Ultrasonographic Biometry of the Ovaries of Pregnant Kundhi Buffaloes

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Abstract: Sixteen gravid uteri of 1st, 2nd, 3rd and 4th month of pregnant Kundhi buffaloes were collected from Hyderabad slaughterhouse for this study. The ovaries were separated from gravid uteri of Kundhi buffaloes and ultrasonographic biometry was performed by ultrasound machine (HS-2000, Honda electronics Co. Ltd., Japan). The ovaries were examined for presence of follicles and/or corpus luteum. The length, width and height of ovaries and corpus luteum (CL) were recorded and measured. The average weight of ovaries with corpus luteum during 1st, 2nd, 3rd and 4th month's of pregnancy was 4.6 ± 0.345, 5.90 ± 1.134, 6.10 ± 1.179, and 6.50 ± 1.139 gms, respectively. The average weight of CL during 1st, 2nd, 3rd and 4th month of pregnancy was 2.0 ±0.162, 2.4 ± 0.35, 2.6 ± 0.27, and 3.0 ± 0.49 gm, respectively. The average weight of ovaries of non-gravid uterus of same buffaloes was 2.7 ± 0.35, 3.6 ± 1.10, 3.9 ± 1.15, and 4.2 ± 1.09 gm during 1st, 2nd, 3rd and 4th month of pregnancy respectively. The average size of the left and right ovary was 29.0 ± 1.2 mm and 20.01 ± 2.15 mm respectively and the average size of CL was 17.13 ± 3.15 mm. There was significant increase in the weight, length, width and height of ovaries and corpus leutum as pregnancy advances than non-pregnant buffaloes. A greater number of ovarian structure (follicles) was found at the time of oestrus than anoestrus period.

Keywords: Kundhi buffalo, ultrasonography, biometry, ovary.

INTRODUCTION

Buffaloes *(Bubalus bubalis*) are the major dairy animal in Pakistan and the estimated buffalo population in the country was 30.8 million heads in 2009-10, which increased to 32.7 million in 2011-12 [1]. Buffaloes constitute 27.70 percent of country's livestock population and is the major milk producing animals contributing about 67.21 percent of the total milk production and 53.54 percent of the total beef available in the country. Pakistan possesses superior genetic resources in ruminant livestock including buffaloes in whole of Asia [2]. Despite all this, the average lower yields in buffalo had been of great concern as compared to their counter-parts (Cattle) in western countries. This is mainly due to the fact that buffaloes in Pakistan being a different germplasm are not being maintained on scientific lines, be it their genetic improvement or feeding. Ultrasonography is a safe and non-invasive diagnostic technique in veterinary medicine and better method for detecting reproductive disorders in sheep [3], goat [4] and buffalo [5, 6]. The total population of follicles is comparatively lower in buffaloes than in cattle [7]. Some work on the morphology, physiology and pathology of reproductive organs of goat [8, 9], cow [10, 11] and in buffaloes [5, 6, 12] has been reported in different countries. Waheed [13] reported that there was no significant difference in the weight and diameter of corpora lutea between Groups A (1-<3 months pregnancy) and B (3-6 months pregnancy) inEgyptian buffaloes. But very little is known about the ultrasonographic biometry of ovaries, corpus luteum and follicle in kundhi buffaloes.

Therefore, the present study was planned to establish baseline data on the normal ultrasonographic dimensions of ovaries in non-pregnant and pregnant Kundhi buffaloes of Sindh, Pakistan.

MATERIALS AND METHODS

Sixteen gravid uteri of 1st, 2nd, 3rd and 4th months of pregnant and 16 non-pregnant buffaloes were collected from Hyderabad slaughterhouse for this study. The ovaries were separated from gravid uteri of buffaloes and subjected to ultrasonographic biometry. The ovaries were examined for presence of follicles or corpus luteum. The length, width and height of ovaries and CL were gauged by a vernier caliper and recorded and then similarly, ovaries of non pregnant buffaloes were recorded and compared. The weight was gauged by analytical balance.

A real time B-mode ultrasound scanner (HS-2000, Honda electronics Co. Ltd., Japan) equipped with a 5.0 MHz linear-array transducer and a video graphic printer (Sony, Japan) was used for this study. The total follicle population was recorded as appeared by anechoic black structures, while CL with granular structures and more echogenicity was measured and recorded. The means and standard errors for all variables were calculated and presented. Differences between the

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Table 1: Weight of Ovaries and Corpus Leutum of Pregnant Kundhi Buffaloes

