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## Epidemiological survey on lamb mortality in Rayalaseema region of Andhra Pradesh in India

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### Abstract

In Rayalaseema region, a total of 1798 lambs were recorded as dead for a period of six years and the mortality rate was in descending order in Anantapur, Chittoor, Kadapa and Kurnool districts of Andhra Pradesh. The mortality was higher in females than males. Maximum mortality was observed in winter season and at 1-3 months age group. The mortality was majorly due to infectious origin 1533 (85.26%) followed by non-infectious origin 223 (12.4%) and miscellaneous causes 42 (2.34%). Majority of deaths were due to respiratory system affections followed by digestive system affections, multiple system involvement, combined digestive & respiratory systems, non-specific affections, circulatory system, urinary system and combined respiratory & urinary system in descending order.

**Keywords:** Epidemiological survey, Lambs, Mortality, Rayalaseema region

### Introduction

To meet the ever increasing demand for animal proteins it is very important to improve the productivity of lambs from the ewe even though the sheep, contributes significantly to the economy of the country. The number of lambs born per ewe is a crucial factor for successful commercial sheep enterprise as well as the small scale farmer to improve their economy. The important cause of lamb mortality includes pneumonia, diarrhoea and pneumoenteritis (Mahmoud *et al.*, 1999 and Binns *et al.*, 2002) [10, 1]. The non infectious conditions that can affect lamb mortality includes starvation/chilling exposure complex, stillbirths/dystochia, mis-mothering, low birth weight (Dwyer *et al.*, 2005) [4], breed (Mukasa-mugerwa *et al.*, 2000) [11], age of ewe (Mahmoud *et al.*, 1999) [10], immunity acquired by neonate through colostrum (Vihan, 1986) [20], parity of dam and sex of lamb (Binns *et al.*, 2002) [1]. Reductions in lamb mortality can be achieved only by identifying and targeting its specific etiology (Kirk and Anderson, 1982 and Khan *et al.*, 2006) [9, 8].

### Material and methods

The lamb mortality was ascertained by examining six years records from various organized sheep farms, records maintained by Animal Disease Diagnostic Laboratories and postmortem records maintained by Department of Veterinary Pathology, Veterinary Colleges located in the Rayalaseema region of Andhra Pradesh. The data from the mortality registers and relevant records of the above cited institutions were collected for calculating the lamb mortality for the period from April, 2010 to April, 2016. The cause of death was noted based on the postmortem reports available.

### Results and Discussion

An epidemiological survey was conducted in Rayalaseema region of Andhra Pradesh to assess the prevalence of the lamb mortality. The data was collected from April 2010 to April 2016 and summarized in tabular form (Tables: 1-7) based on district, age, year, season, sex, etiology and system and further the data was analyzed and presented (Figs. 1-7).

The district wise prevalence of lamb mortality in Rayalaseema region for a period of 6 years (April, 2010- April, 2016) was presented in Table 1. Out of 1798 lambs that were recorded dead, more lambs 1059 (58.9%) were died in Anantapur district followed by Chittoor 348 (19.35%), Kadapa 215 (11.96%) and Kurnool 176 (9.79%). The mortality in females was higher 1014 (56.4%) than males 784 (43.6%). Heavy mortality in female lambs compared to the male lambs was in contrast to the findings of Singh and Singh (1970) [15] Rama Rao *et al.*

