

## Prevalence of Bacterial Diseases in Cattle: A One-Year Study in Sherpur District, Bangladesh

Obaidul Islam <sup>1\*</sup>, Jahid Hasan Tipu <sup>2</sup>, Md Ashraf Islam <sup>3</sup>, Radwan Raquib <sup>4</sup>, Manna Roy <sup>5</sup>, Mahmuda Begum <sup>6</sup>, Md Altafur Rahman <sup>7</sup>, Ysharzya Mojumder <sup>4</sup> and Ashraf Alam Emon <sup>8</sup>

<sup>1</sup>Laboratory of Veterinary Epidemiology, College of Veterinary Medicine, Chungbuk National University, Chungbuk 28644, South Korea

<sup>2</sup>Centre for International Health, Department of Global Public Health and Primary Care, Faculty of Medicine, University of Bergen, Bergen 5007, Norway

<sup>3</sup>Laboratory of Veterinary Laboratory Medicine, College of Veterinary Medicine, Chungbuk National University, Chungbuk 28644, South Korea

<sup>4</sup>Faculty of Veterinary, Animal and Biomedical Sciences, Sylhet Agricultural University, Sylhet 3100, Bangladesh

<sup>5</sup>Department of Pharmacology and Toxicology, Sylhet Agricultural University, Sylhet 3100, Bangladesh

<sup>6</sup>Department of Livestock Production and Management, Sylhet Agricultural University, Sylhet 3100, Bangladesh

<sup>7</sup>Graduate School of Innovation and Practice for Smart Society, Hiroshima University, Japan

<sup>8</sup>Department of Medicine, Sylhet Agricultural University, Sylhet 3100, Bangladesh

\*Corresponding author: obaiduldvmsau20@gmail.com

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### ABSTRACT

This study aimed to examine the prevalence of bacterial diseases in cattle within the Sherpur district, Bangladesh, analyzing 986 recorded cases. Our study highlighted that mastitis emerged as the most prevalent disease, affecting 20.28% of the cattle population, followed by blackleg (16.73%) and calf scour (15.21%). In contrast, diseases like anthrax (0.75%) and tuberculosis (2.21%) had lower prevalence, while foot rot (11.15%) and wooden tongue (10.14%) were also common. Breed-wise analysis showed that the incidence of diseases in crossbred cattle was higher (59.23%) than in non-descriptive breeds (40.77%), with mastitis being the most common disease in both breeds. The sex-wise comparison revealed that mastitis was more prevalent in females (32.52%), while blackleg was more common in males (24.80%). Season-wise analysis revealed that the summer and monsoon seasons were the most common times for bacterial diseases, with mastitis peaking during these times. On the other hand, anthrax was primarily prevalent during the monsoon season and nonexistent in the winter, whereas tuberculosis and brucellosis increased in winter. The results of this study provide information about the burden of bacterial diseases and assist in making decisions and taking the required actions to control the diseases in the study area.

**Keywords:** Prevalence, bacterial diseases, mastitis, crossbred, Sherpur

### INTRODUCTION

Bangladesh's geographical location, suitable climatic conditions, and fertile land allowed it to become an agro-based nation. Its economic growth is heavily reliant on agriculture. The livestock sector contributes 16.52% to the agricultural GDP and directly provides 20% of employment, with an additional 50% engaged partly. Approximately 24.49 million cattle are available in Bangladesh out of 57.14 million ruminants (DLS, 2023). They supply milk, meat, hides, transportation, bone, and biogas (Chowdhury et al. 2019).

Despite having a large cattle population, Bangladesh struggles to fulfill the daily demand for milk and beef. Frequent outbreaks of infectious diseases in cattle herds throughout the year is one of the main reasons for this. Reports suggest that the prevalence of infectious diseases varies from 7.84 to 12.39% across different districts (Ullah et al. 2015; Hossain et al. 2016). The most common viral diseases include FMD (foot and mouth diseases), BVD (bovine viral diarrhea), papillomatosis, BEF (bovine ephemeral fever), rabies, with the recent unprecedented outbreak of LSD (lumpy skin disease) in cattle across the country (Badruzzaman et al. 2015; Khan et al. 2024).