Observations	Gestation Period			
	one month	2 months	3 months	4 months
Weight of ovary with CL (gm)	4.6 ± 0.345^{aa}	5.9 ± 1.134^{abbcc}	6.1 ± 1.179^{aabb}	6.5 ± 1.139^{aadd}
Weight of CL (gm)	2.0 ± 0.162^{aabb}	2.4 ± 0.347^{aabb}	2.6 ± 0.266^{aabbcc}	3.0 ± 0.494^{aabbcc}
Weight of ovary in which CL absent (gm)	2.7 ± 0.345^{aabbccdd}	3.6 ± 1.140^{bbccdd}	3.9 ± 1.149^{bbdd}	4.2 ± 1.093^{bbccdd}

^{aa} = Significantly (P<0.01) different from corresponding values.
^{a} = Significantly (P<0.05) different from corresponding values.
^{bb} = Significantly (P<0.01) different from corresponding values.
^{cc} = Significantly (P<0.01) different from corresponding values.
^{dd} = Significantly (P<0.01) different from corresponding values.

ovarian size and the number of follicles and corpus in pregnant and non-pregnant buffaloes were tested by Student "t" test.

RESULTS AND DISCUSSION

Buffaloes are regarded to have a lower reproductive efficiency and several reports suggest lower follicular population in the buffalo ovaries [6, 7, 14]. The average weight of ovaries with corpus luteum during 1st, 2nd, 3rd and 4th months of pregnancy was 4.6 ± 0.345, 5.90 ± 1.134, 6.10 ± 1.179, and 6.50 ± 1.139 gms respectively. The average weight of CL during 1st, 2nd, 3rd and 4th month of pregnancy was 2.0 ±0.162, 2.4 ± 0.35, 2.6 ± 0.27, and 3.0 ± 0.494 gm respectively. The corpus luteum enlarges as pregnancy advances and produces progesterone to help in the maintaining of the lining of the endometrium in early pregnancy [13, 15]. When the placenta is capable of producing adequate amounts of progesterone and estrogen, it slowly decreases in size and function after the 10th to 12th week of pregnancy [16].

The average weight of ovaries of non-gravid uterus of same buffaloes was 2.7 ± 0.345, 3.6 ± 1.14, 3.9 ± 1.149, and 4.2 ± 1.093 gm during 1st, 2nd, 3rd and 4th month of pregnancy, respectively. The mean length, width and height of ovaries in slaughter Specimens of non-pregnant buffaloes were 29.00 ± 1.20, 20.0 ± 1.1 and 22.00 ± 2.1 mm (Lt. Ovary) and 20.01 ± 2.15, 14.50 ± 2.4 and 19.60 ± 6.50 mm (Rt. Ovary), respectively (Table **1**). The length and width of left ovary was significantly higher than right ovary in kundhi buffaloes. The mean length, width and height of ovaries of Kundhi buffaloes were greater than those observed in non-descript buffaloes by Chandrahasan and Rajasekaran [17], in Murrah buffaloes by Kumar *et al*. [18] and in Toda Buffaloes by Patel *et al.* [6].

All ovaries of gravid uterus had mature projecting CL of 11.2 ± 4.5, 18.5 ± 2.6, 19.0 ± 1.1, and 19.8 ± 1.4 mm in length and 11.2 ± 6.5, 17.5 ± 2.44, 17.8 ± 4.94, and 19.0 ± 0.2 mm width during 1st, 2nd, 3rd and 4th month of pregnancy respectively Table **3**. Left ovaries had 4.0 ± 0.5 graafian follicles and right ovaries possessed higher number of 6.0 ± 1.0 graafian follicles (Table **4**). The length, width and height of graafian follicles on left ovaries were 15.23 ± 2.3, 12.6 ± 3.2, and 10.2 ± 2.2 mm respectively, whereas length, width and height of graafian follicles on right ovaries were 14.24 ± 2.5, 11.5 ± 2.3 and 9.8 ± 3.3 mm respectively (Table **4**). Significant changes in the length and width of ovaries prior to and post pregnancy were observed. The smallest normal ovary was found to be 18 x12 mm (length x width), while the biggest ovary measured 44.5 x 26 mm. On the 4th month of pregnancy, they measured 32.3 x 22 mm and 44.2 x 26.4 mm, respectively.

Table 2: Ultrasonographic Ovarian Biometry of Non-Pregnant Kundhi Buffaloes

Measurements (mm)	Left ovary	Right ovary
Length	29.0 ± 1.2^{a}	20.01 ± 2.15^{b}
Width	20.0 ± 1.1^{a}	14.5 ± 2.4^{b}
Height	22.0 ± 2.1	19.6 ± 6.5

^{a} = Significantly higher at (P<0.01) than corresponding values.

