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Resumption of postpartum ovarian cyclicity in winter-lambing Lohi sheep (*Ovis aries*)

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Abstract

The postpartum ovarian cyclicity which is associated with uterine involution has significant importance in fertility of sheep. The study was conducted to estimate the postpartum resumption of ovarian cyclicity in Lohi sheep during winter lambing season. Twelve pregnant ewes were selected. The commencement of ovarian cyclicity was investigated in postpartum ewes by estimating progesterone (P_4) concentration in blood samples collected on weekly intervals starting from day of parturition till 12th week of postpartum. On the day of parturition, mean P_4 concentration was 0.38 ± 0.08 ng / mL. After that, P_4 level raised to 0.70 ± 0.13 and 0.83 ± 0.13 ng / mL during 1st and 2nd weeks respectively. During 3rd week, P_4 concentration was 1.02 ± 0.18 ng / mL (ovulation). The peak P_4 level during first estrous cycle was 3.02 ± 0.8 ng / mL and detected on 5th week. Second ovulation was observed during 6th week and again peak P_4 concentration of 2nd cycle was found as 2.5 ± 0.64 ng / mL on 7th week. Based upon the hormonal profile, it was concluded that postpartum ovarian cyclicity resumed on 3rd week of postpartum in winter lambed Lohi sheep.

1. INTRODUCTION

Livestock can play a pivotal role in developing agricultural countries to counter the malnutrition, unemployment, and sluggish economy. Eight million families are directly engaged in livestock production business in Pakistan (GOP, 2019). Due to recent increase in public dietary awareness and gush in animal food consumption, the livestock impact has signified to level of 60.54% in the agricultural GDP of Pakistan (GOP, 2019). But unfortunately, pace of livestock farming is still reeling on outdated fashion because of poor infrastructure and weak economic conditions of farmer (Bhutto and Bazmi, 2007). The adaptation of modern, cost effective farming techniques and utilization of marginal resources is the need of time. On marginal lands, small ruminants (sheep and goat) farming is preferred over the large due to comparatively low cost of production (Khan and Ashfaq, 2010). Pakistan stands 11th among the sheep producing countries in the world and delightfulness of sheep meat is also famous as treat in various areas of the country (Rizwan et al., 2017). There are 31 sheep breeds in the Pakistan which are classified in to thin tail (16 breeds) and fat tail (15 breeds) breeds (Khan et al., 2007). The Lohi breed is the most productive among the all breeds of Pakistan (Babar et al., 2004). This breed is very well known due to its traits of meat, quality wool production and better adoptability over wider area of Punjab province (Nawaz et al., 1999).

The production of the flock positively correlated to the reproduction. Time span between parturition and next fruitful conception (postpartum interval) critically affects the cost of production (Ascari et al., 2016). Postpartum interval is an imperative time period when series of tasks like restoration of body reserves, nourishment of new-born, resumption of ovarian activity, and uterine involution are being simultaneously fulfilled by animal (Lamraoui et al., 2017). This period is influenced by many factors like breed, suckling frequency, lambing season and nutrition (Ascari et al., 2016). By controlling aforementioned factors, productivity of the animals can be improved very well. Resumption of postpartum ovarian activity can be assessed by visual methods (surgical, ultrasound, estrus detection) and P_4 hormonal profile analysis (Medan and El-Daek, 2015). Due to the smaller size of the rectum and impossible manual palpation of uterine and ovarian structures, the confirmation of the resumption of postpartum cyclicity becomes difficult task to do (Naznin et al., 2019). Everywhere in field condition, the provision of ultrasound machine and expertise looks difficult to provide so the hormonal clues from blood serum via laboratory test seem most appropriate option. P_4 is a hormonal marker that can help for accurate assessment of the reproductive stage in ewe (Khanum et al., 2007). Concentration of P_4 > 1 ng / mL indicates the ovulation or on-going luteal activity in postpartum ewes (Medan and El-Daek, 2015).

A systematic approach to explore postpartum cyclicity based on hormonal profile in Lohi sheep has not been tested before so, this research was planned as first step to gather the preliminary information on postpartum interval in local sheep during the winter lambing season.

