

Original Research Article

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Aetio-Pathological Studies of Digestive and Respiratory Affections Affecting Kids

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Aetio-pathological studies of digestive and respiratory affections were undertaken on ten carcasses of kids of age below six months received for post mortem examination to the Department of Veterinary Pathology, Lala Lajpat Rai University of Veterinary and Animal Sciences (LUVAS), Hisar during a period of seven months i.e. from September, 2015 to March, 2016. Study revealed that maximum mortality was in kids of 1 to 3 months of age. Sex-wise mortality was more in males as compared to females. A system-wise cause of mortality was highest due to combined involvement of digestive as well as respiratory systems followed by involvement of digestive and respiratory system alone. Bacteriological study of different samples collected from carcasses of kids revealed that presence of *E. coli*, *Proteus* spp., *Klebsiella* spp. and *Salmonella* spp. Maximum number of bacterial species were isolated from intestine followed by lungs and heart blood. The results of in-vitro drug sensitivity testing revealed that most of bacterial strains were sensitive to gentamycin and resistant to tetracycline. Examination of faecal samples of dead and diarrhoeic kids revealed major infestation of *Eimeria* spp.

Introduction

In most region of our country, goats are mainly reared for meat and milk purposes. Two reasons for the goats' ability to survive in some of the most inhospitable regions of the world are their exceptional tolerance to heat stress (Norman, 1991) and ability to grow on poor quality feed. Therefore, goat production is equally suited to marginal farming areas, small farms or large-scale production in the tropics and sub-tropics. While goats are generally considered hardy animals and in many situations receive little medical care,

they are subject to a number of diseases. Among the conditions affecting goats are respiratory diseases including pneumonia, foot rot, internal parasites, pregnancy toxosis and feed toxicity. Goats can become infected with various diseases, such as colibacillosis, salmonellosis, peste des Petits Ruminants (PPR), enterotoxaemia, foot-and-mouth disease, caprine arthritis encephalitis, caseous lymphadenitis, pinkeye, mastitis, tuberculosis and brucellosis. Parasitic gastro-enteritis leads to a serious health threat with a limitation to the productivity of small ruminants due to the associated morbidity, mortality, cost of

treatment and prophylaxis (Nwosu *et al.*, 2007). Goats have numerous internal parasites and one of the most important is the coccidian species (Dai *et al.*, 2006). For the prevention and control of mortality in kids, a study was planned on the aetio-pathological aspects of the disease conditions causing mortality in kids with particular reference to digestive and respiratory system disorders so that adequate therapeutic and preventive measures can be taken or advised to prevent further losses to farmers/farm personnel.

Materials and Methods

Ten carcasses of kids aged below six months were brought to the post mortem hall of the Department of Veterinary Pathology, LUVAS, Hisar during period from September, 2015 to March, 2016 for necropsy examination. Following parameters were studied:

Postmortem examination and pathological study

A detailed postmortem examination was conducted immediately on arrival of the carcass. Representative and appropriate tissue pieces from intestine, part of stomach, liver, lung, trachea, heart and mesenteric lymph nodes were collected in 10% buffered formalin and were subsequently processed for histopathological studies. The formalin fixed tissues were processed for paraffin embedding technique. The section were cut at the thickness of 3-4 μ and stained with H & E stain (Luna, 1968).

Bacteriological study

At necropsy, materials for bacteriological studies were collected aseptically in sterile containers. Isolation of organisms was attempted from the heart blood, lung, trachea, and intestinal contents. The collected samples were put in nutrient broth or buffered peptone

water and incubated at 37°C for 24 h. The next day after collection of the samples, 1 ml of culture from buffered peptone water was transferred to selenite broth and incubated at 37°C for 24 to 48 h, while those collected in nutrient broth were inoculated on Nutrient agar (NA) and Mac Conkey's Lactose agar (MLA) plates and incubated at 37°C for 24-48 h. From MLA plate, lactose fermenting colonies were taken, inoculated on Eosin Methylene Blue (EMB) agar and incubated at 37°C for 24 h and the isolates were stored in maintenance medium. From NA plates, golden orange coloured, round, opaque and luxuriant colonies developed were selected and inoculated on Baird Parker agar (BP) and incubated at 37°C for 24-48 h. From BP agar, the black coloured colonies were selected and stored in maintenance medium.

