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# Progesterone Level of Lactating Ewes Influenced by Parity Order, Type of Lambing and Lambs Sex

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**Abstract** | Postpartum (pp) Progesterone (p4) level essential to discover resumption of corpus luteum, which is important for ewes' efficiency. As known level of progesterone influences by several factors breed, physiological condition, season, nutrition, suckling and parity, the present study was conducted to estimate progesterone level in lambing and postpartum period, first rise of hormone, and study the effect of parity order, type of lambing, and offspring sex on postpartum progesterone among Turkish Awassi ewes. **Method:** 24 pregnant ewes at the last month of gestation in first and fourth parties were used in this study. All ewes submitted to same management condition. Blood samples were collected every two weeks, started at two weeks before lambing until weaning time to estimate progesterone level by radioimmunoassay (RIA) method. **Results:** there are no significant differences in P4 at lambing between 1st and 4th parity, while the first elevation of p4 was in 4th parity at 4wks after lambing. Lambing type affects significantly in the 1st parity. There is no effect to offspring sex on the p4 level. **Conclusion:** there is no effect of parity in the lambing p4 level, but influence positively on the level of postpartum p4 (the highest level of p4 in4$^{th}$ parity at 4 wks. postpartum). Lambing type affects postpartum p4 level but there is no effect to offspring sex on postpartum p4.

**Keywords** | Postpartum progesterone, Parity, Lambing type, Lamb sex

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## INTRODUCTION

Progesterone is a steroid hormone produce from corpus luteum (CL) from granulosa-lutein cells through reproduction phase and from the placenta through pregnancy. Adrenal cortex also source of few amounts of progesterone. (Miller & Auchus 2011; McGraw, 2007). It has several important functions, it induces ovulation, facilitates implantation of embryo in the uterus in early pregnancy (Clark & Sutherl, 1990; Graham & Clarke, 1997), and prevents contraction of myometrium during pregnancy due to decrease calcium intake by uterus muscle during pregnancy (Clark & Sutherl, 1990, Niswender et al., 2000). It has a part in the mammary gland growth and development with estrogen during puberty and pregnancy. Estrogen hormone required for ductal and branch system growth while progesterone responsible for the development of a lobular alveolar system of the mammary gland in production of milk (Sivaraman et al., 2001). Progesterone level in blood reflects reproductive state of animal (Qureshi et al., 2000; Ball & Peters, 2004). Postpartum period in farm animals characterizes by uterine involution and restoration of ovarian activity which have to take place to new pregnancy (Takayama et al., 2010; Medan & El-Daek, 2015) which affects by many factors like season of birth, nutrition, lactation, number of fetus, intensity of suckling and breed (Senger, 2003; Khanum et al., 2008; Hileman et al., 2011; Ivan et al., 2016). Thus the current study aimed to determine a level of progesterone hormone at lambing and postpartum periods, and study the impact of parity number, type of lambing and sex of lambs on progesterone level among Awassi Turkish ewes in Iraq.

## MATERIAL AND METHODS

### Animals

24 pregnant Awassi Turkish ewes selected from flock of 50 ewes which were used in the current study achieved in

sheep and goat rearing station in Baghdad/ ministry of agriculture, at age of 2- 4 years old in two parties first and fourth parity at last month of gestation which determined by ultrasonography method All these ewes were separated from rams from the first month of gestation and housed in the semi-open yard under veterinarian observation. All ewes subjected to the feeding regime of the station. Their fodder was Concentration 14% protein and roughage. Minerals and water were access all the day. All ewes were grazed three hours daily for exercises and sunlight exposure to complete nutritional requirements. All newborn lambs left with their dams continuously to get enough amounts from colostrum and for normal lactation until the age of weaning at 70 days.

