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Prevalence Assessment of Feline Infectious Peritonitis Based on Rapid Test and Protein Ratio Analysis in Dhaka, Bangladesh

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ABSTRACT

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Feline Infectious Peritonitis (FIP) is a fatal systemic disease of domestic cats caused by a virulent mutant of feline coronavirus (FCoV). Despite its global significance, epidemiological data on FIP in Bangladesh remain scarce. This study aimed to determine the prevalence, clinical patterns, and key risk indicators of FIP among domestic cats in Dhaka from January to May 2025. A total of 300 cats of various breeds (local, Persian, and mixed) presented to veterinary clinics were enrolled with owner consent under a cross-sectional study design. Rapid antigen detection (Testsealabs, China) was used for initial screening, and the albumin-globulin (A/G) ratio was assessed as a supportive diagnostic tool. FIP was confirmed in 200 cats (66.67%). Mixed-breed (50%) and local cats (33.33%) accounted for the majority of positive cases. The highest prevalence was observed in the 60–120-day age group. Female cats demonstrated higher infection and fatality rates, whereas male cats showed comparatively better recovery outcomes. Clinically, the dry form (48%) and wet form (40%) were most commonly observed, with the wet form exhibiting the highest fatality rate (67.5%). Protein profiling revealed that 82 cats—predominantly female local breeds—had a markedly low A/G ratio (<0.4), strongly supporting FIP infection. These findings highlight a considerable burden of FIP among domestic cats in Bangladesh and underscore the urgent need for improved diagnostic surveillance, greater owner awareness, and enhanced management practices to mitigate its impact.

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Introduction

One of the most deadly and complicated viral diseases affecting domesticated cats is feline infectious peritonitis (FIP). It is caused by a pathogenic variant species of feline coronavirus. FCoV is a widespread virus among cat species worldwide. No specific vaccine is available in Bangladesh against this virus. Thereby, this is largely carried by the fecal–oral route, usually via contaminated litter or feces of infected cats. The disease is particularly common in environments with multiple cats, like catteries, shelters, and breeding facilities, where high stress and overcrowding elevate the risk of viral spread (Pedersen *et al.*, 2009; Kipar and Meli, 2014). While the majority of feline enteric coronavirus (FECV) infections are mild or subclinical, the virus occasionally experiences a critical mutation in the host that transforms it into the virulent feline infectious peritonitis virus (FIPV), which can replicate in macrophages and cause systemic infection (Addie *et al.*, 2022). Granulomatous lesions and severe vasculitis are caused by the subsequent immune-mediated inflammatory response ultimately leads to multi-organ failure and death (Pedersen *et al.*, 2019).

The disease condition presents in two primary clinical types: effusive (wet) and non-effusive (dry), though intermediate or mixed forms are also frequently identified (Pedersen, 2014). The accumulation of sticky, straw-colored fluid in the thoracic or abdominal cavities, which causes pyrexia, abdominal distension, and respiratory discomfort is a characteristic of the effusive type. On the other hand, the non-effusive form usually causes symptoms like weight loss, anorexia, uveitis, ataxia, seizures, or paralysis and usually affects the eyes, central nervous system, liver, or kidneys (Combes *et al.*, 2023). Furthermore, ocular and neurological forms are typically regarded sub-categories of the non-effusive variety. Ocular signs include anterior uveitis and chorioretinitis, while neurological damage leads to tremors, ataxia, and partial paralysis (Pedersen *et al.*, 2014; Kipar and Meli, 2014).

According to the population density, geographic region, and diagnostic techniques employed, the prevalence of FIP varies greatly throughout the world, ranging from 0.3% to 12% (Hu *et al.*, 2024). Young age, intact male sex, and purebred status were identified as key risk variables in a thorough meta-analysis of 21 research carried out in mainland China between 2008 and 2023, which projected an overall prevalence of 2% (95% CI: 1–2%) (Hu *et al.*, 2024). Pedersen *et al.* (2014) published similar results, noting that cats under two years old and purebred or pedigree breeds including Persian, Siamese, and Birman cats demonstrated greater sensitivity. According to guidelines from the European Advisory Board on Cat Diseases (ABCD) and the American Association of Feline Practitioners (AAFP), the condition is most commonly detected during high cat density situations as well as inherited breeds (ABCD, 2025).

