



Occurrence of Abortion in Different Breeds of Goats Reared under Semi-intensive Farming System at Organized Farms in Semi-arid Region of India

Anil Kumar Mishra¹, Vijay Kumar², Ashok Kumar¹, K. Gururaj¹,
Nitika Sharma¹, Manoj Kumar Singh¹, Vinay Chaturvedi¹

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ABSTRACT

Background: Abortion is a major health problem of animals including goats, which results in significant financial losses for the farmers. The aim of the current study was to determine the occurrence of abortion in different breeds of goats reared under semi-intensive farming system at the organized farms in the semi-arid region of India, and to determine the relationship between the parity, season and pregnancy stage of the aborted goats with the incidence of abortions.

Methods: The data on the caprine abortions was collected and analyzed. The caprine abortions that occurred at the organized farms under a semi-intensive management system were categorized according to the season at the time of abortion, parity and pregnancy stage of the aborted goats. The Chi-Square test and ANOVA methods were used for the statistical analysis of the abortion data.

Result: The occurrence of abortion in goats (combined farm) had a significant association with seasons and stages of pregnancy, whereas it was not associated with parities. Barbari, Jakharana and Jamunapari goats individually showed significant differences in abortion rates across various seasons, but did not exhibit significant variation in abortion rates with respect to different stages of pregnancy or parities. In the study, the majority of abortions were found in the winter season, followed by the rainy and summer seasons; similarly, most of the abortions were noticed in the later stage of pregnancy, followed by the mid- and early stages. There was the highest abortion rate in the goats with parity 3 and above, followed by the first and second parities. Further investigation is required to validate the current findings. In conclusion, the study revealed that abortion rates in goats are significantly influenced by seasonal changes and the stages of pregnancy.

Key words: Abortion, Breed, Goat, Parity, Season, Stage of pregnancy.

INTRODUCTION

Among the farm animals, goats have the widest ecological range, and provide revenue, sustenance, and employment to marginal, small and landless farmers (Ørskov, 2011; Wodajo *et al.*, 2020; Singh *et al.*, 2023). The main issues with goat farming are the diseases that cause goat farmers and entrepreneurs to suffer significant financial losses (Mahdi *et al.*, 2015; Doley and Nekibuddin, 2017). Genital disorders inflict heavy economic losses to goat farmers, and among them, abortion, retention of placenta and stillbirth are major ones (Azawi *et al.*, 2010; Beena *et al.*, 2017). Out of these genital disorders, the problem of abortion is considered the most important (Alemayehu *et al.*, 2021). Abortion causes the number of unproductive females in a herd to increase and the number of productive animals and milk output to decrease (Ali *et al.*, 2019; Lokamar *et al.*, 2020). A healthy herd of goats should have an abortion rate of less than 2%, the rate between 2 and 5% indicating its endemic state and over 5% requiring aggressive surveillance and monitoring (Menzies, 2011). According to Hovingh (2002), 3 to 5 abortions out of every 100 pregnancies annually are regarded as "normal" in the case of cattle. Abortion in animals, including goats, is caused by infectious as well as non-infectious agents, but

¹ICAR-Central Institute for Research on Goats, Makhdoom, Farah-281 122, Mathura, Uttar Pradesh, India.

²ICAR-Directorate of Poultry Research, Hyderabad-500 030, Telangana, India.

Corresponding Author: Anil Kumar Mishra, ICAR-Central Institute for Research on Goats, Makhdoom, Farah-281 122, Mathura, Uttar Pradesh, India. Email: anilmishradr@gmail.com

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the majority of caprine abortions are caused by infectious ones (Smith and Sherman, 2009; Entrican *et al.*, 2009; Mishra *et al.*, 2023). The present investigation was carried out to study occurrence of abortion in different breeds of goats reared under semi-intensive farming system at the organized farms in the semi-arid region of India, and to assess the association of season, parity of the aborted goats and stage of pregnancy with occurrence of abortion.