### Blood Collection

The jugular vein was the site of blood collection by anticoagulant free vacationer tubes in the morning before feeding every 14 days. The first sample was drawn before lambing at 135 ± 2 days of gestation. The second sample was at the day of lambing, while the following collections were each 14 days (six sample for each ewe with a total 144 samples) which cold transported to the laboratory for centrifugation 3000 c/min for 20 minutes to get serum which preserved at -18c until the day of hormone testing by radioimmune assay.

### Statistical Analysis

For presentation data and analysis using SPSS Vr. 24:
-Descriptive statistics (mean and stander deviation).
-Compare means by using t- test
-Sample correlation coffetion (r).
- 5- 1% the level of analysis used in analysis of data.

## RESULTS

Table 1 shows descriptive statistics of progesterone level in the first parity which appears the largest mean (3.479) in the prepartum period while the lowest level (1.0033) at 28 days postpartum.

**Table 1:** Descriptive Statisticsof Progesterone /1st parity

| Collection days | Min. | Max. | Mean | Std. |
|---|---|---|---|---|
| prepartum progesterone (T1) | 1.3 | 4.3 | 3.479 | 1.3328 |
| lambingday (T2) | 0.2 | 2.1 | 1.367 | .8454 |
| 14 day (T3) | 0.2 | 2.0 | 1.383 | .6494 |
| 28 day (T4) | 0.20 | 1.80 | 1.0033 | .54043 |
| 42 day (T5) | 0.24 | 1.60 | 1.0233 | .56997 |
| 56 day (T6) | 0.40 | 1.90 | 1.4333 | .53914 |

Table 2 shows descriptive statistics of progesterone in the 4th parity which appears the largest mean of progesterone at the prepartum period (2.503) while the lowest mean at 4 weeks postpartum (1.733) in the fourth parity.

**Table 2:** Descriptive Statisticsof Progesterone /4th parity

| Collection days | Min. | Max. | Mean | Std. |
|---|---|---|---|---|
| Prepartum Progesterone (T1) | 1.6 | 2.8 | 2.503 | .3137 |
| lambing day (T2) | 0.8 | 2.1 | 1.533 | .4719 |
| 14 day (T3) | 0.6 | 1.9 | 1.567 | .4885 |
| 28 day (T4) | 1.3 | 1.9 | 1.733 | .2338 |
| 42 day (T5) | 0.8 | 1.8 | 1.417 | .3869 |
| 56 day (T6) | 0.8 | 1.7 | 1.483 | .3545 |

Table 3 shows significant differences P≤0.05 in the level of certain hormone between comparative parities at prepartum day and at 28 day postpartum, While the significant absence in the rest time.

**Table 3:** t- Test of Progesterone /1st parity & Progesterone /4th parity

| | t | P-Value | C.S |
|---|---|---|---|
| Prog1T1 & Prog4T1 | 2.580 | 0.0171 | P≤0.05 (S) |
| Prog1T2 & Prog4T2 | 0.449 | 0.672 | P>0.05 (NS) |
| Prog1T3 & Prog4T3 | 0.591 | 0.580 | P>0.05 (NS) |
| Prog1T4& Prog4T4 | 2.573 | 0.050 | P≤0.05 (S) |
| Prog1T5 & Prog4T5 | 1.109 | 0.318 | P>0.05 (NS) |
| Prog1T6 & Prog4T6 | 0.173 | 0.870 | P>0.05(NS) |

Table 4 shows the impact of sex of a newborn on the level of progesterone which appears no impact of newborn sex on the level of progesterone in the 1st parity.

**Table 4:** t- Test of Progesterone /1stparity & Sex

| Progesterone /1st parity | Mean± Std. | t | P-Value | C.S |
|---|---|---|---|---|
| Male | 0.801±0.415 | 0.306 | 0.769 | P>0.05 (NS) |
| Female | 0.871±0.190 | | | |

Table 5 shows the impact of sex of a newborn on the level of progesterone which appears no impact of newborn sex on the level of progesterone in the 4th parity

**Table 5:** t- Test of Progesterone /4thparity & Sex

| Progesterone /4st parity | Mean± Std. | t | P-Value | C.S |
|---|---|---|---|---|
| Male | 1.221±0.13132 | 1.731 | 0.141 | P>0.05 (NS) |
| Female | 1.423±0.141 | | | |

Table 6 shows an effect of lambing type on the level of p4 which appearssignificant increase P≤0.05 in the level of p4 among twins bearing ewes than those which single bear ewes in the first parity.