The culture from selenite broth was streaked on Brilliant Green agar (BGA) and incubated at 37°C for 24 h. The plates were observed for colonies after incubation. From BGA plate, pinkish white colonies were taken and inoculated on Xylose-Lysine Deoxycholate (XLD) agar and incubated at 37°C for 24 h and the isolates were stored in maintenance medium. Identification of all isolates was done following the procedure of Cruickshank and McCartney (1965). All bacterial isolates were stained by Gram's staining and examined for their morphological characteristics. Biochemical tests viz. IMViC (Indole, methyl red, Voges-Proskauer and citrate utilization test), sugar fermentation tests, nitrate reduction test, urease tests, H₂S production test on triple sugar iron medium, and catalase test were also performed.

***In-vitro* drug sensitivity testing**

Different isolated bacterial strains were subjected to *in-vitro* drug sensitivity testing using antimicrobials by the disc diffusion method as suggested by Bauer *et al.*, (1966).

With the help of a platinum loop, small amount of growth from at least three isolated colonies of the organisms were transferred into a tube of trypticase soya broth and incubated for two to five hours at 37°C so as to obtain a turbidity, equivalent to that obtained by adding 0.5 ml of 0.048 M BaCl₂ (1.175% BaCl₂, 2H₂O) to 99.5 ml of 0.36 M NH₂SO₄ (1% v/v). The broth culture was then evenly spread by smearing over the surface of Mueller Hinton agar plates. Different antibiotic discs of standard concentrations were then used. The plates were then incubated at 37°C for 18-24 h and observed for sensitivity by measuring the zones of inhibition. Results were noted as sensitive (S) and resistant (R) on the basis of the table provided by the manufacturer (Himedia) for zone size interpretation.

Parasitological studies

A total of 18 faecal samples were collected i.e. eight from carcasses of kids received for post mortem examination and ten from diarrhoeic kids of the organized farm of the University and Central Sheep Breeding Farm, Hisar. Examination of these faecal samples was performed as per the method of Soulsby (1982) by floatation and sedimentation techniques.

Results and Discussion

As per the information provided and from the post mortem requisition form it was noticed that most of the kids had died suddenly without showing any clinical signs and symptoms, whereas others were being treated for diarrhoea, dehydration and weakness. The mortality pattern according to age, sex, system-wise causes of death/mortality along with different bacterial species isolated from various samples and faecal examination of dead as well as diarrhoeic kids is given in Table 1. The proposed study starting from

September, 2015 to March, 2016 of kids revealed that maximum age-wise mortality was in age group of 1 to 3 months followed by upto 1 month and no mortality were seen in age group of 3 to 6 months. These findings were supported by Ershaduzzaman *et al.*, (2007) and Dohare *et al.*, (2013) as they reported that higher mortality in kids was in 0 to 3 months of age. However, Ramirez-Bribiesca *et al.*, (2001) reported maximum mortality during 8 to 90 days of life in kids. Sex-wise mortality was more in male as compared to female kids. These finding were supported by Malik *et al.*, (1990) as they reported that mortality rates were higher in male as compared to female kids. However, Husain *et al.*, (1995), Chowdhury *et al.*, (2002) and Ershaduzzaman *et al.*, (2007) reported higher mortality in female than male kids. Honhold (2001) found no significant differences in mortality between the sexes. System-wise mortality was highest due to combined involvement of digestive as well as respiratory systems followed by involvement of digestive and respiratory system alone. Gastritis, enteritis, pneumo-enteritis, hepatitis and pneumonia were the main conditions encountered in kids. Sharma *et al.*, (2007); Alam *et al.*, (2008); Sabapara and Deshpande (2010) and Dohare *et al.*, (2013) reported that major causes of mortality was enteritis and pneumonia.

Grossly, intestine showed congestion, haemorrhages and presence of catarrhal exudate. Mesenteric lymph nodes were found enlarged. Liver revealed congestion, firmness and induration. Gall bladder was fully distended. Lungs showed congestion and consolidation. Trachea showed presence of whitish frothy exudate in lumen. Heart disclosed presence of haemorrhages on epicardium. Kidney revealed congestion and pale necrotic areas. Spleen revealed petechial haemorrhages. There was distension in urinary bladder due to accumulation of urine.

Hydrothorax along with presence of sero-sanguinous fluid and inflammation of umbilicus with accumulation of pus was also observed. Almost similar observations regarding gross lesions were also reported by Abou-Zaid *et al.*, (2000) in kids.