MATERIALS AND METHODS

Data on caprine abortions was collected from Jamunapari, Barbari and Jakhrana breeds of goats reared under semi-intensive farming system at ICAR-Central Institute for Research on Goats, Makhdoom, Farah, Mathura, Uttar Pradesh (India). The study area was situated in the semi-arid zone of western Uttar Pradesh, India (27.10°- 27.50° N, 77-78.0°E, MSL169.2). The goats were being reared in an organized way, and the data collection was done during a 12-year period starting from 2011-2012 to 2022-2023. In the present study, the stages of pregnancy were categorized as early, mid and late, respectively, up to 2 months of pregnancy, between 2 and 3.5 months of pregnancy and after 3.5 months of pregnancy. Similarly, the periods from March 1 to June 15; October 1 to February 29; and June 15 to September 30 were classified as summer, winter and rainy seasons, respectively. The following formula was used to determine the abortion rate.

$$\frac{\text{Total number of abortions}}{\text{Total number of pregnant or conceived goats}} \times 100$$

The Chi-Square test and ANOVA using SPSS (v12) and Microsoft Office Excel Sheet were performed to statistically analyze the abortion data and determine the relationship between the variables.

RESULTS AND DISCUSSION

Among animals, especially goats, abortion is a very important health issue that results in heavy financial losses for goat farmers (Alemayehu *et al.*, 2021). The current study was conducted for the first time to assess the status of abortion in different breeds (Jamunapari, Barbari and Jakhrana) of goats reared under the semi-intensive farming system at organized farms in the semi-arid region of India with respect to season as well as stage of pregnancy at the time of abortion and the parity of the aborted goats. The overall abortion rate was found 1.82% (Table 1), which

suggests that the goats were in good health with regard to the incidence of abortions (Menzies, 2011), indicating that the farms were well managed. Compared to the present study, Goel *et al.* (2005) reported a higher abortion rate (4.4%) among the goats reared under the semi-intensive farming system at organized farms in the semi-arid region of India. In contrast to our finding, cattle reared under a semi-intensive system had higher abortion rate compared to those kept under an extensive management system (Deresa *et al.*, 2020). Similar abortion rates were seen in the Barbari and Jakhrana breeds and significantly higher ($p < 0.05$) from Jamunapari and combined farm (Table 1). This difference may be attributable to the variations in breed and the management practices implemented at the respective farms (Mee, 2023).

The rate of abortion in goats (combined farm) and among individual breeds had a significant association with seasons, and the majority of abortions observed in the winter, followed by the rainy and summer seasons (Table 2). The winter months saw the highest number of abortions, which may have been caused by the cold stress, but more research is needed to corroborate this conclusion (Mishra *et al.*, 2023). In concurrence with the current study, the majority of abortion cases were noticed in the winter months in the goats reared under the extensive farming system (Mishra *et al.*, 2023). According to Yaqoob *et al.* (2016), there is an increased occurrence of abortions in cattle in the summer months and it was said that heat stress was the cause of this observation (Yakoob *et al.*, 2016). Nevertheless, Lopez-Gatius *et al.* (2004) found no correlation between the season and the number of abortions in cattle. Hence, further investigation is required to support the above finding.

The rate of abortion in goats (combined farm) had significant association with stage of pregnancy, but among the individual breeds, no such association was found, and most of the abortions were noticed in the later stage of pregnancy, followed by the mid- and early stages (Table 3).

Table 1: Yearly abortion rates in Barbari, Jamunapari and Jakhrana goats.

Year	Barbari	Jamunapari	Jakhrana	Combined
2011-12	1.52* (5**/327***)	0.32 (1/306)	0.0 (0/73)	0.85 (6/706)
2012-13	1.2 (4/332)	2.75 (7/254)	2.17 (2/92)	1.92 (13/678)
2013-14	4.53 (14/309)	0.82 (3/364)	2.1 (2/95)	2.47 (19/768)
2014-15	6.45 (20/310)	0.39 (1/255)	3.3 (3/99)	3.61 (24/664)
2015-16	1.65 (5/302)	0.4 (1/245)	0.0 (0/122)	0.90 (6/669)
2016-17	4.31 (15/348)	1.61 (4/247)	4.16 (5/120)	3.36 (24/715)
2017-18	0.32 (1/304)	1.38 (3/217)	6.66 (5/75)	1.51 (9/596)
2018-19	1.38 (4/289)	0.0 (0/232)	2.77 (1/36)	0.90 (5/657)
2019-20	0.3 (1/332)	0.0 (0/253)	2.85 (1/35)	0.32 (2/620)
2020-2021	2.07 (6/289)	1.31 (3/228)	3.5 (2/57)	1.92 (11/574)
2021-2022	1.37 (4/290)	2.17 (5/230)	0.0 (0/79)	1.50 (9/599)
2022-2023	2.2 (4/181)	2.68 (5/186)	3.44 (3/87)	2.64 (12/454)
Average	2.27±0.5 ^a	1.16 ±0.2 ^b	2.58± 0.5 ^a	1.82±0.3 ^b
(12 Years' Period)	(83/3613)	(33/3017)	(24/970)	(140/7600)

Figures with different superscripts differ significantly ($p < 0.05$); *Abortion rate; **Number of abortions; ***Number of pregnancies.

