the fields during the daylight; this system is a representative model for the rural management system. The reproductive history of these buffaloes is unknown. They suckle their calves for one to three months and are milked twice daily until dry; their parities ranged from one to six times.

Estrus is detected by farmers visually based on the sound of buffalo bellowing and teat erection during milking. Farmers mainly depend on natural mating, with rates as high as 100% in some villages, depending on the availability of bulls. It is worth noting that the rate of use of artificial insemination for buffaloes is still very low in these villages. The examination date, animal village, complaint of the animal owner, date of last calving, milk production status, and number of parities per buffalo were also recorded.

The animals were fed individually, depending on the availability of feedstuffs and the economic situation of the farmers. In winter, animals are fed a ration composed of green alfalfa (*Trifolium alexandrinum*), wheat or rice straw ad libitum, and varied amounts of concentrate feed mixture (CFM). In summer, the animals were fed on CFM, hay, wheat straw, and a small amount of green corn called Darawah.

The reproductive tract of each buffalo was examined by a veterinarian using manual rectal palpation; the ovaries were carefully examined for structure, consistency, and size. The uterus was also examined for consistency, contents, thickness, and symmetry to identify any changes in the reproductive tract associated with the reproductive failure in the animal.

b- Buffalo herd of the research farm

The remaining 67 buffalo heads are maintained at the research farms of the Animal Production Department, Faculty of Agriculture, Menoufia University (Location-B). These buffaloes exhibited no history of reproductive disorders, aged between 2 and 8 years, and had 1 to 5 parities.

It is worth noting that there are two research farms with different management systems, one of which is located at the Faculty of Agriculture in Shebin El-Kom, where animals are tied and housed in a closed system (tail-to-tail) throughout the day. The second farm is in Al-Raheb village, about 2 Km from Shibin El-Kom city, where the animals were housed freely in semi-open, shaded yards. The buffaloes move between the two farms throughout the year, depending on the animal's physiological condition.

The general management practices of the two farms were determined by the Animal Production Department, Faculty of Agriculture, Menoufia University. Estrus was detected every morning using a teaser bull. The applied insemination was mainly natural.

These buffaloes were provided with their nutritional requirements to meet the recommendations of the NRC (1987) according to the feeding regime applied in these farms, where the animals are fed on concentrated feed mixture (CFM), berseem (*trifolium alexandrium*) and rice straw from November to June; during the rest of the year the berseem is replaced by hay in addition to green fodder called Darawa. The feeding allowance was adjusted monthly in accordance with changes in body weight. The animals were healthy and kept under the routine veterinary care of the farm. Fresh water was available ad lib for the animals throughout the period of the experiment.

Transrectal ultrasound examination of these 67 buffaloes was performed using a multi-frequency linear array probe (3-8 MHz, L561 V), M12-SONOSCAPE-ultrasound (SONOSCAPE Medical Corp., Guadong, China). Buffalo cows were restrained in a standing position, and the rectum was cleared of feces. An ultrasound probe was inserted into the rectum and passed over the uterine horns; the ovaries were carefully examined to determine whether the ovary contained structures (ovarian follicles - corpus luteum) or was without of structures (smooth ovary), as described by Ali *et al.,* 2003; The number of visible ovarian follicles in each ovary (right and left) was counted and classified into three categories based on their surface diameter:

- Small follicles (less than 4 mm in diameter).
- Medium follicles (4 to 8 mm in diameter).
- Large follicles (8 to 12 mm in diameter).

The presence, diameter, and position of the corpus luteum were figured out and recorded. Additionally, the uterus was examined for size and texture, as described by Ahmed *et al.* (2002) and Youngquist (1997).

Statistical analysis

Statistical analyses were conducted using SAS software (SAS, 2007). Crosstabulations of the studied traits were compared using chi-square (χ^2) analysis at a significance level of $\alpha = 0.05$.

Ethical approval

All examinations were done after the approval of the Ethics Committee of Menoufia University, with the approval number: 33-SRE&AUC-MUAGR-08-2025.

RESULTS AND DISCUSSION

I- The most common reproductive disorders in buffaloes

The results in Tables 1 and 2 showed that the ovarian disorders were the most common reproductive disorders (54.7%), followed by uterine disorders (45.3%) in the studied buffaloes, regardless of the season of the year, productive status, management system, number of parities, or the period between the date of calving and the day of examination. This result is consistent with El-Wishy (2007), who reported that ovarian inactivity remains one of the most common reproductive disorders in this species, as well as Serur *et al.* (1982), who indicated that ovarian inactivity was the most frequent form of anestrus in cattle and buffaloes. In addition, Moss *et al.*

(2002) also reported that uterine disorders such as endometritis, parametritis, and pyometra were recorded as causative of infertility in buffaloes. The incidence rate of uterine infection in buffalo cows is much higher than in cows (Azawi, 2006; Azawi, 2008). Serur *et al.* (1982) and Ghanem et al. (2002) reported endometritis incidences of 38.9% and 22.4%, respectively, in Egyptian buffalo cows. Alwan *et al.* (2001) documented the prevalence of 47.9% of endometritis in buffaloes in Baghdad.