The epidemiology of FIP is not well documented in Bangladesh. According to a recent clinic-based cross-sectional inquiry conducted in Dhaka the general prevalence of FIP among pet cats was about 3%, with a greater frequency seen in young (less than a year) and non-neutered animals (Mamun *et al.*, 2024). The effusive (wet) form predominated among these instances, making up almost two-thirds of all infections. Rapid antigen or antibody test kits and blood biochemical markers like total protein or albumin–globulin (A/G) ratio are still the only diagnostic tools available, despite increased awareness among veterinarians and pet owners. Nevertheless, rather than being conclusive diagnostic instruments, these tests are frequently employed as supportive indicators. A relatively small A/G ratio (<0.8) may indicate inflammation, with ratios below 0.4 strongly indicating FIP (Felten and Hartmann, 2019). However, concurrent infections and differences in protein metabolism may distort these findings, necessitating more precise molecular or histopathological tests for confirmation. Most countries, including Bangladesh, do not currently have an officially authorised vaccine for FIP. FIPV cannot be prevented by commercial vaccines like Nobivac® Feline 3 that gives protections against calicivirus, herpesvirus, and feline panleukopenia. A nucleoside analogue antiviral drug GS-441524 have demonstrated exceptional therapeutic success under close supervision of a veterinarian care. This medication reported survival rates surpassing 80% (Addie *et al.*, 2022; Dickinson *et al.*, 2020). The need for early identification and prevention through management practices is highlighted by the fact that these

medications are costly long term therapeutic and hardly available. There is an urgent need to determine the frequency and distribution of FIP in Bangladesh's out of the dearth of thorough epidemiological data on the condition and diagnostic resources. In order to better understand the frequency and clinical trends of FIP among indigenous, Persian, and mixed-breed cats in Dhaka, Bangladesh, the current study was conducted. The study also attempted to evaluate the association between disease incidence, age, vaccination status, and breed. The results are anticipated to improve knowledge of FIP epidemiology and support the creation of diagnostic and preventive measures for feline populations in Bangladesh.

Materials and Methods

Study Area and Duration

In order to investigate the prevalence and clinical characteristics of Feline Infectious Peritonitis (FIP) among cats of different category reported to the local veterinary clinic (Dada Pet Life Care, Mirpur, Dhaka), a cross-sectional study was carried out from January to May. Three breed groups of cats were represented in the study: mixed, Persian, and local.

Animals and Sampling

Both sexes and cats of different ages were studied. Clinical cases were chosen for additional diagnostic testing if they showed indicators of FIP, such as lethargy, anorexia, fever, dyspnea, abdominal distension, neurological symptoms, or ocular abnormalities. There were both unvaccinated and vaccinated cats. Owner interviews and clinical data were used to confirm vaccination records.

Diagnostic Procedures

1. Rapid Test Kit Detection

A Rapid Test Kit (Testsealabs, China) (Figure 1) was used to identify the antigen of the feline infectious peritonitis virus. FIP antibodies from blood serum or abdominal fluid (ascitic fluid) can be qualitatively detected with this kit. As directed by the manufacturer, around 0.5 mL of the sample was added to the test cassette. A single control (C) line suggested a negative outcome, whereas the appearance of two bands (C and T) was viewed as positive.



Plate 1. Rapid Test Kit (Testsealabs, China)

2. Protein and A/G Ratio Assessment

Albumin and globulin levels were measured by further analysis of blood samples. An additional diagnostic method for FIP was the albumin/globulin (A/G) ratio. The following is how ratios were interpreted:

- <0.8 is abnormal and may indicate an infection.
- <0.6 strongly indicative of FIP
- <0.4: a clear sign of FIP



Plate 2. Protein and A/G Ratio Assessment

Due to its low specificity, the A/G ratio by itself was not regarded as a conclusive diagnostic criterion, despite the fact that high globulin levels are frequently linked to peritonitis.