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Meanwhile, a study in the Dinajpur district suggests that bacterial diseases are more prevalent than viral ones (Juli et al. 2015). Diseases caused by bacteria, commonly are anthrax, black quarter (BQ), mastitis, colibacillosis, foot rot, calf scour, tetanus, hemorrhagic septicemia (HS), etc. (Rahman 2023).

The epidemiology of these diseases is influenced by various factors such as the age and sex of the animal, particular seasons and climatic conditions. For instance, there is no chance of mastitis in bull or heifer, it mainly occurs in dairy cows. It is most common in summer (47.62%), less so in the rainy season (42.86%), and least in winter (10.86%) in Sylhet (Lucky et al. 2016; Islam et al. 2019). Similarly, BQ typically occurs in growing cattle (Nahian et al. 2017) and is usually prevalent during summer and autumn (Tagesu et al. 2019). Thus, almost all bacterial disease epidemiology depends upon such factors. Bacterial diseases commonly show symptoms of fever, lethargy, loss of appetite, respiratory distress, diarrhea, reduced production, pain, and, in some cases, reproductive issues (Moreira et al. 2019).

Although numerous studies have examined the epidemiology of bacterial diseases in various regions of Bangladesh, there is a scarcity of available data on bacterial diseases of cattle in the Sherpur district of Bangladesh, and also there is no recent studies are available. That is why, this study aims to address this gap by investigating the prevalence of bacterial diseases in Sherpur. This study might assist researchers and clinicians in designing and implementing priority-based research on bacterial diseases and to take effective strategies to control the diseases.

## MATERIALS AND METHODS

### Study area and period

Data were collected from the clinical register book of one year at Upazila Livestock Office and Veterinary Hospital (ULOVH) of Nakla, Nalitabari, and Sreebardi upazila under Sherpur district of Bangladesh (Fig. 1). This study included a total of 986 bacterial infections in cattle with different breeds, sexes, and seasons were examined and diagnosed during the study period from April 2020 to

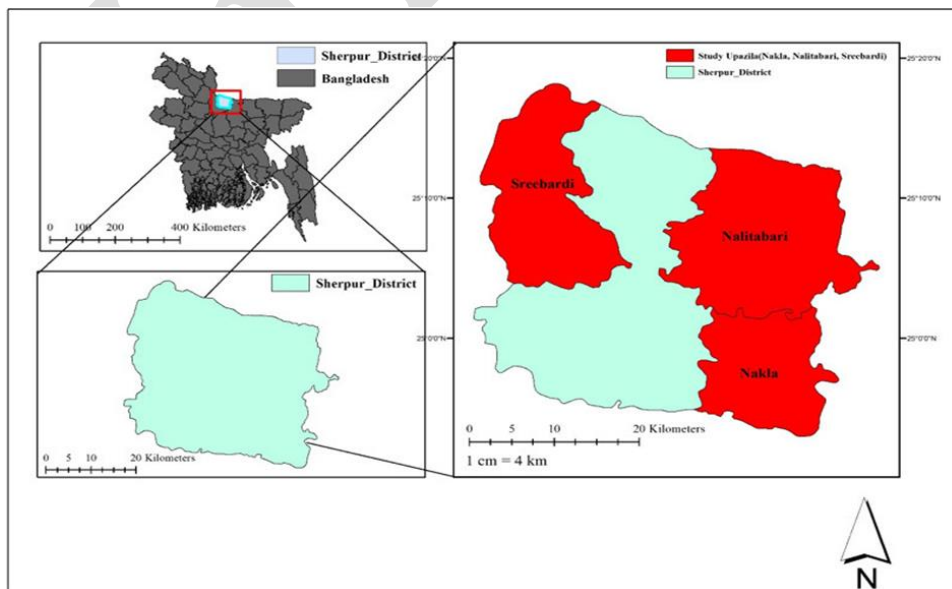
March 2021. The major four seasons are categorized like summer (March - May), monsoon (June - August), autumn (September - November), and winter (December - February). The handling of animals in the study was performed in accordance with current Bangladesh legislation (Cruelty to Animals Act 1920, Act No. I of 1920 of the Government of the People's Republic of Bangladesh).

