



Research Article

Prevalence and Associated Risk Factors of flu Virus in Cat at Barishal Sadar in Barishal Distric of Bangladesh

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Abstract | Cat flu, a common viral infection caused by feline herpesvirus-1 and feline calicivirus for cat populations in worldwide. A study was conducted at district veterinary hospital under the district of Barishal in Bangladesh during the period from March, 2023 to February, 2024. The purpose of this study investigates the prevalence, risk factors, transmission, and impact of cat flu. Data were collected 1200 cats across Barishal Sadar geographical locations through surveys and medical records. A total of 180 cats were found cat flu affected in which overall prevalence of 15%. The prevalence of cat flu was maximum 41.11% at age of 0-6 months, in compare with 31.11%, 13.33%, 8.89%, 5.55% at age category 6 -12 months, 12-36 months, 36-60 months, >60 months respectively. Prevalence of cat flu in local breeds was 83.33% whereas persian breed 6.66% and mixed breed 4.44%. The variable sex of cat, males (63.33%) were more susceptible than female (36.66%) and study area prevalence in winter season (62.77%) is higher than summer (31.66%) or rainy season (5.55%) cat flu. The prevalence of in the study area, sick cats (88.89%) were more susceptible than apparently healthy cats (11.11%). The most typically used antibiotic were ceftriaxone (95%) and amoxicillin (83.75%). Lack of vaccination, season, age, outdoor access, poor management, owners' ignorance, various topographic regions, environments and multi-cat households were identified as significant risk factors. The study underscores the need for vaccination, hygiene practices, and further researchs to mitigate the impact of cat flu on feline health and welfare is needed.

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Introduction

Bangladesh is one of the world's most densely populated countries in south Asia. Over the past few decades, domestic cats have gained popularity as pets both domestically and internationally (Lepczyk *et al.*,

2015). Regarding of social standing, a sizeable majority of individuals around the world own pets. In Bangladesh's Dhaka, society places a high value on cats. They serve as vital companions in many homes, promoting the physical, social, and mental development of youngsters as well as the wellbeing of their

owners (Dohoo *et al.*, 1998). The benefits of cats to our society include friendship, interaction with children, protection of the home and alerting the owner of any dangerous conditions, giving gifts to particular people, and economic gain (Parvez *et al.*, 2014). In this region, pet ownership is typically associated with obligations, such as housing, disease prevention, and good pet ownership with implications for public health when pets are abused (William *et al.*, 2002). Since pets and people live in the same environment, they serve as a significant reservoir for zoonotic infections (Kornblatt *et al.*, 1980). It has been discovered that household pets directly contribute to the spread of zoonosis. Most of the diseases that cats carry is zoonotic, or diseases that can spread from animals to people.

Feline upper respiratory tract disease (URTD), colloquially termed as 'cat flu', is a relatively mild condition, manifested by oral or nasal discharges, lethargy, pyrexia, conjunctivitis and sneezing (Helps *et al.*, 2005). The disease, however, may progress to the severe sequelae, with potentially fatal outcome (Bannasch and Foley, 2005). Feline herpesvirus type 1 (FHV-1) and feline calicivirus (FCV) are considered to be the two major causes of URTDs (Bannasch and Foley, 2005). Caliciviridae family encompasses non-enveloped, single-stranded, positive-sense RNA viruses that can infect both humans and animals (Ohlinger *et al.*, 1993), Feline calicivirus (FCV), Vesivirus (Fields *et al.*, 2013) is prevalent worldwide in the domestic cat population and is commonly associated with oral ulceration, salivation, chronic stomatitis, mild respiratory or conjunctiva disorders and limping syndrome.

It has been, however, noted that some FCV isolates cause outbreaks with mortality rates reaching 40–60% (Hurley *et al.*, 2004). No adequate antiviral treatment is available. Herpesviridae family encompasses enveloped, double-stranded DNA viruses associated with incurable, lifelong lasting herpetic infections. Feline herpesvirus type 1 (FHV-1, felid herpesvirus-1) is classified under the genus Varicellovirus and within the Alphaherpesvirinae subfamily.

The virus is present in the domestic cat population worldwide, causing viral rhinotracheitis (FVR) and ocular disease (Hartley, 2010). It is estimated that 90% of cats are seropositive to this virus, whereas about 80% of infected animals establish lifelong latency and ~45% of these shed the virus (Gaskell *et*

al., 1977). The ocular herpetic disease is commonly manifested as acute conjunctivitis or chronic stromal keratitis and may lead to permanent eye damage or blindness (Gould *et al.*, 2011). Following the acute phase, the virus is transported retrograde to sensory neurons, to establish incurable, life-long lasting latency in trigeminal ganglia. Recovery from latency results in recurrent disease (Gaskell and Povey, 1973).