II- The incidence of reproductive disorders and their relationship to the season, production status, management system, parities, and the interval from calving to the day of examination

The data presented in Tables 1 and 2 illustrated the influence of season of the year, production status of the animal, management system, parities, and the interval from calving to the day of examination on the incidence of reproductive disorders in buffaloes suffering from reproductive problems and delayed pregnancy after calving for at least 60 days and up to more than 180 days.

a- Season of the year

The data listed in Table 1 showed that the incidence of overall total reproductive disorders (ovarian and uterine disorders) was significantly higher during the hot months (63.4%) than the cold months (36.6%). The highest incidence of ovarian or uterine disorders was recorded during the hot months (69.1% and 56.4%, respectively) compared to the cold months (30.9% and 43.94%, respectively). On the other hand, the proportion of buffaloes with smooth ovaries or those suffering from persistent CL was higher during the hot months (66.7% and 76.0%, respectively) than the cold months (33.3% and 24.0%, respectively). This finding is consistent with that of Abdoun *et al.* (2014) in buffalo and Peralta-Torres *et al.* (2017) in cattle, who discovered a lower percentage of cyclic animals and a higher incidence of smooth, inactive ovaries during the hot season compared to the cold season, and this was significantly associated with a lower number of ovarian follicles in both species.

The results of the current study concluded that the incidence rate of reproductive problems including forms of ovarian and uterine disorders in the studied 172 buffalo cows whose pregnancy was delayed for more than 60 days after the last calving, whether those raised by small farmers (105 heads) or those raised (67 heads) in the research farm was relatively higher during the hot than the cold months; this is consistent with Al-Tarabani (2018), Darab (2016) and Qayyum *et al.* (2018), who reported lower pregnancy rates during spring and summer compared to autumn and winter. The adverse effect of the summer season can be attributed to the fact that high ambient temperature leads to lower gonadotropin releasing hormone (GnRH) and gonadotropins levels which resulting in slower follicle growth and lower estradiol level from smaller pre-ovulatory follicles resulting in weakness of the expression of estrus signs; as well as lower progesterone during the luteal phase, (Qayum *et al.,* 2018). Progesterone deficiency has been reported to lead to failure to initiate estrus in dairy buffaloes, especially in summer months (San Singh *et al.,* 2013). In addition, Ghuman *et al*. (2010) reported that although one or more follicles developed to ovulatory size during the summer anoestrus, the follicles failed to ovulate due to endocrine insufficiency. In contrast, other reports failed to detect any seasonal variation in fertility in cattle (Roth *et al.,* 2000) or buffalo (Ronchi *et al.,* 2001).

b- Production status

The results shown in Table 1 indicated that the various forms of reproductive disorders recorded during the examination of buffaloes with delayed pregnancy for more than 60 days were higher during the milking period than during the dry period, regardless of season of the year, management system, parity, or time elapsed from calving to the day of examination. In this regard, the rates of overall total studied reproductive disorders, uterine or ovarian disorders were relatively higher in buffaloes that were still milking (73.8%; 76.9% and 71.3%, respectively)

than buffaloes that were dry or not milking (26.2%; 23.1% and 28.7%, respectively). In addition, the results also concluded that the proportion of buffaloes that were still milking and had persistent CL (80.0%) was relatively higher than those that were not milking (20.0%).

Milk production may adversely impact fertility (El-Belely *et al.,* 1988).

Table 1: Effect of season, production status, and management system on the incidence of reproductive disorders.

Factors		Buffalo Reproductive Disorders				
		Ovarian Disorder			Total Uterine Disorder (%)	Total (Ovar.+Ute.) (%)
		Smooth (%)	Pres. C.L (%)	Total Ovarian Disorder (%)		
Season	Cold	23 (33.3%)	6 (24.0%)	29 (30.9%)	34 (43.9%)	63 (36.6%)
	Hot	46 (66.7%)	19 (76.0%)	65 (69.1%)	44 (56.4%)	109 (63.4%)
	Total (%)	69 (73.4%)	25 (26.6%)	94 (54.7%)	78 (45.3%)	172
	p-value	**0.46 ns**	**0.15 ns**	**0.08 ns**	**0.0007 ****	
Prod. Status	Milking	47 (68.1%)	20 (80.0%)	67 (71.3%)	60 (76.9%)	127 (73.8%)
	Dry	22 (31.9%)	5 (20.0%)	27(28.7%)	18 (23.1%)	45 (26.2%)
	Total (%)	69 (73.4%)	25 (26.6%)	94 (54.7%)	78 (45.3%)	172
	p-value	**0.16 ns**	**0.44 ns**	**0.40 ns**	**0.40 ns**	
Management system	Rural	44 (63.8%)	7 (28.0%)	51 (54.3%)	54 (69.2%)	105 (61.0%)
	Semi-intensive	25 (36.2%)	18 (72.0%)	43 (45.7%)	24 (30.8%)	67 (39.0%)
	Total (%)	69 (73.4%)	25 (26.6%)	94 (54.7%)	78 (45.35%)	172
	p-value	**0.54 ns**	**0.002 ****	**0.04 ***	**0.04 ***	

ns: Not significant. * Significant at P<0.05 **highly significant P<0.01.