*et al.* (1980) [13] and Sudan *et al.* (1990) [18] who reported that lamb mortality was not affected by sex but were in agreement with the findings of Choudhuri and Singh (2014) [3] who reported that male showed maximum mortality than females. This might be due to managerial practices and nutritional factors with respect to geographical distribution of a particular area/region. Majority of the lambs were died in winter followed by summer and rainy season which was similar to the findings of Rama Rao *et al.* (1980) [13]. Majority of lambs died during 1-3 months and 4 – 6 months followed by 10 – 12 months of age. These findings were similar to Suzanna Bell (2008) [19] who found most of lamb losses during 3 to 12 months of age. Similar results were also expressed by Juma *et al.* (1974) [16], Kaul *et al.* (1991) [7] and Reddy and Choudhuri (2000) [14] and Palanivel *et al.* (2011) [12]. Sex wise highest mortality, 4-6 months age in males 211 (11.74%) and in females 280 (15.57%) of an recorded age group followed by 1-3 months age 226 (12.57%) was noted. Heavy mortality was recorded in winter 319 (17.74%) followed by summer 233 (12.96%), rainy season 232 (12.9%) in males and in winter 376 (20.91%) followed by summer 341 (18.97%), rainy season 297 (16.52%) in females. Highest mortality in winter season might be due to changing of animals from extensive system of management to a semi-intensive or intensive system in winter when lambing starts which might have enhanced the survival of pathogens and allowed them to spread within flocks and due to cold stress. Maximum mortality of 490 lambs (27.25%) was recorded in 2013 year. The major etiology for mortality in this region was of infectious origin 1533 (85.26%) followed by non-infectious 223 (12.4%) and miscellaneous origin 42 (2.34%). System wise maximum respiratory affections 853 (47.44%) were noted in lambs of this region followed by digestive 516 (28.7%), multiple system involvement 216 (12.01%), combined digestive and respiratory systems 162 (9.01%), non-specific origin 44 (2.45%), circulatory 3 (0.17%), combined respiratory with urinary systems 2 (0.11%) and urinary system 2 (0.11%). Mortality during post weaning period might be due to post weaning stress, harsh climate and improper adaptability of lambs due to feed, fodder and infections. Most of the lambs died due to infectious causes followed by non-infectious and miscellaneous causes. This was in agreement with Hovers *et al.* (1994) [5] and Reddy and Choudhuri (2000) [14]. Lamb mortality due to non-infectious causes in this study was almost close to the findings of Reddy and Choudhuri (2000) [14] who reported 10.99% of lamb losses due to non-infectious causes. Lamb mortality accounted by miscellaneous causes reported in this study is due to starvation, stress, dystocia, disorders of foetal maturation and poisonous conditions. Majority of lambs died due to respiratory affections followed by digestive affections in the present study was intune with the findings of Sreeramulu *et al.* (1988) [17] and Reddy and Choudhuri (2000) [14] who reported pneumonia as a major cause and in contrast to the findings of Chaarani and Robinson (1988) [2] and Solomon *et al.* (2014) [16] who reported diarrhoea as a major cause which might be due to prevailing outbreaks of PPR, Enterotoxaemia etc in the prevailing areas of report with respiratory system or digestive system involvements. In Anantapur district out of 1059 lambs dead, more lambs 250(23.61%) were died at the age of 10–12 months and least at less than one month age 43 (4.06%). Mortality was high 339 (32.01%) in the year 2013. Maximum mortality noted in winter season 440 (41.55%) followed by rainy season 338

(31.92%) and summer 281 (26.53%). Due to infectious origin 986 (93.11%) lambs were died followed by non infectious origin 57 (5.38%) and miscellaneous causes 16 (1.51%). The respiratory system involvement was noted majorly in the mortality cases 636 (60.06%) followed by digestive system affections 313 (29.56%) and least with non specific origin 15 (1.42%). Males 535 (50.52%) were died more than the females 524 (49.48%). Maximum mortality was observed at the age of 4-6 months 141 (26.36%) in males and minimum at <1 month age 32(5.98%). Maximum females died 106 (20.23%) at 1-3 months age, at 4-6 months age 105 (20.04%) and minimum at <1 month age 11 (2.1%).