### Methods used for diagnosing bacterial diseases

The ULOVH in Nakla, Nalitabari, and Sreebardi in the Sherpur district regularly uses the following methods to diagnose bacterial diseases. Comprehensive physical examinations, clinical signs, gross pathology, and laboratory analyses form the basis of diagnostic evaluations. Examining the animal's body, gait, behavior, pulse, posture, temperature, respiration, abdominal distension, defecation, and locomotive abnormalities are all part of a physical examination. Examining the affected animals' body parts and systems involves palpation, auscultation, percussion, needle puncture, and movement observations. Information about the animal's breed, sex, and season is methodically recorded, and owners' reports are also taken into account. According to Jones et al. (1996) and Khan (2000), clinical symptoms and large lesions are crucial for the identification of particular bacterial diseases in cattle. In instances with greater complexity, conclusive diagnoses are verified by examining the biochemical and cultural traits of the bacterium causing the illness, adhering to established laboratory protocols, as described by Rosenberger (1979).

### Statistical analysis

All the data obtained from three veterinary hospitals were organized, structured and analyzed with the help of SPSS version 24 (IBM, Armonk, NY, USA) and summarized as percentages (%). The prevalence of bacterial diseases and disorders was calculated by using the following equation: Prevalence (%) = (Number of affected cattle with specific disease at a given time/Total number of cattle cases attended) X 100



**Fig. 1:** Study area map using ArcGIS version 10.7.1. The map was prepared with the help of district shapefile data collected from the Local Government and Engineering (LGED) Department.

## RESULTS

This study recorded 986 cases of bacterial diseases in the cattle population of Sherpur district, Bangladesh. Among these, mastitis had the highest prevalence at 20.28%, followed by blackleg at 16.73% and calf scour at 15.21%. Foot-rot and wooden tongue were observed in 11.15 and 10.14% of cases, respectively. In contrast, the prevalence of other diseases was below 10%, with anthrax being the least common at just 0.75%, and tuberculosis slightly higher at 2.21%. Hemorrhagic septicemia (HS), lumpy jaw, and brucellosis were each observed in approximately 8% of cases (Table 1).

### Breed-wise prevalence of bacterial diseases in cattle

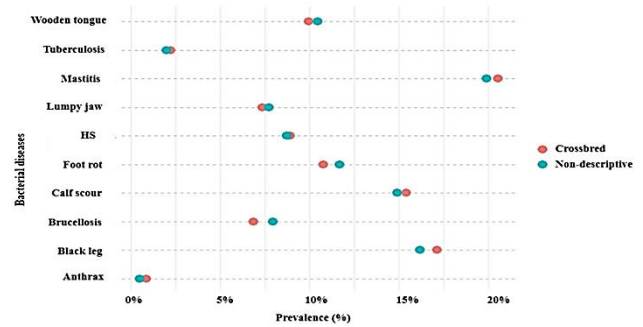
The study conducted a comprehensive analysis of disease prevalence in both crossbreed and non-descriptive breed cattle, recording a total of 584 cases in crossbreed cattle and 402 cases in non-descriptive breed cattle (Table 1). In crossbreed cattle, mastitis emerged as the most prevalent disease, affecting 20.54% of the population, followed by blackleg at 17.13%, calf scour at 15.42%, foot rot at 10.79%, and wooden tongue at 9.94%. Other diseases observed included hemorrhagic septicemia (HS) at 8.91%, lumpy jaw at 7.37%, brucellosis at 6.85%, tuberculosis at 2.23%, and anthrax at 0.86%. Similarly, in non-descriptive breed cattle, mastitis was the most common disease, with a prevalence of 19.90%, followed by blackleg at 16.17%, calf scour at 14.93%, foot rot at 11.69% and wooden tongue at 10.45%. The prevalence of other diseases included brucellosis at 7.97%, lumpy jaw at 7.72%, HS at 8.71%, tuberculosis at 1.99%, and anthrax at 0.49%. Overall, crossbreed cattle exhibited a higher disease prevalence accounting for 59.23% (584 cases) of the total, compared to 40.77% (402 cases) in non-descriptive breed cattle (Fig. 2).