Lactation suppresses the postpartum ovarian activity both in cattle (Quintansa *et al.,* 2009) and buffalo (Honnapagol *et al.,* 1993), resulting in prolongation of the postpartum anestrus period. Lactation stimulates prolactin, cortisol, and oxytocin secretion, which negatively affect the GnRH–LH axis. High level of these hormones inhibits GnRH secretion and increase the concentration of endogenous opioid peptides; β–β-endorphin (Malven *et al.,* 1986), thus ultimately reducing the LH pulse frequency (William, 1990), which delays resumption of postpartum cyclicity. Nava-Trujillo *et al.* (2018) recorded a positive correlation between the CL and milk yield ($P < 0.0001$) and with lactation length ($P < 0.0001$); as well as Seno *et al.* (2010) also reported a positive correlation between milk yield and the length of the first CL.

c- Management system

The results indicated that the overall total percentage of different types of reproductive disorders studied in buffaloes reared under rural management system was relatively higher (61.0%) than that examined in buffaloes reared under semi-intensive management system (39.0%); and the total percentage of uterine or ovarian disorders among buffaloes reared under the rural management system (69.2%; 54.3%, respectively), was relatively higher than those managed under semi-intensive management system (30.8%; 45.7%, respectively) as shown in Table 1. It was also observed that the percentage of examined ovaries holding persistent CL was relatively higher (72.0%) in buffaloes reared in the semi-intensive management system than those

reared in the rural system (28.0%). The opposite was true for the percentage of smooth or inactive ovaries, where the percentage of smooth ovaries was lower (36.2%) in buffaloes reared in the semi-intensive management system compared to those reared in the rural system (63.8%). In this regard, Sharma *et al.* (2010) concluded that housing management significantly affected the postpartum reproductive efficiency of buffaloes during both summer and winter seasons, as they found that buffaloes raised under good, medium and poor housing conditions required 55.2± 6.19, 87.1 ± 3.52 and 139.5 ± 6.26 days, respectively, to show first postpartum estrus and the percentage of buffaloes remaining anoestrus was 38.6%, 54.8% and 71.1%, respectively.

d- Parity

Overall, the data listed in the Table 2 showed that the highest rate of reproductive disorders including total reproductive (28.5%), ovarian disorders (34.0%) which including persistent CL (36.0%) and smooth inactive ovary (33.3%) examined in buffalo cows with delayed pregnancy of more than 60 days were recorded in the 2nd parity, followed by those recorded in the 5th parity (23.3%, 24.5%, 28.0% and 23.3% respectively). However, the lowest percentage of total reproductive disorders (12.2%), uterine (12.8%) or ovarian disorder (11.7%), including persistent CL (4.0%), was recorded in buffaloes in their third parity. The lowest percentage of smooth inactive ovaries was recorded in buffaloes at their first (10.1%) and third parity (14.5%). The highest incidence of total uterine disorders was found among buffaloes in their first parity (28.2%). In comparison, the highest incidence of total ovarian disorders was found among buffaloes in their second parity (34.0%), and the lowest incidence of uterine or ovarian disorders was found among buffaloes in their third parity (12.8%, 11.7%, respectively).

Table 2: Effect of parities and the interval from calving to the day of examination on the incidence of reproductive disorders.

Factors		Buffalo Reproductive Disorders				
		Ovarian disorders			Total Uterine Disorders (%)	Total (Ovar.+ute.) (%)
		Smooth (%)	Pres. C.L (%)	Total Ovarian Disorders (%).		
Parity	1st	7 (10.1%)	7 (28.0%)	14 (15.0%)	22 (28.2%)	36 (20.9%)
	2nd	23 (33.3%)	9 (36.0%)	32 (34.0%)	17 (21.8%)	49 (28.5%)
	3rd	10 (14.5%)	1 (4.0%)	11 (11.7%)	10 (12.8%)	21 (12.2%)
	4th	13 (18.8%)	1 (4.0%)	14 (15.0%)	12 (15.4%)	26 (15.1%)
	5th	16 (23.2%)	7 (28.0%)	23 (24.5%)	17 (21.8%)	40 (23.3%)
	Total (%)	**69 (73.4%)**	**25 (26.6%)**	**94 (54.7%)**	**78 (45.3%)**	**172**
	p-value	**0.06 ns**	**0.23 ns**	**0.19 ns**	**0.19 ns**	
The interval from calving to examination day. (Days)	≥ 60	12 (17.4%)	1 (4.0%)	13 (13.8%)	04 (5.1%)	17 (9.9%)
	60-90	05 (7.2%)	2 (8.0%)	07 (7.4%)	13 (16.7%)	20 (11.6%)
	90-120	10 (14.5%)	3 (12.0%)	13 (13.8%)	07 (9.0%)	20 (11.6%)
	120-150	09 (13.0%)	9 (36.0%)	18 (19.1%)	19 (24.4%)	37 (21.5%)
	150-180	10 (14.5%)	6 (24.0%)	16 (17.0%)	11 (14.1%)	27 (16.0%)
	≥ 180	23 (33.3%)	4 (16.0%)	27 (28.7%)	24 (30.8%)	51 (29.7%)
	Total (%)	**69 (73.4%)**	**25 (26.6%)**	**94 (54.7%)**	**78 (45.3%)**	**172**
	p-value	**0.01 ****	**0.19 ns**	**0.15 ns**	**0.15 ns**	

