

## Research Article



# A Study on the Prevalence and Etiology of Joint Ill in Calves of Cross-Breed Dairy Cattle in Six Dairy Farms of Bangladesh

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**Abstract** | During the study, the proportionate prevalence of joint ill was 2.47% in studied population. The incidence of joint ill was higher in female (57.14%) and calves having 75% Holstein Friesian (HF) blood (71.43%) in compare with male (42.86%) and calves having 62.5% HF blood (28.57%) respectively. During May to July the calves were more (71.43%) prone to joint ill in compare with that of February to April (28.57%). Navel ill was the most important (85.72%) predisposing factor for the joint ill infection. During study, a combined treatment with SP Streptomycin and Penicillin (SP) followed by Kanamycin, Colistin Sulfate, Neomycin and Dexamethasone (KCND) was found significantly ( $P < 0.05$ ) more (75%) efficient than treatment with SP only (0%). The isolated organisms from joint fluid were *Escherichia coli* and *Staphylococcus sp.* *E. coli* isolates were resistant to Ampicillin, Nalidixic acid, Chloramphenicol and Colistin sulphate whereas *Staphylococcus sp* isolates were resistant to Streptomycin, Nalidixic acid, Chloramphenicol and Colistin Sulfate. Both types of organism were sensitive to Tetracycline and Doxycycline. The mortality of joint ill infected calves was found 57.14%. So, prevention of joint ill through avoiding the predisposing factors and treatment of the affected animals with specific antibiotics after Cultural Sensitivity (CS) test can be recommended.

**Keywords** | Prevalence, Joint ill, CS-test, *Escherichia coli*, *Staphylococcus sp.*, Navel ill

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## INTRODUCTION

In Bangladesh, the total cattle population is about 23.4 million of which 6.14 million is dairy cow (Bangladesh, 2014). The mortality of calves less than one year of age is about 9% (Debnath, 1990) and 20% calf mortality may reduce the net profit of farm up to 40% (Singh et al., 2009). In commercial farming, besides the getting of a calf per dam per year, it is recommended to ensure the survivability of new born animals. But, unfortunately, most of the animals die at young age due to different infectious diseases and surgical disorders like *Umbilical hernia*, *Atre-*

*sia ani*, *Navel ill*, *Gangrenous mastitis*, *Teat obstruction*, *Teat crack*, *Arthritis* and *Lameness* (Hossain et al., 1986; Samad et al., 2002). Prevalence of arthritis in cattle is about 6.1% in Bangladesh (Sarker et al., 2014). Joint ill, also known as arthritis, is one of the significant causes of lameness in different farm animals. It is mostly found in cattle calves, buffalo calves, foals, lambs, kids and piglets etc. (Chakrabarti, 2003). The usual cause arises from infection of the navel, or, less commonly, tailing and castrating wounds, by pathogenic bacteria from a contaminated environment (Angus, 1991). Most commonly joint ill is caused by bacteria, but other microorganisms (virus, fungi and protozo-

an) are not ruled out with the current standard diagnostic work up (Nuss, 2012). Treatment of joint ill is a challenging fact. For successful treatment of joint ill, early diagnosis is essential. If caught early, antibiotic treatment can be successful (Robson, 2003). When joint ill develops, most of the clinician treats the calf with broad-spectrum antibiotics. The choice of antibiotic will depend on the causative bacteria (Robson, 2003). So, we wanted to know the present status of this economically important disorder in dairy farm of Bangladesh.

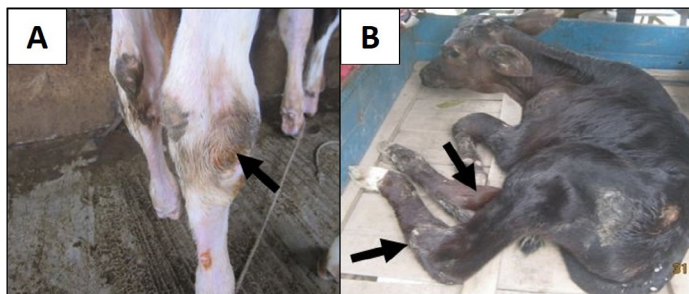
## MATERIALS AND METHODS

### PRELIMINARY SURVEY

A preliminary survey was conducted in December 2015 at ten commercial dairy farms from different districts of Bangladesh. The data of last one year were collected using a standard questionnaire. On the basis of survey findings, six farms were selected for a prospective study on calf diseases especially joint ill in calves of crossbred dairy cattle during February to July 2016.