Treatment options for human herpetic infections often involve the use of specific nucleoside analogs (NA). These compounds are initially inactive and gain the function in infected cells due to phosphorylation by virus-encoded thymidine kinase (TK) and subsequently host GMP kinases (Miller and Miller, 1980) and act as effective viral polymerase inhibitors. While some of the compounds used in humans appear to be toxic in cats (Maggs, 2005). Penciclovir (PCV) appears to be a potent and safe inhibitor of FHV-1 replication *in vitro*; its prodrug famciclovir administered to cats is reported to be a safe and effective antiviral (Thomasy *et al.*, 2011).

In this study, we evaluated the antiviral potency of ceftriaxone, pheniramine maleate, fluid and electrolyte therapy against FHV-1 and FCV. We also evaluated the antiviral potency of amoxicillin, pheniramine maleate, fluid and electrolyte therapy against FHV-1 and FCV. Obtained results show that these polymers inhibit replication of both viruses at nontoxic concentrations but their mode of action differs for the two tested pathogens. Interacts the FHV-1 virus blocks its entry to the cell; it restricts FCV infection during later stages of the replication cycle. Our observations were confirmed with clinical strains. Additionally, what is important, PSSNa was previously used in clinic for other indications such as treatment of hyperkalemia (Mistry *et al.*, 2016). However, given the above, we tested transdermal toxicity of concentrated polymers in a mouse model as it would be a beneficial route of administration in the treatment of URTD. As no toxicity was observed thus far, we believe that PSSNa is a safe and effective drug candidate to be used in the treatment of viral infections in domestic cats. Considering the aforementioned information, the current research was carried out to know the overall prevalence of cat flu at study area, to estimate the proportional prevalence of cat flu relation to breed, age, sex, and season and the evaluation of symptomatic treatment for affected cat.

Materials and Methods

Study area and Duration

The study was conducted at District Livestock Office & Veterinary Hospital, Barishal sadar, Barishal (Figure 1), Bangladesh. The study were carried out in District Livestock Office & Veterinary Hospital during the period of March, 2023 to February, 2024



Figure 1: Study area map (Barishal Sadar).

Sample and sample size

The study was conducted on naturally cat flu suspected cat brought to the veterinary hospital during the study period. The animals were selected which brought into veterinary hospital from different areas around Barishal. In study periods, about 1200 cat were treated in District Veterinary Hospital due to different diseased condition. Among them total cat flu affected cats were clinically suspected 180.

Data collection

A total number of cats were recorded through pre-set questionnaire survey and the numbers of data of clinically suspected 180 cat flu diseased were recorded. The data were directly collected from the owner and record book of the District Veterinary Hospital, Barishal Sadar, Barishal. Questionnaire based data on location, ownership status, age, season, health status, client/owner complaint clinical history, physical examination (inspection, temperature, auscultation, and respiration) and clinical sign of suspected cat.

Complaints of the owner

All the patients were first registered in the patient register book including date, age, sex, breed and complaint of the owners. Detailed clinical examinations

of each of the patient were carried out (vaccination, travel, diet, environmental and birth history).

Clinical and physical examination

The entire studied cat presented at the District Livestock Office & Veterinary Hospital, Barishal Sadar were undergone through physical examination by using the methods of palpation, percussion and auscultation. Diagnosis of a cat flu case was performed considering the general and specific signs of including sneezing, diarrhea, runny nose, lacrimation of eyes, conjunctivitis, dribbling, quiet and subdued behavior, loss of appetite, high temperature and cough or loss of voice pneumonia. Along with the physical examinations drugs which prescribed against cat flu cases were also recorded (Figure 2).



Figure 2: Cat Flu diagnosed in a cat showing typical runny nose (a), (b) and (c) diarrhea and dehydration in cat.

Clinical assessment

Respiration rate, heart rate, pulse rate, temperature, body condition score, skin condition, etc. were measured using clinical examination equipment during a clinical examination of the patients.

Diagnosis of Cat Flu case

Among all diseased cases of cats brought to the veterinary hospitals for treatment, presumptive diagnosis of cat flu in cats were made on the basis of owners complains, clinical history, clinical signs like as inflamed throat, nasal discharge or runny nose, sneezing, coughing, mouth ulcers, saliva dripping, fever, loss of voice, conjunctivitis, low energy, vomiting, diarrhea, loss of appetite etc.

Vaccination history of Cat Flu

Each owner was asked about previous vaccination history of his/her cat sufferings from cat flu virus. Regular vaccination against FHV and FCV is the most effective way of reducing the risk of developing cat flu. Vaccination can start at eight to nine weeks of age in kittens, with a second dose at 12 weeks. Boosters are required at regular intervals thereafter.