ns: Not significant. **highly significant P<0.01.

The incidence of persistent CL ovaries was highest for buffaloes in their second parity (36.0%), followed by those in their first or fifth parity (28.0%), and lowest in buffaloes in their third or fourth parity (4.0%). This is a noteworthy phenomenon. The highest percentage of buffaloes with smooth ovaries was in the second parity (33.3%), followed by those in the fifth parity (23.2%). The lowest value (10.1%) was for buffaloes in the first parity.

The recorded results concluded that the highest values of the various forms of reproductive disorders studied in buffalo cows with late pregnancy of more than 60 days were recorded in the fifth parity, followed by those recorded in the second parity, as shown in Table 1. This clearly indicates that with increasing parity, particularly after the third parity, the incidence of most studied reproductive disorders increases. Nava-Trujillo *et al. (2020) reported that parity has a determining effect on the* reproductive efficiency of buffalo.

e- The interval from calving to examination day

The results indicated that the overall incidence of reproductive disorders, including ovarian and uterine disorders, was the highest in buffalo cows with late pregnancy of ≥ 180 days compared to those examined at other periods. In this regard, the percentage of total reproductive disorders (29.7%), including uterine (30.8%), or ovarian disorders (28.7%), was higher in the examined buffaloes whose pregnancy was delayed for more than 180 days than in any other study period, as shown in Table 1.

In addition, the lowest percentages were observed in the examined buffaloes whose pregnancy was delayed for ≥ 60 days (9.9%; 5.1%; 13.8%, respectively); this may suggest that with increasing age, number of parities, or postpartum period without pregnancy in buffaloes, the incidence of reproductive disorders increases.

Based on the results shown in Table 1 and their discussion, it can be concluded that the highest incidence of various reproductive disorders, including uterine and ovarian types (Smooth and Persistent CL), was generally associated with the hot season, the presence of the animal in milking, the rural management system, late parities (after the third parity), and the length of time elapsed between the last calving date and the day of examination.

Therefore, it is necessary to take into consideration the application of proper management of nutrition, reprod, and housing to prevent or reduce the occurrence of such reproductive disorders, which leads to improving reproductive efficiency.

IV- Effect of reproductive disorders on the dynamic of the follicular pattern

The data in Table 3 indicated that the ultrasound examination of the reproductive tract of 25 buffaloes with smooth or inactive ovaries showed an ovarian follicular pattern characterized by most ovarian follicles being small-sized (60.8%), followed by medium-sized (36.5%), and then large-sized follicles in a very small percentage (2.7%). Hanafi *et al.* (2008) found that a high incidence of ovarian inactivity (71.9%) was associated with an apparent absence of large follicles. Abdoun *et al.* (2014) found in buffalo and Peralta-Torres *et al.* (2017) found in cattle that a lower percentage of cyclic animals and a higher incidence of smooth, inactive ovaries were documented during the hot season than the cold season, and this was significantly associated with a lower number of ovarian follicles in both species. On the other hand, the same examination of another 18 buffaloes suffering from persistent CL and another 24 buffaloes suffering from endometritis showed a similar follicle pattern for both with the highest rate of medium sized follicles being recorded (61.0% and 57.7% respectively) followed by small sized follicles (34.1% and 35.8% respectively) and then large sized follicles (4.9% and 06.6% respectively) as shown in Table 2. In addition, the average follicle count per ovary in buffaloes with smooth ovaries (n=1.48) was lower than that examined and recorded for buffaloes with persistent CL

(n=2.28) or those suffering from endometritis (n=2.9).

Abdoun *et al.* (2014) found in buffalo and Peralta-Torres *et al.* (2017) found in cattle that a lower proportion of cyclic animals and a higher incidence of smooth, inactive ovaries was significantly associated with a lower number of ovarian follicles in both species, which is consistent with study done by Hanafi *et al.* (2008) who recorded that inactive ovaries are often associated with reduced follicle recruitment and development. Several factors influence the number of ovarian follicles in buffaloes, including seasonal variations, nutritional status, and reproductive cycle stage (Abdoon and Kendal, 2001; Elbaz *et al.*, 2019; Abdel-razek, 2005).