### ANIMAL

The total cattle of selected six farms were 800. All the cattle were crossbred dairy cattle. A group of 283 calves having an age of one year or less were considered as study population.



**Figure 1:** A) Swollen hock joint (right) of a calf; B) Swollen hock joint (right and left) of a calf

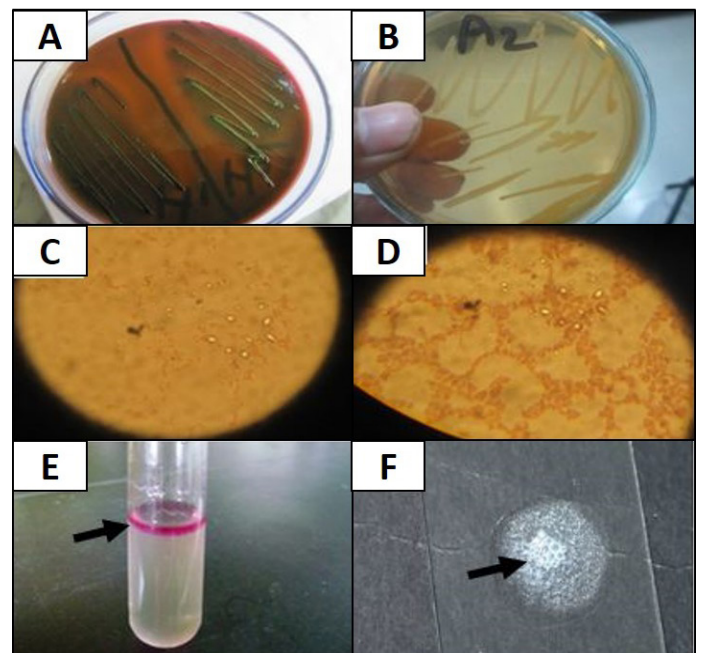
### SAMPLE COLLECTION

During study period, about 85 calves were diagnosed as cases belonging to different diseases on the basis of clinical signs (Figure 1), physical examination and response to the treatment. Data of 283 calves were collected from different registers and direct survey using a standard questionnaire at weekly interval. Joint fluids from knee joint and/or hock joint of 7 infected calves were collected as sample for bacterial isolation and send to Microbiology laboratory of Chittagong Veterinary and Animal Sciences University (CVASU) and Poultry Research and Training Centre (PRTC), Chittagong, Bangladesh.

### MICROBIOLOGICAL ANALYSIS

Bacterial isolation was done following a method described by Feng et al. (2011). Peptone broth (Oxoid Ltd.,

$\text{pH: } 6.2 \pm 0.0$ ), Nutrient broth (Oxoid Ltd.,  $\text{pH: } 7.4 \pm 0.2$ ), MacConkey agar (Oxoid Ltd.,  $\text{pH: } 7.4 \pm 0.2$ ) and EMB agar (Merck,  $\text{pH: } 7.1 \pm 0.2$ ), Mannitol salt agar (Merck,  $\text{pH: } 7.4 \pm 0.2$ ) (Figure 2), Blood agar (Oxoid Ltd.,  $\text{pH: } 7.3 \pm 0.2$ ) were used for isolation of the organism. The suspected colonies were confirmed on the basis of colonial morphology, Gram's staining property and biochemical property (Figure 2). After confirmation of isolates as *E. coli* and *Staphylococcus* sp., Cultural Sensitivity test of the isolates was determined by using the micro disc diffusion method (Kirby-Bauer method), and the method was used according to guidelines established by Clinical and Laboratory Standards Institute (CLSI, 2015) with minor modification. Muller Hinton agar (Biotec,  $\text{pH: } 7.3 \pm 0.1$ ) was used for Cultural sensitivity test. Antibiotics selected for susceptibility testing included a panel of 8 antimicrobial agents (Table 1) of interest to the large animal practitioners to treat joint ill infected calves in studied farms. Measurement of the growth inhibition zone permitted the classification of each isolates as sensitive, intermediate and resistant according to data provided by Oxoid Ltd., Basingstoke, Hampshire, England and CLSI (2015).