Histopathologically, intestine exhibited catarrhal enteritis characterised by goblet cell hyperplasia along with infiltration of leucocytes thereby completely replacing the mucosal glands and goblet cell hyperplasia showing blue coloured muco substances were observed in PAS- Alcian blue staining. Other changes noticed were congestion and haemorrhages in mucosa, necrosed villi epithelium and serositis. Liver revealed hepatitis characterised by focal area of necrosis along with leucocytic cells infiltration. Few cases were showing hepatitis characterised by atrophy of hepatocytes in parenchyma, leucocytic cells infiltration and hydropic changes in hepatocytes. Apart from these, there was congestion in blood vessels along with telangiectasis. Similar observations were reported by Khillare *et al.*, (2014) and Patel *et al.*, (2015) in kids. Lungs showed serous pneumonia characterised by presence of serous fluid in alveoli along with infiltration of leucocytes and emphysema. Presence of rod shaped Gram negative bacteria (bright red coloured) was observed after Taylor's staining. Other changes observed were haemorrhages in parenchyma, congestion and peribronchiolar lymphoid aggregation. Apart from these, atelectasis was also observed. In trachea, there was mild tracheitis characterized by presence of mild haemorrhages along with infiltration of leucocytes in few cases. Similar observations were reported by Patel *et al.*, (2015) in kids. Kidney disclosed presence of focal interstitial nephritis characterised by infiltration of leucocytes, degeneration of tubules, haemorrhages, congestion in blood vessels and also in glomeruli capillary and focal area of

necrosis was also observed. More or less similar observations were recently reported by Patel *et al.*, (2015). Heart revealed mild myocarditis characterised by presence of mild haemorrhages and congestion along with infiltration of leucocytes at focal areas in some of the cases. Some cases of kids revealed presence of myocarditis characterised by severe infiltration of leucocytes and fragmentation of muscle fibres along with presence of sarcocyst. Myxomatous degeneration, fragmentation of muscle fibres and infiltration of leucocytes were also found in few cases. Apart from these, haemorrhages in epicardium and fatty changes were also observed. Spleen showed severe haemorrhages and haemosiderosis in white pulp, congestion. Haemosiderrosis was also seen after Pearl's staining (Table 2).

Depletion of lymphocytes in white pulp and focal areas of necrosis was also seen in spleen. Mesenteric lymph nodes revealed depletion of lymphocytes along with congestion and hyperplasia of cells. Similar lesions in spleen and mesenteric lymph node have been reported by Som and Bhattacharya (1987) and Patel *et al.*, (2015). Microbiological study of different samples collected from carcasses of kids revealed that presence of *E. coli*, *Proteus* spp., *Klebsiella* spp. and *Salmonella* spp.

Maximum numbers of bacterial species were isolated from intestine followed by lungs and heart blood. Various other workers (Sharif *et al.*, 2005 and Zaki *et al.*, 2010) have also been reported the isolation of these bacterial species from the carcasses of kids. *In vitro* drug sensitivity against different bacterial species isolated from different samples collected from carcasses of kids revealed that *E. coli* was found highly sensitive to gentamycin; *Salmonella* spp. to gentamycin, cefotaxime, streptomycin; *Klebsiella* spp. to streptomycin; *Proteus* spp. to gentamycin, amikacin, cefotaxime (Fig. 1-7).

Table.1 Age, sex and system-wise mortality pattern, different bacterial species isolated from various samples along with faecal examination of dead and diarrhoeic kids

Age and sex-wise mortality in kids						
Age groups	Males (Number of cases)	Percentage of age-wise mortality in males	Females (Number of cases)	Percentage of age-wise mortality in females	Total	Percentage of total age-wise mortality
Up to 1 month	2	28.57	1	50.00	03	33.34
1-3 months	5	71.43	1	50.00	06	66.66
3-6 months	0	00.00	0	00.00	00	
Total number of sex-wise mortality	7 (77.77%)	-	2 (22.23%)	-	9 (100.00%)	
System-wise causes of mortality in kids						
System-wise causes of mortality	Digestive system alone	Respiratory system alone	Combination of both digestive and respiratory systems	Others systems/causes	Putrefied carcass	Total number of cases
Total number of system-wise mortality	2 (22.22%)	1 (11.11%)	3 (33.33%)	3 (33.33%)	-	9 (100.00%)
Bacterial species isolated from different samples collected from kids						
Bacterial species isolated	Intestine	Lungs	Tracheal swab	Heart blood	Total number of different bacterial species isolated	Percentage of different bacterial species isolated
<i>E. coli</i>	9	1	0	3	13	52.00
<i>Klebsiella</i> spp.	5	0	0	0	5	20.00
<i>Salmonella</i> spp.	0	1	0	0	1	04.00
<i>Proteus</i> spp.	1	5	0	0	6	24.00
Total number of bacterial species isolated from kids	15 (60.00%)	7 (28.00%)	0 (00.00%)	3 (12.00%)	25 (100.00%)	
Faecal examination in diarrhoeic kids						
<i>Fasciola</i> eggs	Trichuris eggs	<i>Eimeria</i> spp.	Mixed infection	Negative sample		
1	1	4	1 (<i>Eimeria</i> spp. + <i>Fasciola</i> eggs) 1 (<i>Eimeria</i> spp. + Trichuris eggs)	2		
Faecal examination in dead kids						
<i>Eimeria</i> spp.	Mixed infection		Negative sample	Total number of cases		
3	1 (<i>Eimeria</i> spp. + <i>Fasciola</i> egg)		5	9		