The results in Table 3 also showed that the proportion of large-sized ovarian follicles recorded the lowest percentages in the smooth ovaries (2.7%,), in persistent CL ovaries (4.9%) and in ovaries of buffaloes with endometriosis (6.06%) compared to medium-sized ovarian follicles (36.5%, 61.0% and 57.7%., respectively) or small-sized follicles (60.8%, 34.1% and 35.8%, respectively), where their diameter ranged from 8.3-8.4 mm in smooth ovaries, 8.7-10.3 mm in the ovaries with persistent CL, and 8.3-11.5 mm in buffaloes with endometriosis.

Table 3: The impact of reproductive disorders on the dynamic pattern of ovarian follicles.

№. of cases	**Buffalo Reproductive Disorders**						**χ^2 test**
	Smooth Ovary		**Persistent CL**		**Endometritis**		
	(n=**25)**		(n=**18)**		(n=**24)**		
Ovarian structure:							
I: Follicles:	***№.***	**(%)**	**№.**	**(%)**	**№.**	**(%)**	
Small	45	**60.8%**	28	**34.1%**	49	**35.8%**	***χ^2 Value = 15.51***
Medium	27	**36.5%**	50	**61.0%**	79	**57.7%**	***p-value= 0.003*** **
Large	02	**02.7%**	04	**04.9%**	09	**06.6%**	
Total	**74**		**82**		**137**		
-№. of follicles/ovary	**1.48**		**2.28**		**2.85**		
-Diameter of large follicles (mm)	(8.3 – 8.4)		(8.7 – 10.3)		(8.3 – 11.5)		
II- Corpus Luteum:							
-№.	**0.0**		**18**		**0.0**		
-Diameter (mm)			(12.5 to 18.6 mm)				

**highly significant P<0.01.

In this regard, Pandey (2018) documented that a follicle diameter of 12-16 mm is considered the suitable size for ovulation in buffalo, and that follicles within this range are mature enough to support pregnancy in Mura buffalo cows. This may suggest that most of the diameters of the large follicles in the ovaries of buffaloes suffering from one of the three reproductive disorders studied (8.3-11.5 mm) may be less than the appropriate size for ovulation. This may be particularly true for buffalo with smooth ovaries, where the diameter of the large follicles was small and at a very low rate (2.7%).

Ghuman *et al.* (2010) reported that although one or more follicles developed to ovulatory size during the summer anestrus, the follicles failed to ovulate due to endocrine insufficiency.

Several studies have indicated that persistent CL, endometritis, and inactive ovaries can negatively impact follicle count and overall reproductive health in buffaloes and cattle as follows: A persistent CL can inhibit new follicle development due to elevated progesterone levels, which can suppress follicle development, leading to fewer antral follicles and decreased estrous cycle activity (Amin *et al.*, 2025).

Endometritis disturbs ovarian function by causing inflammation, hormonal imbalances, impaired luteal function, and systemic effects, including oxidative stress which results in a decreased number of healthy, viable follicles; It can also lead to an increase in the number of immature follicles and a decrease in the number of healthy follicles, which can lead to infertility (Amin *et al.*, 2025; Sharma *et al.*, 2016) as well as

affecting the CL's ability to regress properly; leading to persistence and further disrupt in the estrous cycle (Hanafi *et al.*,2008; Struve *et al.*,2013; Ojeda *et al.*,2014; Moradikor2014). Pande *et al.* (2012) observed that the most considerable follicle growth is suppressed without any alteration in the total number of follicles during uterine infection.

CONCLUSION

It could be concluded that ovarian disorders were the most common type, followed by uterine disorders, and the highest incidence of various total reproductive disorders, including uterine and ovarian disorders (smooth and persistent CL), was generally associated with the hot season. The presence of the animal in milking, the rural management system, late parities (after the third parity), and the length of time elapsed between the last calving date and the day of examination; as well as reproductive disorders also affected the dynamic pattern of ovarian follicles in buffaloes, with the proportion of large follicles being the lowest in the ovaries of animals suffering from one of the three forms of reproductive disorders studied, and none of them successfully ovulated.

REFERENCES

Abdel-Razek, A.M. (2005). Studies on ovarian activity and hormonal changes during estrous cycle in buffaloes. Zag. Vet. J.; 33(2): 98–106.

Abdoon, A.S.S and Kandil, O.M. (2001). Ovarian follicular development in Egyptian buffaloes as affected by season and hormonal treatment. Egypt J. Anim. Prod.; 38(1): 19–28.

Abdoun, K.A.; El-Sherry, T.M. and Al-Battan, M.A. (2014). Seasonal effects on ovarian activity and follicular dynamics in Egyptian buffaloes. Trop Anim Health Prod.; 46(2): 275–281.