**Figure 2:** A) *E. coli* colonies with metallic sheen on EMB agar; B) Staphylococcal colonies on Mannitol-salt agar; C) Gram negative *E. coli*; D) Gram positive *Staphylococcus* sp.; E) Positive indole test for *E. coli*; F) Positive Catalase test for *Staphylococcus* sp.

### STATISTICAL ANALYSIS

All the collected data relating to 283 calves along with data related to joint ill infected calves were checked manually for obvious inconsistencies, recording errors or missing data. Then, data were entered in Microsoft Excel 2007 and descriptive statistics was done by using the STATA-13 software with 95% confidence interval and 5% level of significance. Results were expressed as percentages of different variables.

**Table 1:** Diameter (zone of inhibition) standards for *E. coli* and *Staphylococcus* sp. (CLSI, 2015)

Groups of antimicrobial	Antimicrobial agents	Disc content	Zone of inhibition (diameter in mm)			Manufacturers
			R	I	S*	
β-lactams	Ampicillin (AMP)	10µg	≤13	14-16	≥17	Oxoid Ltd.
Aminoglycosides	Streptomycin (S)	10µg	≤11	12-14	≥15	Basingstoke
	Neomycin (N)	30µg	≤13	14-15	≥16	Hampshire
Tetracycline	Tetracycline (TE)	30µg	≤14	15-18	≥19	England
	Doxycycline (DO)	30µg	≤10	11-13	≥14	
Quinolones	Nalidixic acid (NA)	30µg	≤13	14-18	≥19	
Chloramphenicol	Chloramphenicol (C)	30µg	≤12	13-17	≥18	
Polypeptide antibiotics	Colistin sulphate (CT)	10µg	≤19	20-22	≥23	

S\*, Sensitive; I, Intermediate sensitive; R, Resistant

## RESULTS AND DISCUSSION

The prevalence of joint ill in calves of crossbred dairy cattle was about 2.47% during study period of February to July 2016 (Table 2), which is lower than the reported prevalence of Wudu et al. (2008) which was 6% in Ethiopia. It might be due to geographical differences. Joint ill was more prevalent (3.31%) during May to July than that of February to April (0.98%) (Table 2). According to this study, the occurrence of joint ill was higher in female calves (57.14%) than male calves (42.86%) (Table 3), which is supported by the research findings of Goodarzi et al. (2015). The calves having 75% Holstein Friesian (HF) blood were more (71.43%) prone to joint ill in compare with calves having 62.5% Holstein Friesian (HF) blood (28.57%) (Table 3). The mortality of calves infected with joint ill was about 57.14% (Table 3). Mortality was insignificantly (P>0.05) higher in male (66.67%) than in female (50%) (Table 3). Again, mortality due to joint ill was more in calves hav-

ing 75% HF blood (60%) in compare with calves having 62.5% HF blood (50%) (Table 3), but the difference was not statistically significant (P>0.05).

**Table 2:** Prevalence of different diseases according to different month categories

Traits	No of case N (%)	Prevalence (%)		
		Feb 16 to Apr 16	May 16 to Jul 16	Overall
URT	27(31.76)	10.78	8.84	9.54
Pnumonea	12(14.12)	5.88	3.31	4.24
Diarrhea	16(18.82)	8.82	3.87	5.65
Dysentery	6(7.06)	1.96	2.21	2.12
Acidosis	3(3.53)	1.96	0.55	1.06
Navel ill	8(9.41)	2.94	2.76	2.83
Joint ill	7(8.24)	0.98	3.31	2.47
Other	6(7.06)	3.92	1.10	2.12
<b>Total</b>	<b>85</b>	<b>37.24</b>	<b>25.95</b>	<b>30.04</b>