Treatment

Antimicrobials of different combination and symptomatic therapy were provided to treat cats suffering from cat flu. The antibiotics commonly prescribed were amoxicillin and ceftriaxone. Among the supportive therapy, pheniramine maleate, promethazine, meloxicam, ketoprofen, vitamin, autohaemotherapy, virutex and povidon iodine, respectively, were used in different treatment regimens in the District Veterinary Hospital.

Statistical analysis

The data generated were entered into Microsoft Excel 2010 spread sheet. Data were cleaned, coded, sorted and checked in MS Excel 2010. The prevalence was calculated by considering total number of samples screened for cat flu and number of samples detected positive as per formula. Cat flu (%) = Number of positive cases/Total number of screened sample x 100. Data also analyzed by Chi-square test to observe the significant influence of parameters.

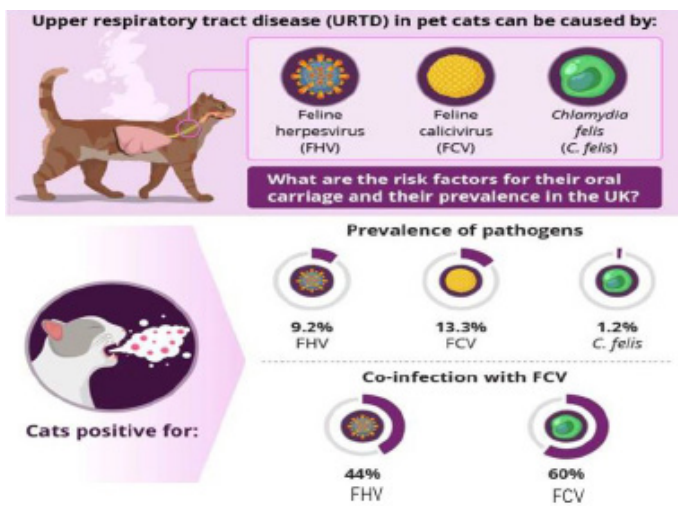


Figure 3: Pathogens risk factors of Cat Flu disease.

Results and Discussion

Overall prevalence of Cat Flu

A total 1200 cats were examined where 180 cats were clinically positive for cat flu disease. The prevalence

and associated results of this study summarized (Figure 3). In the present study the overall prevalence of cat flu was 15% (Table 1). Our result supported the Binns *et al.* (2000), reported that using viral isolation on oropharyngeal swabs to determine the presence of FHV and FCV, prevalence was 11% and 33%, respectively. Helps *et al.* (2005) using PCR to detect presence of FHV and FCV in cats from large multi-cat (>5 cats) households across Europe from oropharyngeal and ocular swabs found prevalence of 16%, 47% respectively. Infect, the prevalence may differ from region to region. The higher or lower prevalence of disease have been influenced by many factors such as age, sex, breed, geography, management system and environment of cat.

Table 1: The overall prevalence of cat flu in cat in Barishal Sadar of Bangladesh.

Total Case	No. of infected cats	Prevalence (%)
1200	180	15

Table 2: The prevalence of cat flu in different ages of cat.

Age (Month)	No. of affected cats	Prevalence (%)
0-6	74	41.11
6-12	56	31.11
12-36	24	13.33
36-60	16	8.89

Prevalence of Cat Flu in different ages of cat

The prevalence of cat flu was maximum 41.11% at age of 0-6 months, in compare with 31.11%, 13.33%, 8.89%, 5.55% at age category 6 -12 months, 12-36 months, 36- 60 months, >60 months respectively as shown in Table 2. In considering the age of cat, the prevalence was higher at 6 months of age 34.0% when compared to adult having similarities with the findings of the Chan *et al.* (2023). In this study area cats were mostly affected because poor hygienic management, non-vaccination reported the cat flu prevalence was higher in young cat in comparison with adult. There was statistically significant difference between animal age and prevalence rate in this study. This dissimilar report to this study was probably due to variation in study place and time.

Prevalence of Cat Flu in different breeds of cat

A total of 180 cats were found affected in which prevalence of cat flu in local (indigenous) breed is 83.33% and in Persian breed is 6.66% and mixed breed is

4.44% (Table 3). The risk of getting cat flu cases in local cat was 8.3 times higher than persian breed in the study area (Barishal sadar). Chan *et al.* (2023) reported that 75.8% were crossbred (domestic shorthair and domestic longhair) and 24.2% were purebred. In the study area (Barishal sadar) cat owners are mostly reared local cat rather than persian breed; for this reason the prevalence of cat flu in local cat is high.