Ahmed, W.M.; El-Khadrawy, H.H. and Hanafi, E.M. (2002). Reproductive status of buffalo-cows with inactive ovaries. Vet. Med. J. Giza. 50(4):601–610.

Ali, A.; Fahmy, S.; Khattab, R. and Abdel-Ghaffar, A.E. (2003). Reproductive status of buffaloes with inactive ovaries as determined by ultrasonography and progesterone levels. Assiut Vet. Med. J.; 49(99): 1–14.

Ali, A.M.; Abdel-Rahman, H.A. and El-Zarkouny, S.Z. (2009). Clinical and ultrasonography studies on ovarian inactivity in cattle and buffaloes under Upper Egyptian conditions. Assiut Vet. Med. J.; 55(121): 154–170.

Al-Tarabani, M. (2018). Seasonal influence on conception rates in Egyptian buffaloes. J. Anim. Reprod.; 45(1): 12–18.

Amin, Y.A.; El-Sherry, T.M.; Hassan, A. and Soliman, A. (2025). Effect of persistent corpus luteum on follicular dynamics and reproductive activity in Egyptian buffaloes. Anim. Reprod. Sci. (In press).

Azawi OI, (2006). Clinical, bacteriological and pathological studies of uterine infections in Iraqi buffaloes. PhD Thesis, College of Vet. Med., Baghdad Univ., Iraq, pp. 122–170

Azawi, O.I.; Omran, S. and Hadad, J. (2008). A study on postpartum metritis in Iraqi buffalo cows: bacterial causes and treatment. Reprod. Domest. Anim., 43(5): 556-65.

Barile, V.L. (2005). Improving reproductive efficiency in female buffaloes. Livestock Prod. Sci., 92: 83–194.

Beg, M.A. and Totey, S.M. (1999). The oestrous cycle, estrus behaviour and the endocrinology of the oestrous cycle in the buffalo (Bubalus bubalis). Anim. Breeding Abst., 67: 329–337.

Darab, M. (2016). Seasonal effects on fertility performance in dairy buffaloes under subtropical conditions. Iranian J. Vet. Res.; 17(3): 153–158.

Das, G. and Khan, F. (2010). Summer anestrus in buffalo–a review. Reprod. in Domestic Anim., 45: e483– e494.

Dutta, J. C.; Buruah, R. N.; Leena, D. and Taluk dar, S. C. (1988). Blood biochemical studies in anestrus and normal cyclic cattle. Indian Vet. J., 65: 239–241

Elbaz, H.T.; Darwish, S.F.; Shahat, A.M. and El-Sherbiny, A.A. (2019). Impact of nutritional status and season dynamics and hormonal

profile in Egyptian buffaloes. J Anim Health Prod., 7(3): 83–91.

El-Belely, M.S.; El-Sheikh, A.S.; Mogawer, H.H. and El-Khayat, Y.M. (1988). Relationship between milk yield and reproductive performance in Egyptian buffaloes. Buffalo J.; 4(1): 69–78.

Elwishy AB, Abdou MSS, Hemaida N, Elsawaf SA. (1971) IV. Reprod. in buffaloes in Egypt. Z Tierzuecht Zuechtungsbiol.;88(1-4):47-63.

El-Wishy, A. B. (2007). The postpartum buffalo: II. Acyclicity and anestrus. Animal Reprod. Sci., 97(3-4), 216-236.

FAO (2020). Food and Agriculture Organization of the United Nations.

FAOSTAT (2019). Food and Agriculture Organization of the United Nations.

Prabhakar, S. (2003). Enhancing reproductive performance in dairy buffalo: Major constraints and achievements. Reprod., 61 (Suppl): 27–36.

Ghanem, M.; Shalaby, A.H.; Sharawy, S. and Saleh, N. (2002). Factors leading to endometritis in Egypt with special reference to reproductive performance. J. Reprod. Sci., 48: 371-375

Ghuman, S.P.S.; Singh, J.; Honparke, M.; Dadarwal, D.; Dhaliwal, G.S. and Singh, S.T. (2010). Fate of Dominant follicle in Summer anestrus buffaloes. Indian J. Anim. Reprod., 31: 7-10.

Hanafi, I.M.; El-Khadrawy, H.H.; Ahmed, W.M. and El-Azab, EA. (2008). Ovarian inactivity in buffalo- cows: Clinical and biochemical studies. Global Vet.; 2(3): 124–129

Hanafi, E.M.; Ahmed, W.M.; Abd El Moez, S.I.; El Khadrawy, H.H. and Abd ELHameed, A.R. (2008). Effect of Clinical Endometritis on Ovarian Activity and Oxidative Stress Status in Egyptian Buffalo- Cows. Am. Eurasian J. Agric. Environ. Sci., 4: 530-536.

Honnapagol, S.S.; Muregeppa, A.; Biradar, U.S. and Mallikarjunappa, S. (1993). Postpartum reproductive performance in suckled and non–suckled Surti buffaloes. Indian Vet. J. 70: 470 – 471.