In Chittoor district out of 348 lambs dead, 108 (31.03%) lambs were died at the age of 4-6 months majorly and at 10-12 months age group 13 (3.74%) minorly. Mortality was high 89 (25.58%) in the year 2012. Maximum mortality was noted in summer season 160 (45.98%) followed by winter season 133 (38.22%) and rainy 55 (15.81%). Due to infectious origin 280 (80.46%) lambs were died mostly. The involvement of respiratory system was 104 (29.89%) to be major. Females 190 (54.6%) died more than the males 158 (45.4%). Maximum males mortality observed at the age of 4-6 months 55 (34.81%) and minimum at 10-12 months age 7 (4.43%). Maximum number of females 53 (27.9%) died at 1-3 and 4-6 months age groups and minimum at 10-12 months age 6 (3.16%).

Of 215 lambs i.e. dead in Kadapa district, more lambs 130 (60.47%) were at un recorded age group followed by 1-3 months 41 (19.07). Mortality was high 93 (43.26%) in the year 2013. Maximum mortality was noted in summer season 74 (34.42%) followed by winter season 72 (33.49%) and rainy 69 (32.09%). Due to infectious origin 193 (89.77%) lambs were died followed by non infectious origin 20 (9.3%) and miscellaneous causes 2 (0.93%). The involvement of digestive system was 85 (39.54%) to be high followed by respiratory system affections 64 (29.77%). Females 153 (71.16%) were died more than the males 62 (28.84%).

Of 176 lambs i.e. dead in Kurnool district, more lambs 51 (28.98%) were died at 1-3 months age group and least deaths noted at 7-9 months age group 8 (4.55%). Mortality was high 95 (53.98%) in the year 2015. Maximum mortality was noted in rainy season 67 (38.07%) followed by summer season 59 (33.52%) and winter 50 (28.41%). Due to non infectious origin 90 (51.14%) lambs were dead followed by infectious origin 74 (42.01%). The multiple system involvement 82 (46.59%) was to be major followed by respiratory system affections 49 (27.84%), digestive system 27 (15.34%). Females 147 (83.52%) were died more than the males 29 (16.48%).

Of 853 (47.44%) in respiratory system, inflammatory origin like Pneumonia (838, 98.24%) included non-specific (618), suppurative (150), broncho (58), fibrinous (1), lobar types (2), Pasteurellosis (5), Jaagsiekte (4) and non-inflammatory (15) affections like congestion, edema, emphysema and atelectasis were recorded. In digestive system, the inflammatory affections (469, 90.89%) like hepatitis (164), cirrhosis (20), lamb dysentery (145), enteritis (80), parasitic infestations (60) (Haemonchosis, immature Amphistomiasis, Coccidiosis, Fasciolosis and other tapeworms) and non-inflammatory affections (47, 9.11%) viz; bloat (12), gastrointestinal obstructions (2), impaction (26), acidosis (1), volvulus (4), intususception (1), atresia ani (1) were noted among 516 (28.7%).

In combined respiratory & digestive systems 162 (9.01%),

PPR (34), PPR mixed with parasitic infestation (7) like immature amphistomiasis and tape worms, pneumo enteritis (33), pneumonia with Haemonchosis (2), pneumonia along with hepatitis (72) and pneumonia with tape worms (12) were recorded. In urinary system 2 (0.11%) uraemia and cystic calculi, in combined urinary & respiratory systems 2 (0.11%) the affections like pneumonia with nephritis were recorded. In circulatory system 3 (0.17%) affections included internal bleeding and snake bite were noted.

**Summary and Conclusion**

In the present survey, the mortality rate was major in Anantapur followed by Chittoor, Kadapa and Kurnool in Rayalaseema region of Andhra Pradesh. The mortality was higher in females than males and the maximum mortality was

observed in winter season and at 1-3 months age group. The mortality was majorly due to infectious origin followed by non-infectious origin. Majority of deaths were due to respiratory system affections followed by digestive system affections.

**Table 1:** District wise prevalence of lamb mortality in Rayalaseema region including Departments of Veterinary Pathology and LRS farms for a period of six years (April, 2010- April, 2016).

