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## Morbidity and mortality rates of Ganjam goats of Odisha in field condition

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### Abstract

The present study deals with morbidity and mortality in Ganjam goats of Odisha due to different diseases and examining the effects of age, sex and season on morbidity and mortality rates using suitable statistical techniques. Morbidity and mortality data of 5819 Ganjam goats of 71 goat keepers from four clusters of Ganjam district were recorded from April 2018 to March 2019, divided into three seasons: summer (March-June), rainy (July-October) and winter (November-February). These goats were divided into three groups: kids (0-3 months), young stocks (3-12 months) and adults (above one year) based on age. The diseases observed were coded as respiratory diseases, digestive diseases, specific infectious diseases and accidents/predation/theft. Overall morbidity and mortality rates were 26.07% and 5.38%, respectively. Morbidity and mortality due to respiratory and digestive diseases were higher as compared to other disease categories. Morbidity was the highest in kids whereas mortality was more prominent among young stocks. Both morbidity and mortality occurred mostly in rainy season than winter followed by summer and were more prominent in male goats than females. Chi-square analysis revealed that morbidity and mortality had significant ( $p < 0.05$ ) association with age, season and sex.

**Keywords:** Age groups, association, incidence, respiratory diseases, season

### 1. Introduction

Goat is one of the small ruminants that plays a very important role in rural economy and can be used for reducing poverty in India. Goat is probably the first domesticated animal <sup>[1]</sup>. It is often known as poor man's cow due to its shorter kidding interval, high reproductive rates, high productivity, ability to survive on scarce vegetation and adverse environmental conditions and utility as a good source of income for farmers through milk and meat <sup>[2, 3]</sup>. According to 20<sup>th</sup> Livestock Census, India has 148.88 million goats that constitute 27.78% of the total 535.78 million livestock population of the country. There are about 34 recognised goat breeds of India <sup>[4]</sup>. Ganjam goat, a dual-purpose breed reared for meat and milk is the only goat breed from Odisha that has been recognized by NBAGR <sup>[5]</sup>. Goats contribute 8.4% (Rs.38590 crores) to India's livestock GDP through meat (Rs.22625 crores), milk (Rs.9564 crores), skin (Rs.1491 crores), manures (Rs.1535 crores) and others (Rs.3360 crores) and generates about 4.2% rural employment to small, marginal farmers and landless labourers <sup>[6, 7]</sup>.

Goats suffer from different bacterial, viral, parasitic and other diseases. The incidence of these diseases is a major impediment to goat farming which results in poor production and leads to significant economic losses to the goat keepers <sup>[8, 2]</sup>. Diseases in livestock decrease livestock productivity due to reduced feed intake, changes in digestion and metabolic activity, increase in morbidity and mortality, decrease in reproduction rates, weight gain and milk production <sup>[9]</sup>. Diseases in goats result in morbidity and mortality losses that lead to low productivity of animals <sup>[10]</sup>. Economic returns from goat farming are greatly affected due to morbidity and mortality.

The main aim of effective livestock management is to minimise the incidence of diseases and increase the productivity and reproduction that can be done by observing the occurrence and pattern of animal diseases <sup>[11]</sup>. Therefore, estimation of morbidity and mortality rate in the flock is essential to determine the disease status. Keeping these aspects in view, the present study from April 2018 to March 2019 was aimed to assess the impact of various diseases causing morbidity and mortality in goats under field conditions in Ganjam district of Odisha with respect age, sex, and season.

## 2. Materials and Methods

### 2.1 Study areas

The Ganjam district that is the home tract of the Ganjam breed of goat of Odisha located at 19.35<sup>0</sup> - 19.92<sup>0</sup>N and 84.98<sup>0</sup> -85.12<sup>0</sup>E was selected for study. It was divided into four clusters namely: Chhatrapur, Rambha, Khallikote and Jirabadi. Out of the four clusters, three clusters Chhatrapur, Rambha and Khallikote belong to the 4th Agro-climatic zone i.e. East and the South Eastern coastal plane and experiences relatively higher maximum and minimum temperature and lower rainfall as compared to the 4th cluster which remains in the 5th Agro-climatic zone of Odisha. The average maximum and minimum temperature experienced in these areas ranged from 37 °C to 39 °C and 10.8 °C to 11.5 °C, respectively. The mean annual rainfall ranged from 1577mm to 1597mm [12].