Table.2 Gross pathological changes observed during postmortem examination of kids

Gross Changes	Intestine	Liver	Mesenteric lymph nodes	Lungs	Heart	Kidneys	Spleen	Trachea	Urinary bladder	Gall bladder
Congestion	5	4	-	4	-	2	-	-	-	-
Haemorrhages	2	-	-	-	4	1	2	-	-	-
Necrotic areas	-	-	-	-	-	1	-	-	-	-
Consolidation	-	-	-	1	-	-	-	-	-	-
Firmness and induration	-	1	-	-	-	-	-	-	-	-
Exudate	1 (Catarrhal)	-	-	-	-	-	-	2 (Whitish frothy)	-	-
Enlargement	-	-	2	-	1	-	-	-	-	-
Distension	-	-	-	-	-	-	-	-	2	2



Fig. 1 Congested lungs (Kid, *E. coli* and *Proteus* spp.infection)

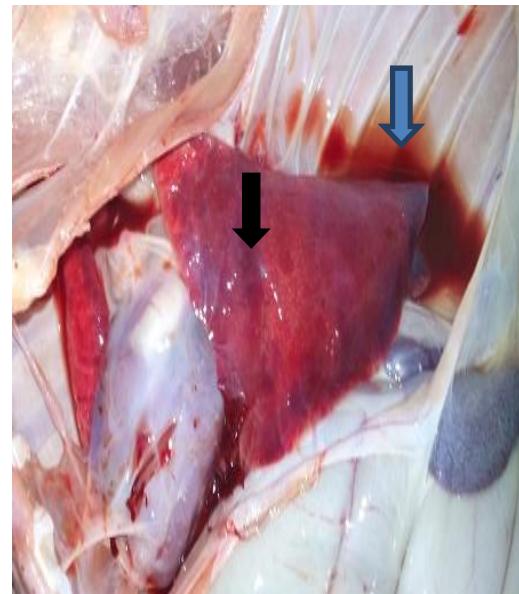


Fig. 2 Hydrothorax with sero-sanguinous fluid (→) and congested lungs (→) (Kid, *E. coli*



Fig. 3 Whitish frothy exudate in trachea (Kid, *E.coli* and *Proteus* spp.infection)

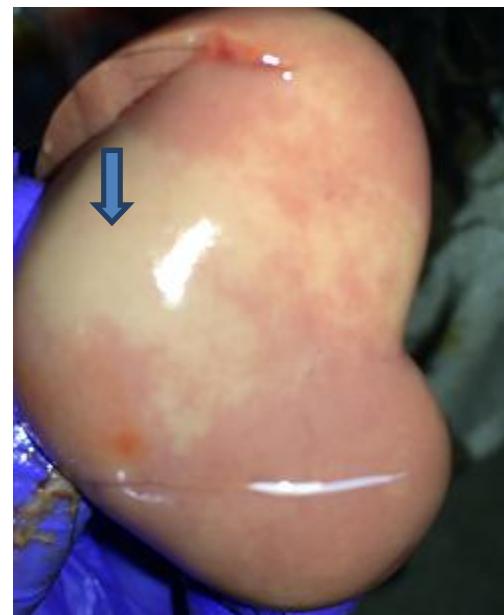


Fig. 4 Pale kidney showing presence of necrotic areas (Kid,*Salmonella* spp.infection)

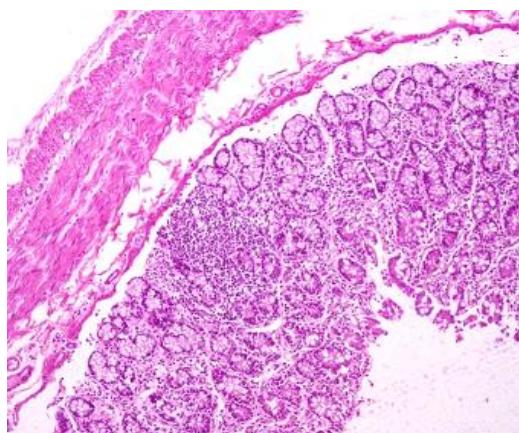


Fig.5 Intestine: Catarrhal enteritis characterized by goblet cell hyperplasia along with infiltration of leucocytes thereby completely replacing the mucosal glands(Kid, *E. coli* and *Klebsiella spp.* infection) H & E x 100