S. No	District	No of deaths	Percentage (%)
1	Anantapur	1059	58.90
2	Chittoor	348	19.35
3	Kadapa	215	11.96
4	Kurnool	176	9.79
	Total	1798	100

**Table 2:** Age wise prevalence of lamb mortality in Rayalaseema region for a period of six years (April, 2010- April, 2016).

S. No	District	Age												Total
		<1 Month		1-3 Month		4-6 Month		7-9 Month		10-12 Months		Un recorded		
		M	F	M	F	M	F	M	F	M	F	M	F	
1	Anantapur	32	11	111	106	141	105	96	61	110	140	45	101	1059
2	Chittoor	15	13	54	53	55	53	10	26	7	6	17	39	348
3	Kadapa	3	5	16	25	13	10	4	1	2	6	24	106	215
4	Kurnool	2	15	9	42	2	26	-	8	6	22	10	34	176
	Total	52	44	190	226	211	194	110	96	125	174	96	280	1798
	Percentage (%)	2.89	2.45	10.57	12.57	11.74	10.79	6.12	5.34	6.95	9.68	5.34	15.57	100

**Table 3:** Year wise prevalence of lamb mortality in Rayalaseema region for a period of six years (April, 2010-April, 2016).

S. No	District	Sex	2010	2011	2012	2013	2014	2015	2016	Total	Percentage (%)
1	Anantapur	Males	5	2	171	188	114	50	5	535	29.76
		Females	8	2	112	151	129	110	12	524	29.14
2	Chittoor	Males	21	36	38	25	16	19	3	158	8.79
		Females	28	23	51	28	17	29	14	190	10.57
3	Kadapa	Males	1	2	5	18	14	18	4	62	3.45
		Females	10	4	5	80	45	6	3	153	8.51
4	Kurnool	Males	5	3	5	-	-	10	6	29	1.61
		Females	8	2	5	-	-	85	47	147	8.18
	Total		86	74	392	490	335	327	94	1798	
	Percentage (%)		4.78	4.12	21.80	27.25	18.63	18.19	5.23		100

**Table 4:** Season wise prevalence of lamb mortality in Rayalaseema for a period of six years (April, 2010-April, 2016).

S. no	District	Summer		Rainy		Winter		Total	Percentage (%)
		M	F	M	F	M	F		
1	Anantapur	128	153	183	155	224	216	1059	58.9
2	Chittoor	68	92	31	24	59	74	348	19.35
3	Kadapa	26	48	8	61	28	44	215	11.96
4	Kurnool	11	48	10	57	8	42	176	9.79
	Total	233	341	232	297	319	376	1798	
	Percentage (%)	12.96	18.97	12.9	16.52	17.74	20.91	100	

**Table 5:** Sex wise prevalence of lamb mortality in Rayalaseema region for a period of six years (April, 2010- April, 2016)

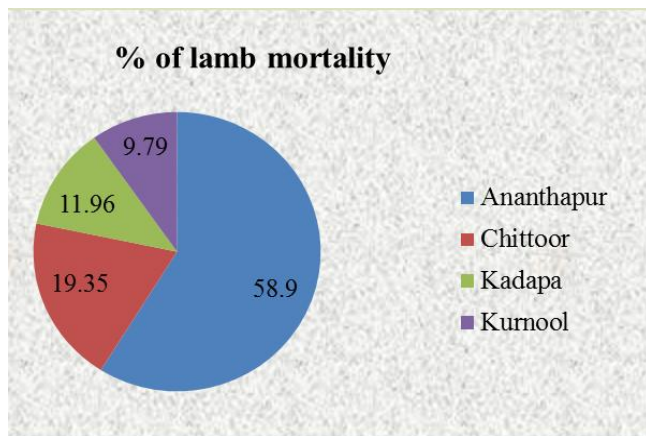
S. No	District	Males	Females	Total	Percentage (%)
1	Anantapur	535	524	1059	58.9
2	Chittoor	158	190	348	19.35
3	Kadapa	62	153	215	11.96
4	Kurnool	29	147	176	9.79
	Total	784	1014	1798	100
	Percentage (%)	43.60	56.40		

**Table 6:** Prevalence of lamb mortality based on etiology in Rayalaseema districts for a period of six years (April, 2010-April, 2016).