The length and width of ovary as observed with ultrasonography in this study was higher than that found by Patel *et al.* [6] in Toda buffaloes, Chandrahasan and Rajsekaran [17] in non-descript buffaloes, Kumar *et al.* [18] in Murrah buffaloes. Size of ovaries was significantly increased as pregnancy advanced. Its size normally increases during early stage of pregnancy but the variation in size may be due

Table 3: Ultrasonographic Biometry of Corpus Leutum During Pregnancy in Kundhi Buffaloes

Measurements (mm)	Gestation Period			
	1st month	2nd months	3rd month	4th month
Length	11.2 ± 4.5[a]	18.5 ± 2.6[b]	19.0 ± 1.1[b]	19.8 ± 1.4[b]
Width	11.2 ± 6.50[a]	17.5 ± 2.44[b]	17.8 ± 4.94[b]	19.0 ± 0.2[b]

[a] = Significantly higher at (P<0.01) than corresponding values.

Table 4: Ultrasonographic Biometry of Corpus Leutum and Follicles in Kundhi Buffaloes

Particulars	Measurements (mm)	Left Ovary	Right Ovary
Corpus luteum (CL)	Length	17.13 ± 3.15	15.2 ± 2.5
	Width	16.38 ± 3.52	17.23 ± 3.4
	Height	13.27 ± 2.4	14.2 ± 2.2
	Number	1.0 ± 0.2	1.0 ± 0.1
Follicle (F)	Length	15.23 ± 2.3	14.24 ± 2.5
	Width	12.6 ± 3.2	11.5 ± 2.3
	Height	10.2 ± 2.2	9.8 ± 3.3
	Number	4.0 ± 0.5[a]	6.0 ± 1.0[b]

[a] = Significantly higher at (P<0.01) than corresponding values.

Table 5: Ultrasonographic Biometry of Ovaries During Pregnancy in Kundhi Buffaloes

Measurements (mm)	Gestation Period			
	1st month	2nd months	3rd month	4th month
Length	26.6± 1.9[c]	30.0 ± 1.2[b]	38.0 ± 6.3[a]	39.0 ± 5.5[a]
Width	22.2± 8.3	22.21 ± 1.1	22.0 ± 2.5	24.0 ± 1.4
Height	22.1± 1.8[b]	22.2 ± 1.1[b]	61.0 ± 11.5[a]	67.0 ± 11.5[a]

[a] = Significantly higher at (P<0.01) than corresponding values.

to variation of breed, age, size of animals, environment and genetic make up. Also significant increase (P<0.05) in the size of the corpus luteum was observed. The changes in ovary size and structures during pregnancy are shown in Plate-**1**. Corpus luteum was present in all the animals studied during pregnancy (Table **3**). Similarly, there was an increase in the availability of number of follicles in response to heat. The average size of follicle on the day of heat (15.25 ± 1.28 mm) was greater as compared post breeding (12.00 ± 0.82 mm). On post breeding, fourteen buffaloes were shown to have a distinct CL, while in two buffaloes; CL was not found in any of the ovaries. However, both the buffaloes had follicles in their ovaries. The same relationship between the size and number was reported in cows [19]. Ginther *et al*. [20] reported a decrease in the dominant follicle diameter after day 90 of cow pregnancy.

Overall, there was no significant difference in the presence of ovarian structures on the post heat or on conception day. The current results are in agreement with the findings of Madan [7]. However, Chandrahasan and Rajsekaran [17] found a greater number (3.41 ± 0.11) of follicles than Toda buffaloes (2.80 + 0.63). Rohilla *et al.* [5] also found 7.7 ± 0.3 follicles in anoestrus Murrah buffaloes by ultrasonography.

The size of the follicle observed in this study was comparable to the ultrasonographic studies by Honparkhe *et al.* [12] and Rohilla *et al.* [5].

The average size of the follicle on the breeding day (15.25 ± 1.28 mm) was greater as compared to the post breeding (12.00 ± 0.82 mm). This increase in size of the follicle may be due to the presence of cysts (16-