Clinical Classification of FIP

Cases were divided into four main categories based on clinical and diagnostic findings:

- Wet (effusive): high temperature, vomiting, dyspnea, and buildup of abdominal or thoracic fluid.
- Dry (non-effusive): low oxygen saturation, lethargy, gradual weight loss, and persistent fever.
- Ocular: fever, hazy vision, and swollen or clouded eyes.
- Neurological: appetite loss, partial paralysis, and convulsions.

Treatment and Supportive Management

Antiviral therapy GS-441524 (China origin) was given subcutaneously once daily for 14-84 days at a dose of 0.3 mL per kg body weight to cats with FIP. Intravenous fluids (Hypertonic Saline or DNS at 10 mL/kg body weight) and oxygen supplements were part of supportive care. Every case's recovery period and clinical development were noted.

Data Collection and Analysis

Age, breed, sex, vaccine status, clinical signs, test results, and treatment outcomes were recorded. The percentage of positive cases among all tested cats was used to determine the prevalence of FIP. To evaluate distribution among various breeds, age groups, and vaccination categories, descriptive statistics were used.

Results

There were significant differences in the frequency of feline infectious peritonitis (FIP) between cat breeds (Fig. 1). Mixed-breed cats had the highest incidence (50.00%), followed by local cats (33.33%) and Persian cats (16.67%) (Fig. 1). According to statistical research, mixed-breed cats had a considerably greater prevalence of FIP than Persian cats ($p < 0.05$), although Local cats had an intermediate prevalence. Cats of different ages had considerably variable distributions of feline infectious peritonitis cases (Fig. 2). The age range of 60–120 days had the greatest number of 64 FIP-affected cats, followed by 59 affected cats at 120–180 days and initial 0–60 days about 56 cats were affected with FIP. Cats older than 180 days had the fewest 21 afflicted cats (Fig. 2). In every age range, female cats were more commonly affected than male cats, according to a sex-wise analysis. In the group aged 60–120 days, there were 38 females and 26 males affected, while the group aged 120–180 days included 35 females and 24 males. In both the younger (0–60 days) and older (over 180 days) animals, females exhibited higher infection rates (32 and 13, respectively) compared to males (24 and 8).

Three separate cat breeds-Local, Persian, and Mixed-were analyzed for the prevalence of FIP, as shown in Fig. 3. Among the 300 cats examined, 200 (66.67%) were found to have FIP. Following treatment, 94 (47.0%) of the infected cats recovered, while 106 (53.0%) unfortunately died. In terms of breed distribution, Local cats had the highest number tested ($n=100$), with 70 (70%) infected, 31 (44.3%) succumbing to the disease, and 39 (55.7%) recovering. Persian cats exhibited a slightly lower rate, with 50 tested, out of which 40 (80%) were infected; among these, 25 (62.5%) died and 15 (37.5%) recovered. Mixed breed cats represented the largest tested group ($n=150$), with 90 (60%) affected, 50 (55.6%) fatalities, and 40 (44.4%) recoveries noted. In comparison to and Mixed breeds, the Persian breed had a higher overall mortality rate, suggesting a potential breed sensitivity to FIP infection.

In a gender-based analysis of the affected population, it was found that a greater number of female cats ($n=76$) were infected compared to male cats ($n=30$). However, the group of recovered cats consisted of more males ($n=57$) than females ($n=37$). While further immunological studies are necessary to confirm this observation, it may suggest that male cats exhibit better recovery responses to FIP infection.