2. MATERIALS AND METHODS

2.1 Location and climatic conditions

The study was conducted at Nuclear Institute for Agriculture and Biology (NIAB), Faisalabad, research farm (31°23'47.8" N 73°02'09.0" E) during the winter season (December to February). Faisalabad is located in central Punjab with 184.5m elevation from mean sea level. This region has dry semi-arid agro-climatic conditions with well managed canal irrigation system. Summer monsoon mainly cause rainfall while winter yield less in this regard. Day time temperature shoots above 40°C in summer (April-September). The winter season commences from the month of November and continues till March. December, January and February are considered coldest months of year where the temperature drops below 0°C at night time (Shamshad, 1988). The maximum rainfall is being recorded during March, April and February accordingly. Mean maximum temperature at daytime and mean minimum temperature at night gradually fall from November to January and then start rising onward (PMD, 2013).

2.2 Selection of animals

Twelve, pre-partum, pluriparous (3 - 8 years of age), Lohi ewes with body condition score ranging from 2.5 – 4.0 on the scale of 1-5 (1 = emaciated and 5 = obese) were selected during the terminal stages of pregnancy (confirmed by ultrasound machine named Honda HS - 1500 with transcutaneous probe and 3.5 MHz frequency). Ewes were regularly observed for the event of parturition. All the parturitions were normal. Lambs were kept with their dams and allowed them to suckle freely. A fertile ram was also housed together for natural mating.

2.3 Management of animals

Animals were kept on seasonal grasses, Barseem (*Trifolium alexandrine*) and mix grains concentrate (@ 0.5 kg concentrate / day / ewe). Fresh and clean drinking water was available *ad libitum*. Deworming and vaccination were carried out as per local schedule.

2.4 Blood sampling and processing

Weekly blood samples were collected via jugular venipuncture, starting from day of parturition till 12th week postpartum. Samples were collected in plan, non-coated glass tubes and left for serum separation at room temperature (25 ºC). Further, serum was harvested, clarified by centrifugation (2000 x g for 10 min) and stored at - 20 ºC till further analysis.

2.5 Radioimmunoassay for P_4 analysis

Serum P_4 concentration was estimated by using solid phase radioimmunoassay kits having I^{125} labeled P_4 as tracer (Beckman coulter, Czech Republic). Automatic gamma counter (Videogamma Rack, l'can, scientific laboratories, Italy) was used for gamma scintillation counting in assay tubes. The intra and inter assay coefficient of variance (cv) were ≤ 8.15% and ≤ 8.6% respectively, whereas analytical sensitivity of the assay was 0.03 ng / mL.

2.6 Statistical analyses

All the data were arranged and presented as mean ± standard error (mean ± SE). Graphical illustration of average P_4 values with respect to days of postpartum was developed using Microsoft Excel® 2007.

3. RESULT AND DISCUSSION

Data have shown that mean serum P_4 on the day of parturition was 0.38 ± 0.08 ng / mL. After that, P_4 raised to 0.70 ± 0.13 and 0.83 ± 0.13 ng / mL during the 1st and 2nd week of postpartum. On 3rd week, P_4 concentration recorded as 1.02 ± 0.18 ng / mL, which was > 1 ng / mL (> 1 ng / mL is an indicator of ovulation). The peak P_4 concentration during the first estrous cycle was observed as 3.02 ± 0.8 ng / mL on 5th week. Again P_4 level sharply declined and ovulation of the 2nd cycle was detected on 6th week. The serum P_4 peak of second cycle was attained on 7th week of postpartum with the level of 2.5 ± 0.64 ng / mL on scale (Figure.1).

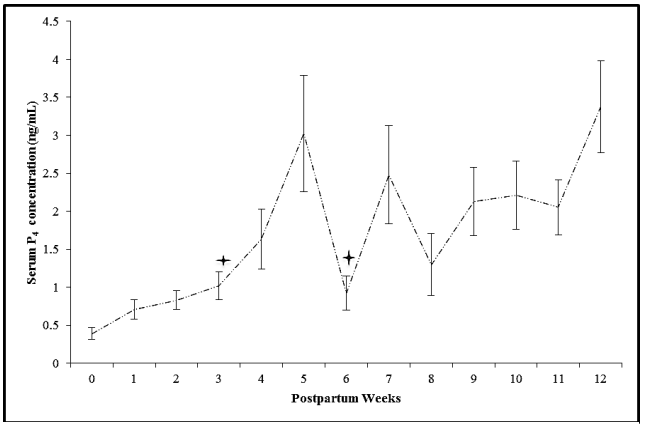

Figure 1: Serum progesterone concentration (mean±SEM) in postpartum Lohi sheep (n=12) during the winter lambing seasons. Sign ✦ is showing point of ovulation where P_4 concentration increases > 1 ng/ml. Bars are showing the standard error of mean P_4 concentrations.