**Table 1:** Breed-wise prevalence of bacterial diseases in cattle

Diseases	Crossbred		Non-Descriptive Breed		Total Number of Cases	Overall Prevalence (%)
	Cases (n)	Prevalence (%)	Cases (n)	Prevalence (%)		
Mastitis	120	20.54	80	19.9	200	20.28
Calf scour	90	15.42	60	14.93	150	15.21
Blackleg	100	17.13	65	16.17	165	16.73
HS	52	8.91	35	8.71	87	8.82
Foot rot	63	10.79	47	11.69	110	11.15
Wooden tongue	58	9.94	42	10.45	100	10.14
Lumpy jaw	43	7.37	31	7.72	74	7.75
Brucellosis	40	6.85	32	7.97	72	7.30
Anthrax	5	0.86	2	0.49	7	0.75
Tuberculosis	13	2.23	8	1.99	21	2.21
Total	584		402		986	100.00

**Table 2:** Sex-wise prevalence of bacterial diseases in cattle

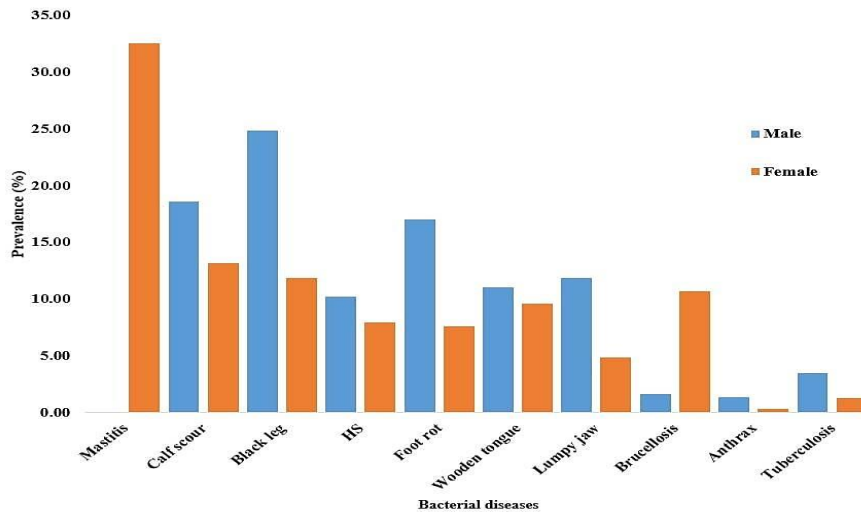
Name of the Diseases	Male		Female		Total
	Case (n)	Prevalence (%)	Case (n)	Prevalence (%)	
Mastitis	0	0.00	200	32.52	200
Calf scour	69	18.60	81	13.17	150
Blackleg	92	24.80	73	11.87	165
HS	38	10.24	49	7.97	87
Foot rot	63	16.98	47	7.64	110
Wooden tongue	41	11.05	59	9.59	100
Lumpy jaw	44	11.86	30	4.88	74
Brucellosis	6	1.62	66	10.73	72
Anthrax	5	1.35	2	0.33	7
Tuberculosis	13	3.50	8	1.30	21
Total	371	100.00	615	100.00	986



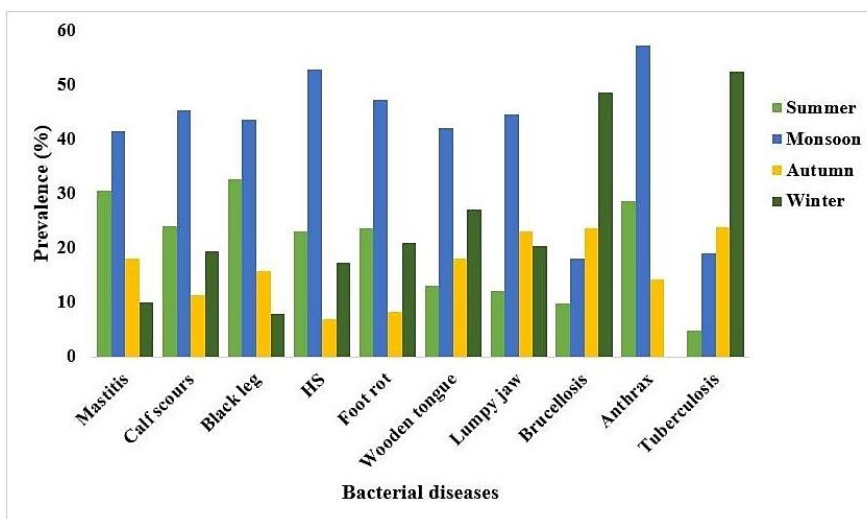
**Fig. 2:** Breed-wise prevalence of bacterial diseases in cattle