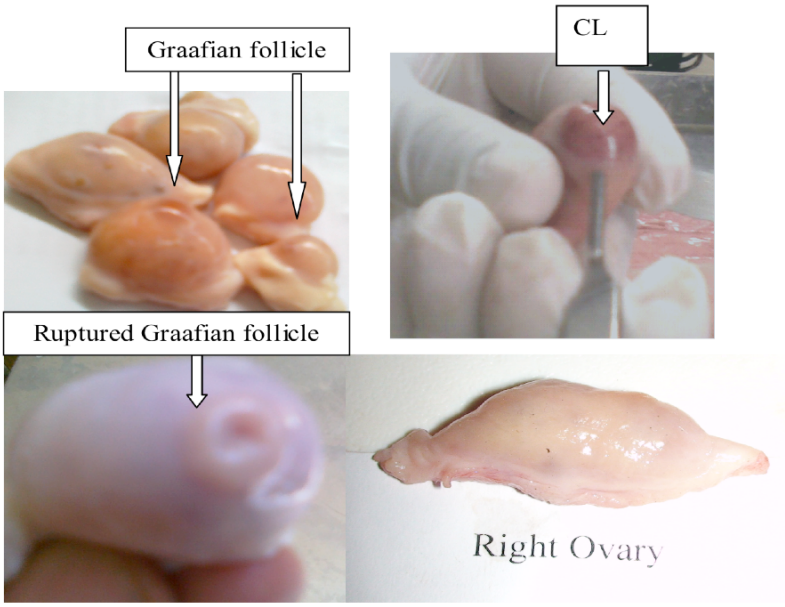
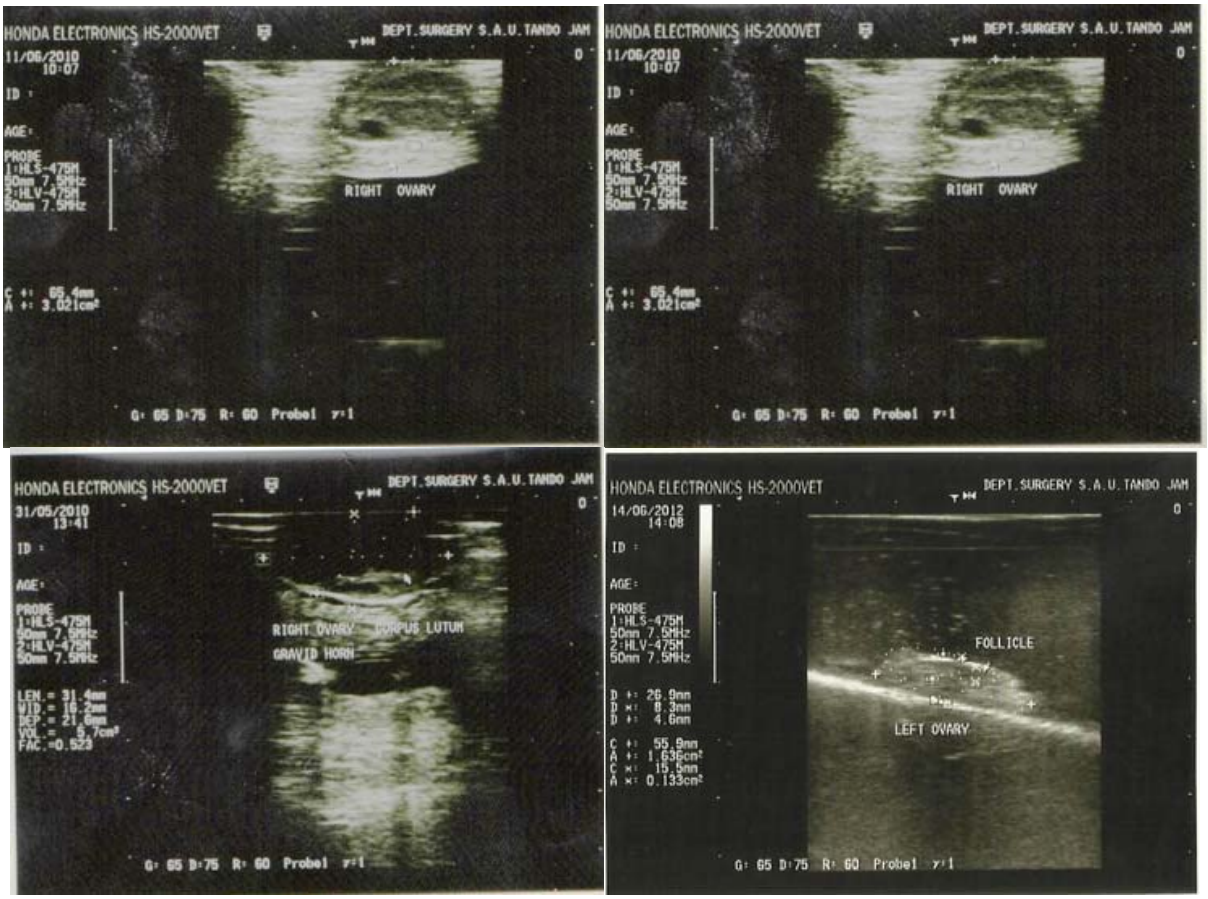


Plate-1. Ovary and structural changes during pregnancy and heat in buffaloes.



22 mm) found on the day of breeding in three buffaloes. The size of CL was larger than those studied by Honparkhe *et al.* [12] and Chandrahasan and Rajsekaran [17]. In conclusions, there was significant increase in the weight, length, width and height of ovaries and corpus leutum as pregnancy advances than non-pregnant buffaloes. A greater number of ovarian structure (follicles) was found at the time of oestrus than anoestrus period. The length and width of left ovary was significantly higher than right ovary in kundhi buffaloes.

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