Malven, P.V.; Parfet, J.R.; Gregg, D.W.; Allrich, R.D. and Moss, G.E. (1986). Relationships among concentrations of opioid neuropeptides and luteinizing hormone in neural tissues of beef cows following early weaning. J. Anim. Sci., 62: 723– 733

Moradikor, N. (2014). Pathological and hormonal causes of persistent corpus luteum in dairy cows. Vet. Res. Forum; 5(3): 163–167.

Moss, N.; Lean, L.J.; Reid, S.W.J. and Hodgson, D.R. (2002). Risk factors for repeat breeder syndrome in New South Wales Nandital S. (2001). Seasonal effect on oocyte quality and reproductive efficiency in buffaloes Bull; 20(3): 45–50.

Nava-Trujillo, H.; Escalona-Muñoz, J.; Carrillo-Fernández, F. and Parra-Olivero, A. (2018). Effect of parity on productive performance and calving interval in water buffaloes. J Buffalo Sci; 7: 13-16.

NRC (1987). Nutrient Requirements of Dairy Cattle. 6th rev. ed. Washington, DC: National Academy Press.

Ojeda, A.R.; Jiménez, R.; Hernández, A. and Rodríguez, M.L. (2014) . Persistent corpus luteum and its impact on reproductive performance in dairy cattle. Trop. Anim. Health Prod., 46(6):1039–1045.

Pandey, A. K.; Gupta, A. K. and Prasad, S. (2013). Reproductive disorders and their management in dairy animals: A review. Indian J. Anim. Sci., 83(10), 1035–1045.

Payton, R.R.; Rispoli, L.A.; Saxton, A.M. and Edwards, J.L. (2004). Impact of heat stress on bovine oocyte quality and gene expression. Reprod.; 127(5): 621–629.

Peralta-Torres, J.F.; Cuadro, F.; Barragan, A.; Palomares, R.S.; Gonzalez, R. and Munoz, M. (2017). Heat stress reduces follicular population and ovarian activity in dairy cattle. Anim. Reprod. Sci.; 182: 100–106.

Qayyum, A.; Khan, M.I.; Ahmad, N. and Younis, M. (2018). Seasonal variations in reproductive efficiency of Nili-Ravi buffaloes under field conditions. Buffalo Bull.; 37(1): 67–72.

Quintansa, G.; Vázquez, A.I. and Weigel, K.A. (2009). Effect of suckling restriction with nose

plates and premature weaning on postpartum anestrous interval in primiparous cows under range conditions. Anim. Reprod. Sci. 116: 10-18.

Ronchi, B.; Stradaioli, G.; Verini Supplizi, A.; Bernabucci, U.; Lacetera, N. and Accorsi, P. (2001). Influence of heat stress or feed restriction on plasma P4, estradiol 17, LH, FSH, prolactin and cortisol in Holstein heifers. Livest. Prod. Sci.; 68: 231-41.

Roth, Z.; Meidan, R.; Shaham-Albalancy, A.; Braw-Tal, R. and Wolfenson, D. (2001). Delayed effect of heat stress on steroid production in medium-sized and preovulatory bovine follicles Anim. Reprod. Sci.; 745–751

SAS Institute. (2007). SAS/STAT® 9.2. User's Guide. SAS Institute Inc., Cary, NC .USA.

Seno, L.O.; Silva, L.A.; Nogueira, G.P.; Fernandes, C.B. and Viana, J.H.M. (2010). Relationship between milk yield and ovarian function in dairy buffaloes. Anim Reprod Sci.; 119(1–2): 94–98.

Serur, B.H.; Farra, A.A. and Goma, A. (1982). Incidence of certain infertility problems among cow and buffaloes in upper Egypt. Assiut. Vet. Med. J., 10: 39-41.

Sharma, C.G.; Kharche, S.D.; Kumar, S.; Behl, R. and Jindal, R. (2016). Morphometric and endocrine characteristics of ovarian follicles in relation to fertility in buffaloes. Indian J Anim. Sci.; 86(7): 800–805.

Sheldon, I. M. (2009). Defining postpartum uterine disease and the mechanisms of infection and immunity in the female reproductive tract in cattle. Biol. Reprod. 81: 1025–1032.

Singh, M.; Chaudhari, B.K.; Singh JK, Singh AK, and Maurya PK. (2013). Effects on buffalo reproductive performance during summer season. J. Biol. Sci.; 1(1): 1 – 8 .

Singh, G.; Chandolia, R. K.; Dutt, R.; Saini, A. and Malik, R. K. (2018). Characteristics of middle uterine artery and umbilical blood flow in pregnant Murrah buffalo. Indian Journal of Animal Reprod., 39: 11-14.

Singh, J.; Nanda, A. S. and Adams, G. P. (2000). The reproductive pattern and efficiency of female buffaloes. Animal Reprod. Science, 593-604.