%, Percentage; URT, Upper respiratory tract infection

**Table 3:** Overall statistics of joint ill infected calves

Traits	No of case attended	Fate of The Animals		Chi-square Value	P-value
		Death N (%)	Recovery N (%)		
<b>a) Sex</b>					
Male	3(42.86)	2(66.67)	1(33.33)		
Female	4(57.14)	2(50)	2(50)	0.19	0.66
<b>b) Blood percentage</b>					
25%SL x75%HF	5(71.43)	3(60)	2(40)		
37.5%SL x62.5%HF	2(28.57)	1(50)	1(50)	0.05	0.81
<b>c) Month categories</b>					
Feb15-Apr15	2(28.57)	1(50)	1(50)		
May15-Jul15	5(71.43)	3(60)	2(40)	0.05	0.81
<b>d) Treatment</b>					
SP	3(42.86)	3(100)	0(0)		
SP+KCND	4(57.14)	1(25)	3(75)	3.93	0.04
<b>e) History of other condition</b>					
Navel ill	6(85.72)	N/D	N/D		
Amputation of extra leg	1(14.28)	N/D	N/D	N/D	N/D
<b>f) Fate</b>					
Recovery	3(42.86)	N/D	N/D		
Death	4(57.14)	N/D	N/D	N/D	N/D

%, Percentage; SL, Shahiwal; HF, Holstein Friesian; SP, Streptomycin and penicillin; KCND, Kanamycin, Colistin Sulfate, Neomycin and Dexamethasone; N/D, Not Done



About 57.14% joint ill infected calves were subjected to treatment with SP followed by KCND while about 42.86 % were subjected to treatment with SP only. The treatment with SP followed by KCND was more efficient (75%) in compare with treatment with SP only (0%) (Table 3). The difference of fate of animal between two treatment groups was statistically significant ( $P < 0.05$ ). The isolated organisms from the joint fluid sample were *E. coli* and *Staphylococcus* sp. The result coincides with the results found in a research conducted by Nuss (2012). *E. coli* were sensitive to Tetracycline and Doxycycline and fully resistant to Amphotericin, Nalidixic acid, Chloramphenicol and Cholistin Sulphate (Table 4) which support the research findings of Paul et al. (2010). *Staphylococcus* sp., isolates showed distinctly sensitivity to Tetracycline and Doxycycline, moderately sensitive to Neomycin and resistance to Nalidixic acid, Chloramphenicol, Cholistin sulphate and Streptomycin (Table 4). Recent study findings partially support the previous research findings of Pereira and Siqueira-Jr (1995). The difference might be due to geographical differences or species variation of organism.

There is no conflict of interest.

### AUTHORS' CONTRIBUTION

MS Jalal designed the study, carried out lab work and wrote the manuscript. A Dutta analyzed data edited the manuscript. KMF Islam, J Sultana and MSH Sohel collected samples and related data. A Ahad supervised all the activities of this study.