### Sex-wise prevalence of bacterial diseases in cattle

The study examined the prevalence of various bacterial diseases across both sexes, recording 371 cases in males and 615 cases in females. All instances of mastitis, an udder-specific disease, were found in cows, making it the most prevalent disease in females at 32.52%. In contrast, blackleg was the most common disease among males, with a prevalence of 24.80%. Other diseases such as calf scour, hemorrhagic septicemia (HS), foot rot, and lumpy jaw showed higher prevalence in males, at 18.60, 10.24, 16.98, and 11.86%, respectively, compared to lower rates in females, with corresponding prevalence of 13.17, 7.97, 7.64, and 4.88%. The prevalence of wooden tongue was similar in both sexes, with 11.05% in males and 9.59% in females. Brucellosis was significantly more prevalent in females (10.73%) compared to males (1.62%). Anthrax had the lowest prevalence, with 0.33% in females and 1.35% in males. Tuberculosis also exhibited low prevalence rates in both sexes, with 3.50% in males and 1.30% in females (Table 2). Overall, the analysis revealed that bacterial diseases tend to be more prevalent in females than in males (Fig. 3).



**Fig. 3:** Sex-wise prevalence of bacterial diseases in cattle.



**Fig. 4:** Season-wise prevalence of bacterial diseases in cattle.

### Season-wise prevalence of bacterial diseases in cattle

The seasonal variation in bacterial disease prevalence was evident in our study. Mastitis was consistently prevalent across all seasons, with particularly high rates observed in summer (30.5%) and monsoon (41.5%). Diseases such as calf scour, blackleg, HS, and foot rot also exhibited higher prevalence during the monsoon and summer months, with significantly lower occurrences in autumn and winter. Specifically, in autumn, the prevalence rates for calf scour, blackleg, HS, and foot rot were 11.33, 15.76, 6.9, and 8.18%, respectively. However, these diseases showed an increase in winter, with calf scour, HS, and foot rot reaching prevalence rates of 19.33, 17.24, and 20.91%, respectively. Wooden tongue and lumpy jaw followed similar seasonal trends, peaking during the monsoon (42 and 44.59%, respectively) and reaching their lowest levels in summer (13 and 12.16%, respectively). An exception was noted with wooden tongue, which was more prevalent in winter (27%) compared to lumpy jaw (20.27%). The most prevalent diseases in winter were tuberculosis (52.38%) and brucellosis (48.61%), while no cases of anthrax were recorded during this season. Brucellosis and tuberculosis showed a gradual increase in prevalence from summer to winter, whereas anthrax was most prevalent during the monsoon (57.14%) (Table 3). Overall, our analysis indicates that bacterial diseases are present throughout the year, with the highest prevalence in

summer and monsoon, except for anthrax, which was absent in winter (Fig. 4).

### DISCUSSION

The study aimed to assess the overall burden of bacterial diseases in the cattle population in three upazila namely Nakla, Nalitabari, and Sreebardi of Sherpur district in Bangladesh. This study reflects a comprehensive overview of bacterial disease in Sherpur district as well as Bangladesh. At the same time, this study has presented a breed-wise, sex-wise and season-wise comparison of bacterial diseases which can certainly guide in implementing necessary preventive measures as well as can help in guessing the accurate time of vaccination in cattle (Constable et al. 2016).

Our findings indicate that among 986 disease cases in cattle, crossbred cattle (59.23%) were more susceptible to bacterial diseases than non-descriptive cattle breeds (40.77%). This pattern is consistent with another study conducted in Chittagong, where diseases were most prevalent in cross-bred cattle (44.23%), followed by Red Chittagong cattle (28.46%) and non-descriptive deshi cattle (27.31%) (Badruzzaman et al. 2015). The lower disease burden in non-descriptive deshi cattle could be attributed to their frequent exposure to these diseases, which may have led to the development of natural immunity in these local