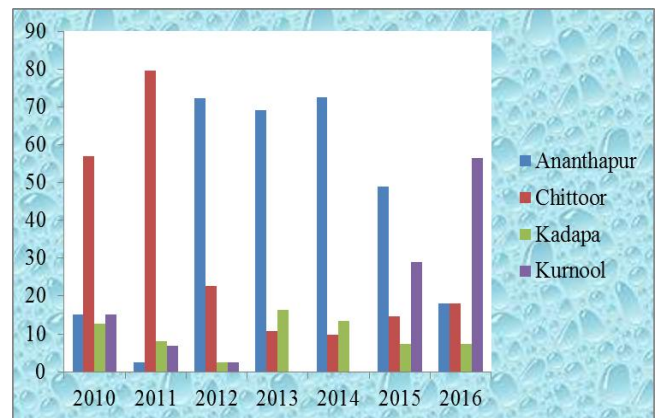
District	Infectious origin	Non-infectious origin	Miscellaneous origin	Total	Percentage (%)
Ananthapur	986	57	16	1059	58.9
Chittoor	280	56	12	348	19.35
Kadapa	193	20	2	215	11.96
Kurnool	74	90	12	176	9.79
Total	1533	223	42	1798	
Percentage (%)	85.26	12.4	2.34		100

**Table 7:** Prevalence of lamb mortality based on system affected in Rayalaseema districts for a period of six years (April, 2010-April, 2016).

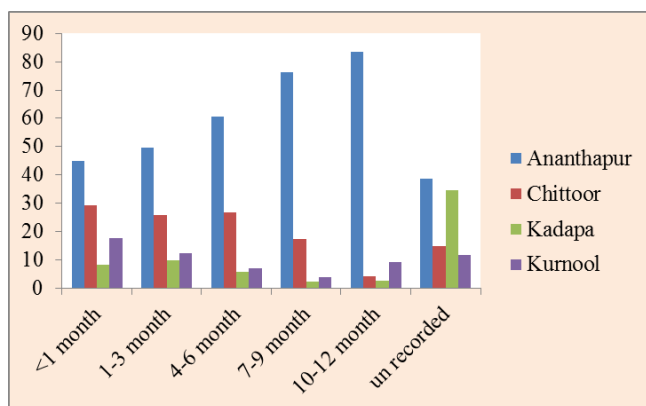
S. No	System affected	Ananthapur	Chittoor	Kadapa	Kurnool	Total	Percentage (%)
1.	Respiratory system	636	104	64	49	853	47.44
2.	Digestive system	313	91	85	27	516	28.7
3.	Urinary system	0	2	0	0	2	0.11
4.	Digestive &Respiratory combined	68	51	37	6	162	9.01
5.	Respiratory & Urinary combined	0	2	0	0	2	0.11
6.	Circulatory system	0	2	1	0	3	0.17
7.	Multiple system	27	83	24	82	216	12.01
8.	Non specific	15	13	4	12	44	2.45
	Total	1059	348	215	176	1798	100



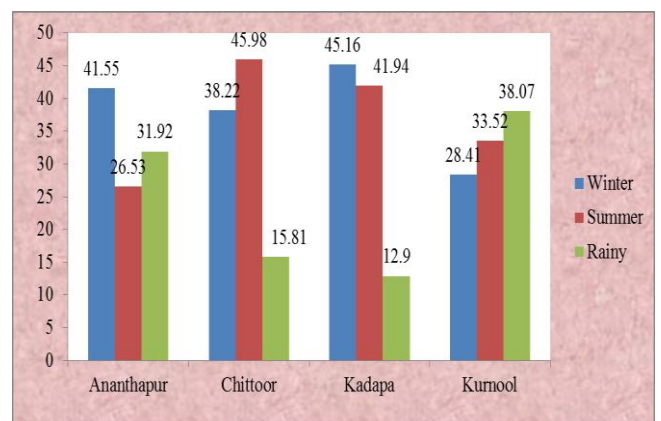
**Fig 1:** District wise prevalence of lamb mortality in Rayalaseema region including Departments of Veterinary Pathology and LRS farms for six years (April, 2010- April, 2016).