### REFERENCES

- Angus K (1991). Arthritis in lambs and sheep. In Practice, ISSN: 0263-841X. (5): 204-207.
- Banglapedia (2014). National encyclopedia of Bangladesh. Available at: <http://en.banglapedia.org/index.php?title=Cattle>.
- Chakrabarti A (2003). Joint ill, In: A textbook of preventive veterinary medicine. 3<sup>rd</sup> ed. Kalyani Publishers, New Delhi, India, Section 3(31), Pp. 493-496.
- CLSI (2015). Methods for dilution antimicrobial susceptibility tests for bacteria that grow aerobically. In: CLSI guideline, 10<sup>th</sup> edition: Approved Standard M7-A10, CLSI, Wayne, PA, USA, Volume 32, Pp. 1-86.
- Debnath NC, Sil BK, Selim SA, Prodhan MAM, Howlader MMR (1990). A retrospective study of calf mortality and morbidity on smallholder traditional farms in Bangladesh. Prevent. Vet. Med. 9(1): 1-7. [https://doi.org/10.1016/0167-5877\(90\)90037-I](https://doi.org/10.1016/0167-5877(90)90037-I)
- Feng P, Weagant SD, Jinneman K (2011). Diarrheagenic *Escherichia coli*, In: Bacteriological analytical manual, U.S. Food and Drug Administration Centre for Food Safety and Applied Nutrition, February, USA, Volume 12(4), Pp. 68-101.
- Goodarzi M, Khamesipour F, Mahallati SA, Dehkordi MK, Azizi S (2015). Study on Prevalence of Bacterial Causes in Calves Arthritis. J. Agric. Biol. Sci. 10(6): 206-212.
- Hossain MA, Shahidullah M, Ali MA (1986). Surgical disease and reproductive disorder recorded at the Veterinary Hospital of Bangladesh Agricultural University Mymensingh, Bangladesh. Bangladesh Vet. J. 20: 1-5.
- Nuss K (2012). To treat or not to treat synovial structures, large animal review journal. Soc. Ital. Vet. Anim. Reddito. 18(1): 39-40.
- Paul SK, Khan MSR, Rashid MA, Hassan J, Mahmud SMS (2010). Isolation and characterization of *Escherichia coli* from buffalo calves in some selected areas of Bangladesh. Bangladesh J. Vet. Med. 8(1): 23-26.
- Pereira MSV, Siqueira-Junior JP (1995). Antimicrobial drug resistance in *Staphylococcus aureus* isolated from cattle in Brazil. Lett. Appl. Microbiol. 20(6): 391-395. <https://doi.org/10.1111/j.1472-765X.1995.tb01328.x>
- Robson S (2003). Bacterial arthritis in lambs. NSW Agriculture, Primefact (February 2007), State of new South Wales, ISSN: 1832-6668.
- Samad MA, Islam MA, Hossain A (2002). Patterns of occurrence of calf diseases in the district of Mymensingh in Bangladesh. Bangladesh Vet. J. 36(1-2): 1-5.

**Table 4:** Results of CS-test for *E. coli* and *Staphylococcus* sp. isolates

Organism	Sample No.	Antimicrobial disc used								
		AMP	S	N	TE	DO	NA	C	CT	
<i>E. coli</i>	JF1	R	I	I	S*	S*	R	R	R	
	JF3	R	I	I	S*	S*	R	R	R	
	JF6	R	R	I	S*	S*	R	R	R	
<i>Staphylococcus</i> sp.	JF2	I	R	I	S*	S*	R	R	R	
	JF7	S*	R	I	S*	S*	R	R	R	

AMP, Ampicillin; S, Streptomycin; N, Neomycin; TE, Tetracycline; DO, Doxycycline; NA, Nalidixic acid; C, Chloramphenicol; CT, Colistin sulphate; S\*, Sensitive; I, Intermediate sensitive; R, Resistant

### CONCLUSION

The proportionate prevalence of joint ill has made it as a major animal health issue. As both gram positive and gram negative bacteria contribute to joint ill, and, also, they show resistance to different commonly used antibiotics, so, a complex combination of antibiotic treatment after cultural sensitivity test may be an option of treatment aiming to reduce calf mortality caused by joint ill in dairy farm.

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- Sarker NU, Rahman MM, Rana MS, Islam MT, Rima UK (2014). Prevalence of surgical diseases of cattle in stall-fed and free-range cattle in Bangladesh. *Bangladesh Vet.* 30(2): 62-69. <https://doi.org/10.3329/bvet.v30i2.18256>
- Singh DD, Kumar M, Choudhary PK, Singh HN (2009). Neonatal calf mortality—an overview. *Intas. Polivet.* 10(2): 165-169.
- Wudu T, Kelay B, Mekonnen HM, Tesfu K (2008). Calf morbidity and mortality in smallholder dairy farms in Ada'a Liben district of Oromia, Ethiopia. *Trop. Anim. Health Prod.* 40(5): 369-376. <https://doi.org/10.1007/s11250-007-9104-3>