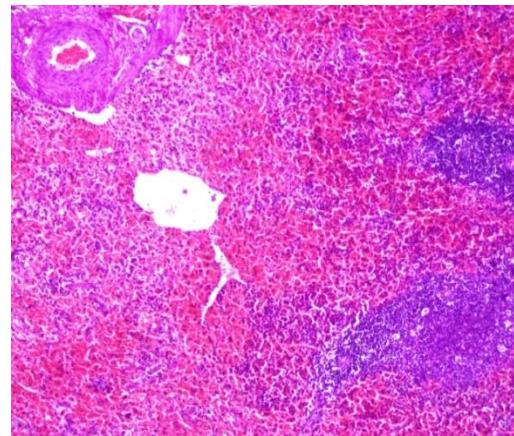


Fig. 6 Liver: Hepatitis characterised by focal area of necrosis of hepatocytes in parenchyma. Leucocytic cell infiltration (Kid, *E. coli*, *Klebsiella spp.* and *Eimeria spp.* infection) H & E X 100

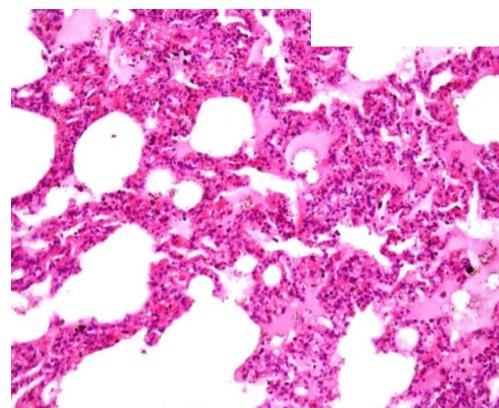


Fig.7 Lungs: Serous pneumonia characterised by presence of serous fluid in alveoli along with infiltration of leucocytes, Emphysema and congested alveolar capillaries (Kid, *E.*

E. coli was found highly resistant to tetracycline; *Salmonella* spp. to amoxyclav, tetracycline; *Klebsiella* spp. to amoxyclav, polymyxin B and ampicillin; *Proteus* spp. to 16.66 %) polymyxin B, amoxycillin, tetracycline and amoxyclav, co trimoxazole, ciprofloxacin. More or less similar results with respect to antimicrobial sensitivity resistance patterns have been reported previously by Blanco *et al.*, (1996) and Abou-Zaid *et al.*, (2000) in kids.

Examination of faecal samples of diarrhoeic/diseased kids revealed that *Eimeria* spp. was the major infection followed by *Fasciola* egg alone, *Trichuris* eggs alone, mixed infection of *Eimeria* spp. along with *Fasciola* eggs and *Eimeria* spp. along with *Trichuris* egg.

Examination of dead kids revealed that *Eimeria* spp. was the major infection followed by mixed infection of *Eimeria* spp. along with *Fasciola* egg. More or less similar observations were reported by Ibrahim *et al.*, (2014) as they also reported Coccidian and *Fasciola* infection in kids.

In kids, mortality was influenced by age groups and suggesting that more care and attention need to be paid in age group of 1 to 3 months. Young ones of this group require adequate care and management such as feeding of colostrum, better health care and proper housing to avoid seasonal stresses. No mortality was seen in age group 3-6 months due to better management practices given to this age group. Sex-wise mortality was more in male as compared to females. System-wise mortality in young ones of kids was higher due to combined involvement of digestive system along with respiratory system followed by affections of digestive systems alone and respiratory system alone. Gastritis, enteritis, pneumo-enteritis, hepatitis and pneumonia were the main conditions encountered in kids. Different bacterial species isolated from young ones of kids were *E. coli*, *Proteus* spp., *Klebsiella* spp. and *Salmonella* spp. Maximum numbers of bacterial species were isolated from intestine

followed by lungs and heart blood. Most of the bacterial species were highly sensitive to gentamycin and highly resistant to tetracycline in young ones of kids. Examination of faecal samples of diarrhoeic and dead kids revealed that *Eimeria* spp. was the major infection and faecal samples of dead kids revealed that *Eimeria* spp. was the major infection. Therefore, proper deworming should be done at early age of life and at proper timing.

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