Table 3: *The prevalence of cat flu in different breeds of cat.*

Name of Breed	No. of affected cats	Prevalence (%)
Local	180	83.33
Persian	12	6.66
Mixed	8	4.44

Table 4: *The prevalence of cat flu in different sex of cat.*

Sex	No. of affected cats	Prevalence (%)
Male	114	63.33
Female	66	36.66

Prevalence of Cat Flu in different sex of cat

The variable sex of cat, males (63.33%) were more susceptible than female (36.66%) to cat flu disease (Table 4). In this study male are more susceptible than female. Our findings similarities of the Arjona *et al.* (2000) seems to indicate that sex may somehow influence the development of sins related to FeL V infection in cats who reported of significantly ($p>0.05$) higher prevalence of FeL V infection in male (63.2%) than that of female (41.4%).

Table 5: *The prevalence of cat flu in different seasons of cat.*

Season	No. of affected cats	Prevalence (%)
Winter	113	62.77
Summer	57	31.66
Rainy	10	5.55

Prevalence of Cat Flu in different season cat

The prevalence of cat flu in the study area (Barishal Sadar) in winter (62.77%) season is higher than summer (31.66%) or rainy (5.55%) season (Table 5). The prevalence of FInV in cat was higher in winter season due to lower humidity that helps to longer survival period of virus and close contact of animal Alam *et al.* (2013). This study shows that in winter season is higher than rainy season or summer season. Cat flu

is associated with decreased temperature. It is more prevalent during the wet and cold condition of winter months. The cold climate in midland and lowland agro-climates has been considered as more favorable environment for cat flu.

Prevalence of Cat Flu in different health status of cat

The prevalence of cat flu in the study area (Barishal sadar), sick cats (88.89%) are more susceptible than apparently healthy cats (11.11%) (Table 6). A recent survey of healthy and sick cats presented to the Ohio in United State Veterinary College reported by Ali *et al.* (2011) over a 1-year period found that, of 400 serum samples, 22.5%, 33%, and 43.5% were seropositive against A (H1N1) pdm09, seasonal H1N1, and seasonal H3N2, respectively, and only 153 (38%) were negative for all 3 influenza subtypes tested. These results indicate a higher prevalence of sick cat. The seroprevalence of FInV is higher in these studies because they conducted study on serum sample but the present study was conducted based on clinical findings.

Table 6: *Prevalence of Cat Flu in different health status of cat.*

Health status	No. of affected	Prevalence (%)
sick	160	88.89
apparently	20	11.11

Efficacy of therapeutic response of Flu in cat at different therapeutic methods

As a viral disease, cat flu has no specific treatment and only symptomatic therapy is applicable by using combination of antimicrobials and anti-inflammatory drugs. Most common antibiotics that were used to treat cats under the present study (Hasib *et al.*, 2020) were amoxycilin, ceftriaxone and fluid and electrolyte therapy (Malik *et al.*, 2009). These systemic antibiotics were seemingly important to cure the flu lesion and prevent secondary infection. The most typically used medication (95%) was antibiotic ceftriaxone and amoxicillin was the most used antibiotic (83.75%) (Table 7). Anti-inflammatory drugs (pheniramine maleate, promethazine, ketoprofen and meloxicam) were used to reduce generalized inflammation and vitamin supplement was used to stimulate immunity. Intravenous fluid therapy was used for maintenance of dehydration and preventing debilitation during diarrhea and decumbency.

Table 7: Efficacy of therapeutic response of cat flu in cat with different therapeutic drugs.

Therapy	Total no. of treated animal	No. of cured animal	Prevalence of cured animal
ceftriaxone+ pheniramine+ maleate+ fluid and electrolyte therapy	100	95	95%
Amoxicillin+pheniramine maleate+ fluid and electrolyte therapy	80	67	83.75%

Conclusion and Recommendations

Cat flu is one of the most economically significant, emerging viral diseases of domestic cat caused by viruses of the feline herpesvirus (FHV-1) and feline calicivirus (FCV), poses 80% significant health concerns for feline populations worldwide. The present study has been observed that local breeds are more susceptible to cat flu as compared to persian breed. Kitten and young are more susceptible than old cat. Here male was more susceptible than female to cat flu infection and winter season is higher than other season. So combined antibacterials, anti-inflammatory and antihistaminic drugs are used. People from different areas come to veterinary hospital, Barishal Sadar to get utility of their cats. By appraising this report, a part of strategy can be taken about cat flu in Barishal Sadar. However, further sero-prevalence, epidemiological and microbiological studies are needed for better understanding of the diseases in stray and pet cats.

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Author's Contribution

All authors contributed to the experimental design, wrote down and examined the manuscript, and were confirmed liable for any aspect of the manuscript.

Conflict of Interest

The authors have declared no conflict of interest.

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