**Table 3:** Season-wise prevalence of bacterial diseases in cattle

Name of the diseases	Summer (Mar-May)	Prevalence in Summer (%)	Monsoon (Jun-Aug)	Prevalence in Monsoon (%)	Autumn (Sep-Nov)	Prevalence in Autumn (%)	Winter (Dec-Feb)	Prevalence in Winter (%)	Total Case
Mastitis	61	30.50	83	41.50	36	18.00	20	10.00	200
Calf scours	36	24.00	68	45.33	17	11.33	29	19.33	150
Blackleg	54	32.73	72	43.64	26	15.76	13	7.88	165
HS	20	22.99	46	52.87	6	6.90	15	17.24	87
Foot rot	26	23.64	52	47.27	9	8.18	23	20.91	110
Wooden tongue	13	13.00	42	42.00	18	18.00	27	27.00	100
Lumpy jaw	9	12.16	33	44.59	17	22.97	15	20.27	74
Brucellosis	7	9.72	13	18.06	17	23.61	35	48.61	72
Anthrax	2	28.57	4	57.14	1	14.29	0	0.00	7
Tuberculosis	1	4.76	4	19.05	5	23.81	11	52.38	21
Total	229	23.22	417	42.29	152	15.42	188	19.06	986

breeds (Dash 2020). Among the diseases observed, mastitis (20.54%), calf scour (15.42%), blackleg (17.13%), HS (8.91%), anthrax (0.86%), and tuberculosis (2.23%) occurred more frequently in crossbred cattle. Similar findings supported by the previous study (Verma et al. 2023). On the other hand, foot rot, wooden tongue, lumpy jaw, and brucellosis were more common in non-descriptive deshi cattle. This discrepancy result could be due to the farmers' lower level of concern regarding the health of their non-descriptive deshi cattle (Samad 2020), as crossbred cattle are generally more economically valuable. Additionally, factors such as geographical conditions, environmental influences (Smith 2020), and individual farmers' awareness and knowledge levels may also contribute to this variation (Meijer et al. 2015; Islam et al. 2024).

This study reported that female cases (62.37%) were higher than male cases (37.63%). But if we subtract the mastitis (32.52%) and brucellosis (10.73%) from the list which predominantly occur in female (brucellosis also occurs in males, but it most often remains undiagnosed), males (37.63%) are more prone to other bacterial diseases than females (35.40%). Except brucellosis and mastitis, males were infected more often than females which matches with other study which conducted in Tangail district of Bangladesh where males (51.78%) were comparatively more diseased than females (48.22%) in registered clinical cases (Siddiki et al. 2023). One possible explanation for the increased susceptibility to disease in male animals compared to females could be due to hormonal (Klein 2020), genetic (Leipold 1978) and behavioral factors (Tebug et al. 2015).

Our result showed that animals become more susceptible to bacterial diseases during monsoon season (42.29%) followed by summer (23.22%), winter (19.06%) and autumn (15.42%) respectively. This finding supported by previous study conducted in India (Joshi and Gokhale 2006). Another study revealed that, cattle are more diseased during summer season (40.45%), followed by the rainy season (34.37%) and winter season (25.19%) (Sarker et al. 2014). The seasonal variation of bacterial disease prevalence occurs due to the temporal and spatial differences among the cattle population (Molina et al. 2013).

This study's primary limitation is that it only examined one district in Bangladesh, Sherpur. As a result, the findings may not apply to other areas with different environmental factors, cattle management techniques, or breed

distributions. Furthermore, the use of documented cases raises the risk of biases or errors in reporting. The study did not take into account additional factors that might have an impact on disease prevalence, such as farm management practices, vaccination history, and nutritional status. Furthermore, it is more difficult to determine a causal link between the identified risk factors and the outcomes of the disease because the study is observational in nature.

### Conclusion

In our study, we recorded major bacterial diseases of cattle in the Sherpur district of Bangladesh. Our findings reported that crossbred cattle were more likely to be get affected by bacterial diseases. We also highlighted that, with exception of mastitis and brucellosis, bacterial diseases were more predominant in males than in females. Diseases were found across all season except for anthrax, that was not reported in winter. Interestingly, disease burden was highest in the monsoon, rather than in summer season. Moreover, bacterial diseases were more common in winter than in autumn season. Our study provides a transparent perception of the distribution of cattle diseases in the Sherpur region which may assist the forthcoming researchers to develop effective strategies to tackle the diseases through vaccination and creating awareness among the farmers.

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**Author's Contribution:** OI, MAI, JHT: concept and design the proposal. RR, MR, MB, and MAR: collected and analyzed the published data. OI, AAE, YM: wrote the manuscript draft. All authors revised and approved the final manuscript

**Conflict of interest:** The authors declare that there is no conflicting interest with regards to the publication of this manuscript.

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