Singh, J.; Nanda, A. S. and Adams, G. P. (2018). Reproductive disorders in buffaloes and implications for fertility. Animal Reprod. Science, 192: 1-17.

Strüve, K.; Bollwein, H.; Koert, I.; Herzog, K.; Schwerhoff, M. and Ulbrich, S.E. (2013). Luteal function and conceptus development in dairy cows with persistent corpora lutea. Reprod. Domes. Anim.; 48(4): 571–578.

Takuma, T.; Kamomae, H.; Nishimura, R. and Shimizu, T. (2010). Ovarian dynamics and endocrine profiles in dairy cows during the hot season. Anim. Reprod. Sci.; 119(3–4): 204–211.

Terzano, G.M.; Barile, V.L. and Borghese, A. (2012). Overview on reproductive endocrine aspects in buffalo. J. Buffalo Science, 1: 126–138.

Wilson, S.J.; Kirby, C.J.; Koenigsfeld, A.T.; Keisler, D.H. and Lucy, M.C. (1998). Effects of controlled heat stress on ovarian function of dairy cattle: 2. Heifers J. Dairy Sci., 81: 2132-2138.

Wiltbank, M.; Gumen, A. and Sartori, R. (2002). Physiological classification of anovulatory conditions in cattle. Theriogenology, 57: 21-52.

Yadav, S.P.; Sikka, P.; Kumar, D.; Sarkar, S.; Pandey, A. K.; Yadav, P. S. and Sethi, R. K. (2013). Variation in milk constituents during different parity and seasons in Murrah buffaloes. Indian J. Anim. Sci., 83(7): 747–751.

Youngquist, R.S. and Shore, M.D. (1997). Post partumuterine infection, p. 335-340. In Youngquist, R.S. (ed.) Current Therapy of Large Animal Theriogenology, Philadelphia, PA, U.S.A.

الاضطرابات التناسلية والتغيرات في النمط الديناميكي للحويصلات المبيضية في الجاموس المصري

عبدالله فتحي نيبر، سعيد سعيد عمر، أسماء عبدالله فتحي، مرفت مختار سليمان، ريم صابر مراد

قسم الإنتاج الحيواني، كلية الزراعة، جامعة المنوفية

الملخص العربي

هدفت هذه الدراسة إلى بحث معدل انتشار الاضطرابات التناسلية وتأثيرها على ديناميكية الحويصلات المبيضية في ١٧٢ جاموسة مصرية تم فحصها بعد مرور ≤٦٠ يومًا من الولادة. بصفة عامة، كانت اضطرابات المبيض هي الأكثر شيوعًا (٥٤,٧ %) تلتها اضطرابات الرحم (٤٥,٣ %). وقد تبين أن معدل حدوث الاضطرابات التناسلية كان أعلى بشكل ملحوظ خلال الأشهر الحارة (٦٣,٤ %) مقارنة بالأشهر الباردة (٣٦,٦ %)، وفي الجاموس الحلاب (٧٣,٨ %) مقارنة بالجاموس الجاف (٢٦,٢ %)، وكذلك في الحيوانات المُرباة تحت النظام الريفي (٦١,٠ %) مقارنة بنظيراتها في النظام شبه المكثف (٣٩,٠ %). وسُجلت أعلى معدلات الاضطرابات في موسم الولادة الثاني (٢٨,٥ %) والخامس (٢٣,٣ %)، بينما لوحظت أدنى المعدلات في موسم الولادة الثالث (١٢,٢ %). كما أظهرت الجاموس التي تجاوزت فترة ما بعد الولادة لديها ١٨٠ يومًا حتى الحمل أعلى نسب للاضطرابات (٢٩,٧ %) مقارنة بتلك التي فُحصت بعد ٦٠ يومًا من الولادة (٩,٩%). وقد أوضحت الفحوص بالموجات فوق الصوتية لـ ٦٧ جاموسة أن المبايض الملساء تميزت بانتشار مرتفع للحويصلات الصغيرة (٦٠,٨%)، في حين غلبت الحويصلات المتوسطة في حالات الجسم الأصفر المستديم (٦١,٠ %) وحالات التهاب بطانة الرحم (٥٧,٧ %)، بينما كانت الحويصلات الكبيرة نادرة الوجود (≤٦,٦ %) ولم تنجح في إحداث التبويض. تشير هذه النتائج إلى أن الاضطرابات التناسلية في الجاموس المصري تتأثر بقوة بعوامل الموسم، والحالة الإنتاجية، ونظام التربية، وعدد الولادات، وطول الفترة بعد الولادة، وترتبط بحدوث تغيرات في ديناميكية الحويصلات المبيضية تتسم بضعف نمو الحويصلات الكبيرة القابلة للتبويض.

الكلمات المفتاحية :الجاموس المصري، الاضطرابات التناسلية، خلل المبيض، اضطرابات الرحم، ديناميكية الحويصلات المبيضية.