### 2.2 Study Population and Sampling Procedure

A total of 5819 Ganjam goats of 71 goat keepers from twenty villages were sampled for the study. Age, sex, season and cause wise morbidity and mortality data were collected from all selected goat farmers of Chhatrapur, Rambha and Khallikote blocks of Ganjam district of Odisha for the period of one year from April 2018 to March 2019. The diseases observed during the study period were coded as 1) Respiratory diseases, 2) Digestive diseases, 3) Specific infectious diseases (FMD, Sheep pox, Goat pox etc.), 4) Accidents, predation or theft. The age of the goats were divided into three groups: kids (0-3 months), young ones (3-12 months) and adults (above one year). The year was divided into three seasons, summer (March-June), rainy (July-October) and winter (November-February) to study the variation of incidences in different seasons.

### 2.3 Statistical analysis

The incidence rates were estimated as the ratio of the number

of goats falling sick due certain disease categories to the total number of goats under risk for these categories for the period of study. The data were analysed applying Chi-square test using R software (version 4.0.2). A test of equality of proportion was carried out to ascertain the difference in the incidence rates among the age, sex and season groups.

## 3. Result and Discussion

### 3.1 Morbidity pattern

Out of 5819 Ganjam goats maintained by 71 goat keepers recorded, 1635 were kids, 970 were young ones and 3214 belonged to adult age group. 1517 goats were identified affected due to various disorders, this made annual incidence rate or overall morbidity of 30.14 percent. Dohare *et al.*, [9] and Chaudhry and Singh [11] reported overall morbidity of 20.58% and 25.72%, respectively in goats. As presented in Table 1, the morbidity rate of digestive diseases (12.95%) was higher than respiratory diseases (11.58%) followed by specific infectious diseases (4.07%) and accident/predation/theft (1.52%) which is similar to findings of Tifashe *et al.*, [13] who also reported highest incidence of GIT diseases. This may be due to improper feeding management.

The trend incidence of morbidity due to different causes in the three age groups exhibited that kids were the most vulnerable group among the three age groups. The order of morbidity observed was the highest in kids followed by young stocks and adults respectively. The order of incidence across disease categories revealed that incidence of digestive diseases was the highest followed by respiratory, specific infectious diseases and category of accident, predation and theft respectively. Morbidity percentages in different age groups differed significantly ( $p < 0.05$ ) in all the disease categories.

**Table 1:** Age group wise morbidity of goats

Disease Code	Age group						Significance		
	Kid		Young		Adult		$\chi^2$	df	p
	N	%	N	%	N	%			
1	275	16.8 <sup>a</sup>	121	12.5 <sup>b</sup>	278	8.60 <sup>c</sup>	71.53	2	<0.001
2	328	20.1 <sup>a</sup>	143	14.7 <sup>b</sup>	283	8.80 <sup>c</sup>	125.02	2	<0.001
3	112	6.9 <sup>a</sup>	58	6.0 <sup>b</sup>	67	2.10 <sup>b</sup>	73.82	2	<0.001
4	43	2.6 <sup>b</sup>	27	2.8 <sup>b</sup>	19	0.60 <sup>a</sup>	42.06	2	<0.001
Total	758	46.4 <sup>a</sup>	349	36.0 <sup>b</sup>	647	20.1 <sup>c</sup>	372.9	2	<0.001
Total (All)	1635		970		3214				

<sup>abc</sup> Means in the same row without common superscripts are different at  $P < 0.05$

The analysis of morbidity rate revealed that it had significant ( $p < 0.05$ ) association with season (Table 2). The incidence of respiratory diseases was observed more in winter season than in rainy season followed by summer. The incidence of digestive diseases was more in rainy season followed by

winter and summer season respectively. Maximum morbidity was found in specific infectious diseases and accident/predation/theft in summer followed by rainy and winter season respectively.