Table 2: Relationship between the breeds of goat and the season at the time of abortion.

	Barbari (n=83*)		Jakharana (n=24)		Jamunapari (n=33)		Combined (n=140)	
Season	Number of abortions	Proportion of abortions	Number of abortions	Proportion of abortions	Number of abortions	Proportion of abortion	Number of abortions	Proportion of abortions
Rainy	39	46.98	3	12.5	15	45.45	57	40.71
Summer	5	6.02	5	20.83	5	15.15	15	10.71
Winter	39	46.98	16	66.67	13	39.4	68	48.57
Chi square	10.7** (df=4)						32.4**(df=2)	
Value (Yates')								

*Total abortions.

Table 3: Relationship between the breeds of goat and the stage of pregnancy at the time of abortion.

Stage of pregnancy	Barbari (n=83*)		Jakharana (n=24)		Jamunapari (n=33)		Combined (n=140)	
	Number of abortions	Proportion of abortions	Number of abortions	Proportion of abortions	Number of abortions	Proportion of abortion	Number of abortions	Proportion of abortions
Early	5	6.02	4	16.67	5	15.15	14	10
Middle	29	34.95	7	29.16	12	36.37	48	34.28
Late	49	59.03	13	54.17	16	48.48	78	55.72
Chi square			2.25 (df=4)					
Value (Yates')							42.7** (df=2)	

*Total abortions.

Table 4: Relationship between parity of the aborted does and their breeds.

Parity	Barbari (n=83*)		Jakhrana (n=24)		Jamunapari (n=33)		Combined (n=140)	
	Number	Proportion of Abortion	Number	Proportion of Abortion	Number	Proportion of Abortion	Number	Proportion of Abortion
1	27	32.53	11	45.83	17	51.52	55	39.29
2	29	34.94	7	29.17	4	12.12	40	28.57
≥3	27	32.53	6	25.00	12	36.36	45	32.14
Chi square Value	5.7 (df=4) (Yates' correction)						2.2 (df=2)	

*Total abortions.

According to Pretzer (2008), infectious agents are the common cause of abortions in animals, including goats, and the majority of these agents induce abortions in the later stage of pregnancy. That is why, most abortions in our study were found in the later stage (Smith and Sherman, 2009). Similar to our finding, the majority of abortions were observed in later-stage pregnant goats reared in a free-range farming system (Deresa *et al.*, 2020; Mishra *et al.*, 2023). However, more research is needed to support this claim.

The rate of abortion in goats (combined farm) and among individual breeds had no significant association with the parity of pregnant goats (Table 4). In contrast to what we found, Mishra *et al.* (2023) found a significant ($p<0.01$) association between abortions and parities of pregnancy in the goats raised under the extensive farming system, and goats with parities 1 to 3 had the highest rate of abortions (88.02%; 507/576). Likewise, Sigdel *et al.* (2022) and Reese *et al.* (2020) found significant association

between parity and abortion in cattle. Therefore, a thorough investigation is still needed to validate this finding.

CONCLUSION

In the current study, the overall abortion rate of 1.82% was found in the goats raised in organized farms in the semi-arid region of India under the semi-intensive farming system suggests relatively good health and effective farm management. The abortion rates varied significantly by season, with the highest incidence observed in winter, potentially due to cold stress. The majority of abortions occurred in the later stages of pregnancy, aligning with findings that the majority of the infectious agents often cause late-term abortions. No significant association was found between abortion rates and parity in this study.

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Ethical statement

There was no animal sample collection in the study. Therefore, permission from the Committee for the Purpose of Control and Supervision of Experiments on Animals (CPCSEA) and the Institutional Animal Ethics Committee (IAEC) was not necessary.

Conflict of interest

All authors declare that they have no conflicts of interest.

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