To minimize the lambing interval, shortening of postpartum period is one of the ways to control. Estrus synchronization is widely used technique in organized breeding system which demands the animal to be in prior postpartum resumption stage (Hayder and Ali, 2008). Estrus synchronization before postpartum resumption is totally the wastage of resources and man hours at farm. What happens, pregnancy alters the hormonal interplay between the hypothalamus-adenohypophysis and ovaries (the higher level of P_4 creates the barrier to LH/

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development of the antral follicles) even after parturition. Repletion of LH is mainly responsible for early postpartum recovery and ovulation (Elmetwally, 2018). In postpartum animals as blood P_4 concentration reaches > 1 ng /mL that means the happening of ovulation or occurrence of kick start of new ovaries cycle (Bauernfeind and Holtz, 1991; Berardinelli et al., 2001: Ku´znicka et al., 2016). Completion of postpartum period is affected by genetics and other environmental factors (Pope et al., 1989). Based upon the current study the resumption of postpartum ovarian activity seemed on 3rd week in Lohi sheep. In winter lambed fat-tailed Fara Fra ewes, resumption was observed on 29.4 ± 1.2 day in temperate region (Hayder and Ali, 2008). The trend in Lohi sheep looks to be comparable with other temperate breeds resuming cyclicity on 3rd week of postpartum (Kiracofe, 1980). It is also visualized that most of the ewes start ovarian folliculogenesis within 10 days of partition and 67 to 75% ewes become cyclic in 20 to 30 days (Gonzalez et al., 1987). In this study ovarian cyclicity was also completed on 3rd week which is totally in agreement with aforesaid authors. Due to male effect, the continuous ram presence may also be a triggering cause of early ovarian activity in postpartum ewes in the study (Cappai et al., 1989). These findings are providing important bench marks for the future use of Lohi breed in accelerated lambing program. Various strategies like dietary flushing and hormonal therapies has been used to accelerate the postpartum cyclicity before breeding (Mitchell et al., 2003). Keeping in view the knowhow of postpartum resumption time and use of these strategies (flushing, hormonal, male effects) must be considered for breeding plan which may benefit sheep farming. The Lohi breed also seems to have great potential for utilization in accelerated lambing program as well which needs to be checked further. Since, this was preliminary research; further it can be extended to reveal real time utero-ovarian aspects of postpartum period with aid of radioimmunoassay technique in combination with ultrasound imaging tool.

4. CONCLUSION

Taking into consideration of the recent findings, it may be concluded that ovarian cyclicity resumes during third week of postpartum in Lohi sheep.

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REFERENCES

Ascari, I. J., Gomes, Alves, N., Alves, A. C., Ferreira, Furusho, Garcia, I., Barbosa, Junqueira, F., (2016). Resumption of cyclic ovarian activity in postpartum ewes: a review. Semina: Ciências Agrárias, Londrina. 37 (2): 1101-1116. doi: 10.5433/1679-0359.2016v37n2p1101.

Babar, M., Ahmad, Z., Nadeem, A., Yaqoob, M., (2004). Environmental factors affecting birth weight in Lohi sheep. Pak. Vet. J., 24 (1): 5-8.

Bauernfeind, M., Holtz, W., (1991). Progesterone and estrogen levels in serum of cycling goats measured by enzyme immunoassay. Small Rumin. Res., 6 (1): 95-102.

Berardinelli, J., Weng, J., Burfening, P., Adair, R., (2001). Effect of excess degradable intake protein on early embryonic development, ovarian steroids, and blood urea nitrogen on days 2, 3, 4, and 5 of the estrous cycle in mature ewes. J. Anim. Sci., 79 (1): 193-199. doi.org/10.2527/2001.791193x.

Bhutto, A. W., Bazmi, A. A., (2007). Sustainable agriculture and eradication of rural poverty. Pakistan. Natural Resources Forum. 31 (4), 253-262. doi.org/10.1111/j.1477-8947.2007.00162.x.

Cappai, P., Casu, S., Gallus, M., Naitana, S., & Loi, P., (1989). Post-partum ovarian activity in Sardinian ewes. Journal of Biological Research-Bollettino della Societa Italiana di Biologia Sperimentale, *65* (5), 445-452.

Elmetwally, M. A., (2018). Uterine involution and ovarian activity in postpartum Holstein dairy cows. A review. Journal of Veterinary Healthcare, 1(4), 29. doi 10.14302/issn.2575-1212.jvhc-18-2447.