**Table 6:** t- Test of Progesterone /1st parity& Type of lambing

| Progesterone /1st parity | Mean± Std. | t | P-Value | C.S |
|---|---|---|---|---|
| Single | 1.751±0.280 | 2.856 | 0.046 | P≤0.05 (S) |
| Twins | 0.997±0.362 | | | |

Table 7 shows an effect of lambing type on the level of p4 which appears no effect of lambing type on the level of p4 among 4th parity.

**Table 7:** t- Test of Progesterone /4th parity& Type of lambing

| Progesterone /4th parity | Mean± Std. | t | P-Value | C.S |
|---|---|---|---|---|
| Single | 1.630±0.215 | 0.695 | 0.525 | P>0.05 (NS) |
| Twins | 1.467±0.000 | | | |

## DISCUSSION

Progesterone is a particular signal to corpus luteum function in this period whereas it is the master steroid secretes from CL (Berardinelli et al., 2001) The existing study has shown variation in the levels of progesterone in the postpartum period disagree with other studies which relied on the claim of the level of postpartum progesterone >1ng/m indicates to CL activity (Thimonier 2000; Berardinelli et al., 2001; Hayder & Ali, 2008). This differences in the level of postpartum p4 maybe result from genotype variation among breeds due to feeding intake, milk production and physiological condition among breeds produce diversity in the postpartum anestrus period to fertile one, in addition to the influence of seasons (Pope et al., 1989; Medan & El-Daek, 2015). Over and above reasons the long period between blood collection days in the present study prevents follow the changes in p4 level precisely (Kaskous et al., 2001).

The level of prepartum p4 (2 wks. before lambing) highly significant in 1st parity than 4th one because of the number of twins in the 1st parity more than 4th parity which agrees with Khan & Ludri, (2002) and Souhayla, (2015) who found p4 level higher in twins bearing goats than the single bearing one. The low concentration of progesterone in the blood at the end of gestation will stimulate α-lactalbumin synthesis and complete lactose synthesis to initiate lactation (Cowie & Tindal, 1971).

The pattern changes of P4 levels from prepartum to lambing result from conversion of p4 to estradiol and produces PGF2 alpha from the placenta, which regress the corpus luteum under effect of fetal corticoid (Jainudeen & Hafez 2000; Senger 2003; Gibb et al., 2006) agree with Shanaz et al. (2001), Kaskous et al. (2001) & Khan & Ludri, (2002).

The little resemble in P4 level at lambing and 14 day pp in both parties results from poor activity of corpus lutum due to lactation and suckling which obstacle LH secretion, (Mwaaga & Janowski, 2000) through elevation of oxytocin followed by prolactin after stimulation of teat (Crowe, 2008; Crowe et al., 2014) which inhibits secretion of GnRH causing inadequate LH release that is substantial for growth and maturation of ovarian follicles and delayed ovulation (Yavas & Walton, 2000). In addition to a maternal relationship through visual and/ or olfactory singles between dams and their lambs delays ovarian resumption. Moreover, suckling frequency plays an important role to get the same result. (Noakes et al., 2001; Crowe, 2008; Crowe et al., 2014) the effect of suckling on the P4 level in the present study agrees with Terán et al. (2011) and Oliveira et al. (2013) who found ewes under controlling suckling return to ovulation significantly before uncontrolling group of ewes . As well as agrees with Costa et al. (2007) & Morales et al. (2004) and agree with Khan & Ludri, (2002) in goats. The low levels of p4 through lactation period in both parties agree with Özpınar et al. (2003) & Mohammed et al. (2007).