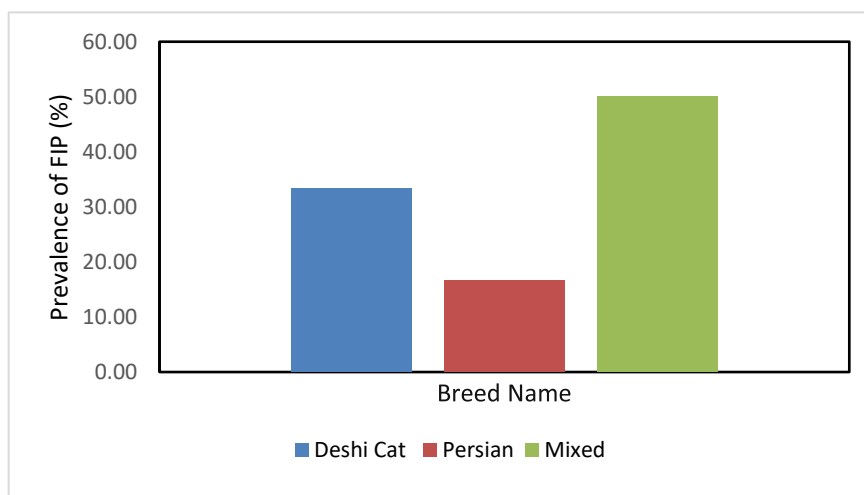


Figure 1. Prevalence of FIP among various cat breeds. *Significantly different from mixed breed cats

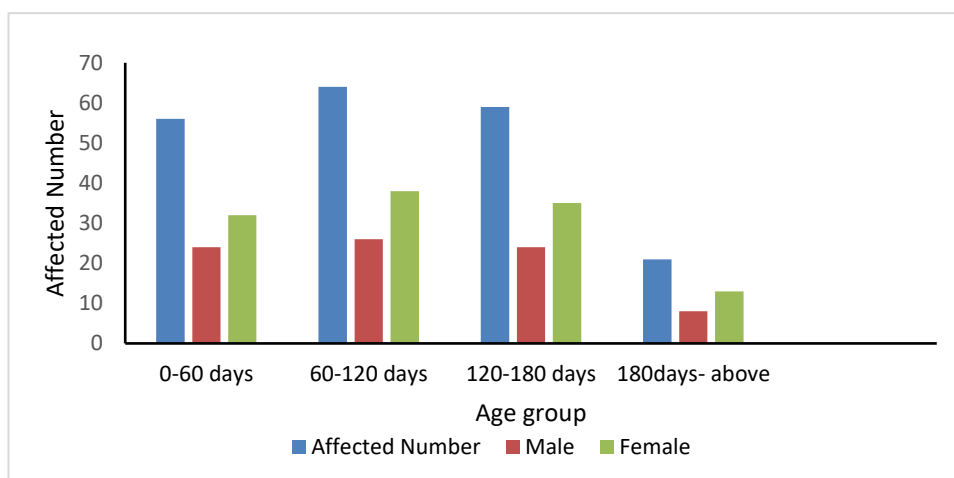


Figure 2. Age group wise FIP affected cat number

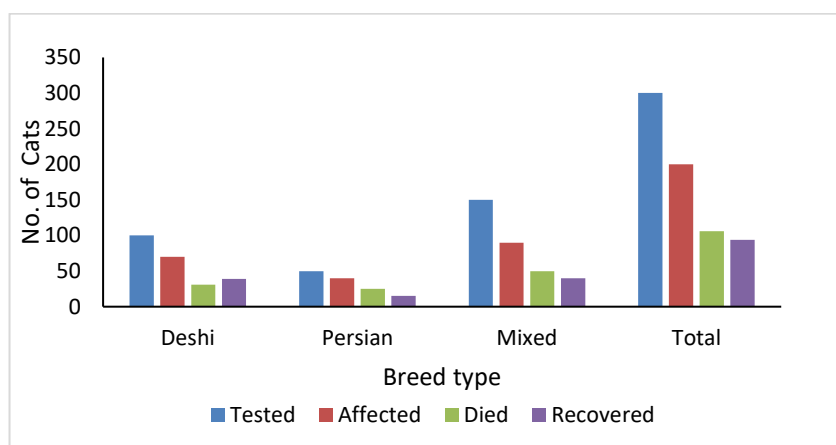


Figure 3. Breed type wise FIP affected, died and recovered cat number.