Gonzalez, A., Murphy, B. D., De Alba, M. J., & Manns, J. G., (1987). Endocrinology of the postpartum period in the Pelibuey ewe. J. Anim. Sci., 64(6), 1717-1724.

GOP (2019). Economic survey of Pakistan 2018-19. Web. http://www.finance.gov.pk/survey/chapters_19/2-Agriculture.pdf/ [accessed 10 October 2019].

Khan, M. F. U., Ashfaq, F., (2010). Meat production potential of small ruminants under the arid and semi-arid conditions of Pakistan. J. A. M. S., 15, 33-39. doi.org/10.24200/jams.vol15iss0pp33-39.

Khan, M. S., Khan, M., Ahmad, S., Mahmood, S., (2007). Continuing education article genetic resources and diversity in Pakistani sheep. Int. J. Agric. Biol., 9 (6): 941-944.

Khanum, S.A., Hussain, M., Kausar, R., (2007). Assessment of reproductive parameters in female Dwarf goat (*Capra hircus*) on the basis of progesterone profiles. Anim. Reprod. Sci., 102 (3-4): 267-275. doi:10.1016/j.anireprosci.2006.11.010.

Kiracofe, G. H., (1980). Uterine involution: its role in regulating postpartum intervals. J. Anim. Sci., 51 (suppl_II), 16-28. doi.org/10.2527/1980.51Supplement_II16x.

Ku´znicka, E., Rant, W., Radzik-Rant, A., Kunowska-Slósarz, M., Balcerak M., (2016). The ovulation rate, plasma progesterone and estradiol concentration, and litter size of a local ewe breed kept in a barn vs. those kept under an overhead shelter. Arch. Anim. Breed., 59: 145–150. doi:10.5194/aab-59-145-2016.

Lamraoui, R., Farida, Afri-Bouzebda, F., Bouzebda, Z., (2017). Resumption of ovarian cyclicity during postpartum in winter-lambing Ouled Djellal ewes in Algerian semi-arid area. Glob. Vet., 18 (1): 27-30. doi: 10.5829/idosi.gv.2017.27.30.

Medan, M. S., El-Daek, T., (2015). Uterine involution and progesterone level during the postpartum period in Barbary ewes in north Libya. Open Vet. J., 5 (1): 18-22.

Mitchell, L. M., Ranilla, M. J., Quintans, G., King, M. E., Gebbie, F. E., & Robinson, J. J., (2003). Effect of diet and GnRH administration on post-partum ovarian cyclicity in autumn-lambing ewes. Anim. Reprod. Sci., 76(1-2), 67-79. doi: 10.1016/s0378-4320(02)00239-7.

Nawaz, M., Khan, M., Qureshi, M., Rasool, E., (1999). Productive and reproductive performance of Kajli and Lohi ewes. Asian-Aust. J. Anim. Sci., 12: 61-67.

Naznin, F., Hasan, M., Bhuiyan, M.M.U., Bari, F.Y. and Juyena, N.S., (2019). Monitoring of uterine involution in indigenous ewes using ultrasonography. Bangladesh Veterinary Journal, 53(1-4), pp.29-34. doi: 10.32856/BVJ-53-2019.04.

PMD., Monthly climatic normals of Pakistan (2013). Climate Data Processing Center, Pakistan Meteorological Department (PMD), Karachi, 1981-2010.

Pope, W. F., McClure, K. E., Hogue, D. E., & Day, M. L., (1989). Effect of season and lactation on postpartum fertility of Polypay, Dorset,

eISSN Number: 2462-2389

St. Croix and Targhee ewes. J. Anim. Sci., 67(5), 1167-1174. doi: 10.2527/jas1989.6751167x.

Rizwan, H., Sajid, M., Iqbal, Z., Saqib, M., (2007). Point prevalence of gastrointestinal parasites of domestic sheep (*Ovis aries*) in district Sialkot, Punjab, Pakistan. The J. Anim. Plant Sci., 27(3):803-808.

Hayder, M., Ali, A., (2008). Factors affecting the postpartum uterine involution and luteal function of sheep in the subtropics. Small Rumin. Res., 79 (2): 174-178. doi:10.1016/j.smallrumres.2008.07.023.

Shamshad, K.M., (1988). Meteorology of Pakistan, Royal Book Agency, Karachi, Pakistan.

eISSN Number: 2462-2389