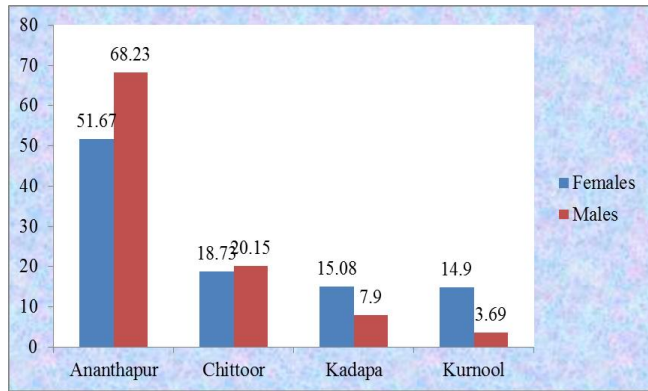
**Fig 3:** Year wise prevalence of lamb mortality in Rayalaseema region for six years (April, 2010-April, 2016).



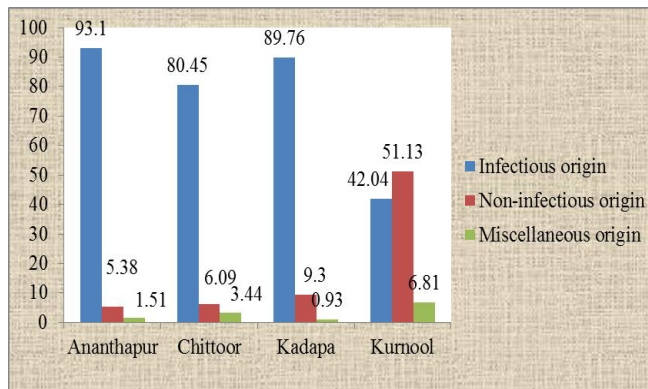
**Fig 2:** Age wise prevalence of lamb mortality in Rayalaseema region for six years (April, 2010- April, 2016).



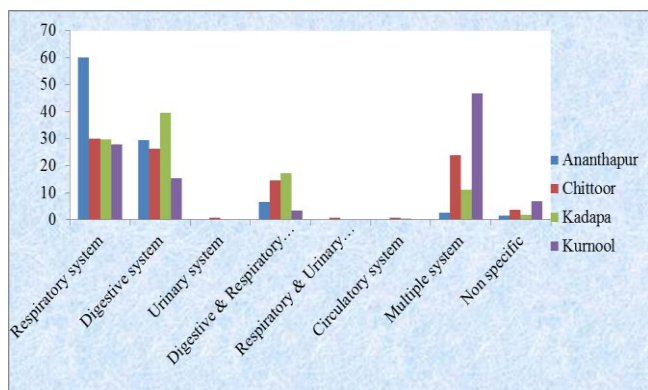
**Fig 4:** Season wise prevalence of lamb mortality in Rayalaseema for six years (April, 2010-April, 2016).



**Fig 5:** Sex wise prevalence of lamb mortality in Rayalaseema region for six years (April, 2010- April, 2016).



**Fig 6:** Prevalence of lamb mortality based on etiology in Rayalaseema districts for six years (April, 2010-April, 2016)



**Fig 7:** Prevalence of lamb mortality based on system affected in Rayalaseema districts for a period of six years (April, 2010-April, 2016).

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