**Table 2:** Season wise morbidity of Ganjam Goats

Disease Code	Season						Significance		
	Summer		Rainy		Winter		$\chi^2$	df	p
	N	%	N	%	N	%			
1	84	4.4 <sup>a</sup>	262	13.4 <sup>b</sup>	328	16.9 <sup>c</sup>	157.9	2	<0.001
2	223	11.6 <sup>a</sup>	281	14.4 <sup>b</sup>	250	12.9 <sup>ab</sup>	6.54	2	0.038
3	98	5.1 <sup>a</sup>	92	4.7 <sup>a</sup>	47	2.4 <sup>b</sup>	20.58	2	<0.001
4	39	2.0 <sup>a</sup>	36	1.8 <sup>a</sup>	14	0.7 <sup>b</sup>	12.80	2	0.002
Total	444	23.1 <sup>a</sup>	671	34.3 <sup>b</sup>	639	32.9 <sup>b</sup>			
Total (All)	1923		1958		1938				

<sup>abc</sup> Means in the same row without common superscripts are different at  $P < 0.05$

The chi-square analysis showed that there was significant ( $p>0.05$ ) association of sex with morbidity pattern (Table 3). Male showed higher morbidity due to respiratory diseases (17.9%) followed by digestive diseases (17.3%) while female

showed higher morbidity due to digestive diseases (11.01%) and respiratory diseases (8.78%) each as compared to their counterpart.

**Table 3:** Sex-wise morbidity of Ganjam Goats

Disease Code	Sex				Significance		
	1		2		$\chi^2$	df	p
	N	%	N	%			
1	321	17.9 <sup>a</sup>	353	8.78 <sup>b</sup>	99.25	1	<0.001
2	311	17.3 <sup>a</sup>	443	11.01 <sup>b</sup>	43.04	1	<0.001
3	125	7.0 <sup>a</sup>	112	2.79 <sup>b</sup>	54.25	1	<0.001
4	48	2.7 <sup>a</sup>	41	1.02 <sup>b</sup>	21.42	1	<0.001
Total	805	44.8 <sup>a</sup>	949	23.6 <sup>b</sup>	264.1	1	<0.001
Total (All)	1797		4022				

<sup>abc</sup> Means in the same row without common superscripts are different at  $P<0.05$

### 3.2 Mortality pattern

The overall mortality rate was 5.38% which is lower than the overall mortality rate reported by Chaudhary and Singh <sup>[11]</sup>, Dohare *et al.*, <sup>[9]</sup> and Upadhyay *et al.*, <sup>[14]</sup>. As presented in Table 4, the mortality rate was highest due to respiratory diseases (1.71%) followed by digestive diseases (1.62%), specific infectious diseases (1.23%) and accidents/predation/theft (0.78%). Upadhyay *et al.*, <sup>[14]</sup> reported the highest mortality due to digestive system diseases followed by diseases of respiratory system and other diseases. Chaudhary and Singh <sup>[11]</sup> reported the highest mortality due to specific diseases. The overall mortality was significantly associated with age groups as revealed by the Chi-square test.

Mortality was the highest among young stocks (9.79%) followed by kids (9.47%) and adults (1.96%) suggesting that the mortality decreased with progress in age. This might be due to lower immunity in kids as compared to young and adults. The transition phase of the movement of the kids from milk to browsing habits and a greater exposure to external causes might be contributing to such a pattern. This finding was in agreement with Chaudhary and Singh <sup>[11]</sup>, Dohare *et al.*, <sup>[9]</sup> and Upadhyay *et al.*, <sup>[14]</sup>. Mortality was highest in kids in digestive (3.85%), respiratory (2.69%) and specific infectious diseases (1.83%) except accident/predation/theft that showed highest morbidity in young goats (2.06%) which is similar to the findings of Chaudhary and Singh <sup>[11]</sup>.