The significant decline (p< 0.05) in P4 at 28 days (4th weeks pp) in the 1st parity represents the highest level of lactation in the ewes in this period (Rubianes, 1993; Al-Ekpi et al ., 2010) leading to increase demands of lambs makes the mechanism more complex associated also with nutritional status of dam which starts negative and indirect influence in LH secretion (McNeilly, 2006) that confirm the impact of lactation, whereas the number of twins births in 1st parity more than 4th one which associated with high milk yield (Loerch et al., 1985; Adegoke et al., 2015; Gamit et al., 2018) In addition to impacts of intensity and frequency of suckling comparing with 4th parity (Terán et al., 2011; Oliveira et al., 2015) which agree with Rubianes, (1993) and Kascose et al. (2001).

However the significant increase (P≤0.05) in the P4 at 28 days (4th week) pp reflects resumption of ovarian activity which agrees with the line of Rubianes, (1993) who find out The first ovulation occurs in Corriedale ewes between day 17 to 25 in autumn lambing. Reffat et al. (2012) reports that p4 > 1ng/ml at 22.0 ± 2.5 d in Farfara ewes had a complete uterine involution and luteal activity within 35 days postpartum during October lambing season. The present finding disagree with Sadat, (2014) who reported the first rise of p4 was 69 days pp, ditto disagree with Kascose et al 2001 who found the first ovulation before day 20 pp as a result of seasonal effectiveness, early weaning and presence of ram in Awassi ewes., while Farfara ewes lambed in February showed p4 >1 ng/ml at 39.0 ± 1.2 d and 69.3 ± 1.2 d in June (Hayder & Ali, 2008). The current results

disagree with Medan & El-Daek T, (2015), Lamraoui et al. (2017) who found first elevation in p4 > 1ng/ml was at 119, 99 and 77 day in different lambing months in Barbary ewes and at six week pp. in Ouled Djellal Ewes respectively. The modulation not concentration of P4 levels in 4th parity resemble to finding by Majdi et al. (2014) on goats. They reported slow elevation in p4 from 7th to 21th day until maximum level at 27th day postpartum, also found in other studies on goats (Khanum et al., 2007; Takayama et al., 2010). These differences due to breeds, managements, physiological condition of animals, seasons, and sampling days and measurement methods. (Greyling, 2000; Kascose et al., 2001).

The current study agrees with Sadat, (2014) who found Lambing intervals declined significantly (P<0.05) with increasing parity as well as agree with Tomomi et al. (2008) reports significant relationship between parity and the day of first ovulation after calving.

P4 level in the pregnancy highly than pp to increase parenchymal cells and alveoli to increase milk production after lambing (Kascose et al., 2001) therefore the twins lambing affect significantly on the P4 level in the pp in 1st parity due to effect of lactation , suckling , and maternal relationship. In spite of this result agreement with Shanaz et al. (2001) and Takayama et al. (2010) in the average postpartum interval in single and twin bearing goats, but disagree with Kascose et al. (2001), Khan & Ludri, (2002) in ewes and goats respectively.

Very little is known about effect of sex of lambs on the postpartum p4. The present results appear no significant effect of sex on postpartum p4, although the impact of sex of offspring on milk production was well known, which influence by low level of p4 in this period. Milk yield of male suckling ewes more than those of female suckling attributed to vigorous behavior of male vs to female that exerts more stimulation of mammary gland resultant low level of p4. (Jalal et al., 2009).

The study has concluded that there are no differences in the level of p4 at the time of lambing between primiparous and multiparous ewes at lambing while postpartum progesterone increases significantly with increase parity but it decrease significantly with increase number of lambing and no effects to sex of lambs on the postpartum progesterone in the Awassi ewes.

## RECOMMENDATIONS

Its necessary to conduct multidisciplinary studies by using this breed to detect the status of hormones particularly which have specificity in the ewes' efficiency for the purpose of formulating plans for improvement and development of the production

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## CONFLICT OF INTEREST

There are no possible conflicts of interest from this study.

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