**Table 4:** Age wise mortality of goats

Disease Code	Age group						Significance		
	Kid		Young		Adult		$\chi^2$	df	p
	N	%	N	%	N	%			
1	44	2.69 <sup>b</sup>	31	3.20 <sup>b</sup>	25	0.78 <sup>a</sup>	38.5	2	<0.001
2	63	3.85 <sup>b</sup>	24	2.47 <sup>b</sup>	8	0.25 <sup>a</sup>	92.8	2	<0.001
3	30	1.83 <sup>b</sup>	20	2.06 <sup>b</sup>	22	0.68 <sup>a</sup>	18.2	2	<0.001
4	18	1.10 <sup>b</sup>	20	2.06 <sup>b</sup>	8	0.25 <sup>a</sup>	34.02	2	<0.001
Total	155	9.47 <sup>b</sup>	95	9.79 <sup>b</sup>	63	1.96 <sup>a</sup>	372.9	2	<0.001
Total (All)	1635		970		3214				

<sup>abc</sup> Means in the same row without common superscripts are different at  $P<0.05$

Season-wise mortality is shown in Table 5. Mortality was the highest in rainy season (6.13%) followed by winter and summer. The overall mortality rate in rainy season was significantly higher than that of the summer season. Mortality in respiratory diseases and digestive diseases were more prominent in rainy season whereas the rate for specific infectious diseases (1.44%) was the highest in winter. The mortality rate due to accident/predation/theft was the highest

in summer and the lowest in winter season. Upadhyay *et al.*, <sup>[14]</sup> also found similar fluctuations in mortality. Relatively higher percentages of mortality in the rainy season might be due to high humidity, frequently getting wet in the rain and poor and damp condition of the floor where these goats were housed at the end of the day as most of the Ganjam goats farmers were not having proper shed to keep their goats.

**Table 5:** Season wise mortality of Ganjam Goats

Disease Code	Season						Significance		
	Summer		Rainy		Winter		$\chi^2$	df	p
	N	%	N	%	N	%			
1	12	0.62 <sup>a</sup>	45	2.30 <sup>b</sup>	43	2.22 <sup>b</sup>	20.4	2	<0.001
2	31	1.61	33	1.69	31	1.60	0.05	2	0.974
3	21	1.09	23	1.17	28	1.44	1.08	2	0.583
4	20	1.04 <sup>a</sup>	19	0.97 <sup>a</sup>	7	0.36 <sup>b</sup>	6.89	2	0.032
Total	84	4.37 <sup>a</sup>	120	6.13 <sup>b</sup>	109	5.62 <sup>ab</sup>			
Total (All)	1923		1958		1938				

<sup>abc</sup> Means in the same row without common superscripts are different at  $P<0.05$

Males showed higher mortality due to diseases than females, which is 8.01% and 4.20% respectively even though the number of male goat died are less than that females (Table 6). The lower incidences of mortality in females as compared to males can be explained by the fact that there are very high

number of females that belongs to the adult category and the mortality rate in adults is low. The report made by Chaudhary and Singh <sup>[11]</sup> in small ruminants of Himachal Pradesh corroborated the present finding. However, a higher mortality rate in females was reported by some workers. <sup>[9, 14]</sup>

**Table 6:** Sex-wise mortality of Ganjam Goats

Disease Code	Sex				Significance		
	1		2		$\chi^2$	df	p-value
	N	%	N	%			
1	48	2.67 <sup>a</sup>	52	1.29 <sup>b</sup>	13.2	1	<0.001
2	33	1.84	62	1.54	0.50	1	0.478
3	39	2.17 <sup>a</sup>	33	0.82 <sup>b</sup>	17.4	1	<0.001
4	24	1.34 <sup>a</sup>	22	0.55 <sup>b</sup>	8.87	1	0.003
Total	144	8.01 <sup>a</sup>	169	4.20 <sup>b</sup>	264.1	1	<0.001
Total (All)	1797		4022				

<sup>abc</sup> Means in the same row without common superscripts are different at  $P < 0.05$

#### 4. Conclusion

The morbidity rate in Ganjam goats hovered around 30 percent whereas the mortality rate remained below 6 percent. The general trend in the morbidity and mortality indicated that adults had the lowest rate followed by the young and kids respectively. The morbidity rates ranged from 23.10% in summer to the highest 34.26% in rainy season. The highest mortality rate was observed in the rainy season. Males had significantly higher morbidity and mortality rates as compared to females. The age groups and seasons were significantly associated with the morbidity and mortality of goats. It was found that respiratory and digestive diseases are major causes of morbidity and mortality in Ganjam goats. The study advocates for proper care of the goats at an early stage in their lives for better health care of the herd to minimize economic loss to the farmers.

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