Table 1 illustrates the distribution of different clinical signs of Feline Infectious Peritonitis (FIP) observed in the affected cats. The dry form was the most prevalent, impacting 96 cats (48%) out of 200 infected with FIP, followed by the wet form, which impacted 80 cats (40%). The ocular type was the least common, affecting only 6 cats (3%), while 18 cats (9%) exhibited the neurologic form. The findings suggest that the main types of FIP infections present in the studied community are both dry and wet. A total of 106 cats (53%) died from FIP infection, according to mortality study. The wet form had the highest death rate (54 deaths; 67.5%), followed by the dry type (46 deaths; 47.9%), with 5 and 1 deaths respectively, the neurologic and ocular types had somewhat lower mortality rates. Notably, across all symptom types, female cats ($n=76$) had a greater mortality count than male cats ($n=30$), suggesting potential sex-linked variations in immune response or disease resistance.

Table 1. Different form of FIP Symptoms observed

Type	Affected	Died	Male Died	Female Died
Dry Form	96	46	16	30
Wet Form	80	54	13	41
Ocular Form	6	1	0	1
Neurologic Form	18	5	1	4
Total	200	106	30	76

Cats with Feline Infectious Peritonitis (FIP) had their blood protein content assessed by breed and sex (Figs. 5 and 6). Based on the albumin to globulin (A/G) ratio, the protein ratio was divided into three groups according to the degree of severity of FIP infection: moderate indication (<0.8), high indication (<0.6), and severe indication (<0.4). Out of the 200 cats that tested positive for FIP, 40 had mild signs of infection, 78 had high signs, and 82 had strong signs. With 30, 51, and 58 cases under moderate, high, and strong indications, respectively, female cats showed greater proportions across all severity levels than male cats, with 10, 27, and 24 cases (Table 2). Based on blood protein profiles, these finding imply that female cats showed a more robust positive indication for FIP infection.

Table. 2 Sex wise blood protein test of FIP infected Cats

Type	Total	Male	Female
Mild Indication <0.8	40	10	30
High Indication <0.6	78	27	51
Strong Indication <0.4	82	24	58

Based on a study of different breeds, local cats showed the highest number of cases with a strong protein indication <0.4 , totaling 28, followed by 13 Persian cats and 21 mixed breeds. Persian cats represented 15 cases, while local breeds and mixed breeds each had major occurrences for high indication levels <0.6 , with 25 local and 40 mixed breeds. Similarly, a minor protein indication <0.8 was observed most frequently in 29 mixed breeds, followed by 12 Persian cats and 17 local cats (Table 3).

Table 3. Breed type wise blood protein test of FIP infected Cats

Type	Local	Persian	Mixed
Mild Indication <0.8	17	12	29
High Indication <0.6	25	15	40
Strong Indication <0.4	28	13	21

Discussion

The results show a distinct variance in feline infectious peritonitis (FIP) incidence among cat breeds, indicating possible environmental and genetic implications on disease susceptibility. Given that mixed-breed cats frequently have more outside access and less regulated breeding conditions, their higher occurrence may be due to increased exposure to the environment to the feline coronavirus (FCoV), the causal agent of FIP. Conversely, the typically domestic lifestyle and well-controlled breeding conditions of Persian cats could

account for their reduced prevalence, leading to decreased exposure to viruses. The moderate level of sensitivity shown by the intermediate incidence in Local cats may be the result of diverse management techniques and partial exposure to FCoV. These results are consistent with earlier studies showing that infection burden, overcrowding, and environmental stresses have a major role in FIP outbreaks (Addie *et al.*, 2020; Pedersen, 2014). Overall, the current study highlights the significance of management-related and breed-associated factors in the frequency of FIP. Reducing the prevalence of FIP may be greatly aided by putting in place efficient biosecurity measures and raising awareness among cat owners, particularly those who are in charge of mixed or community cats. According to the current research, kittens between the ages of 60 and 180 days exhibit the highest risk of infection, suggesting that age has an impact on susceptibility to feline infectious peritonitis (FIP). Immature immune systems and greater exposure to the feline coronavirus (FCoV) during weaning or early socialization phases may be linked to this age-dependent pattern. Young kittens are more susceptible to stress and changes in their environment, which can trigger viral replication and increase the likelihood of developing FIP. Cats over 180 days old tend to have greater immunity or resistance to FCoV infection, evidenced by the lower occurrence of FIP in these older animals. Prior research has shown similar patterns, with FIP primarily affecting kittens and young cats under a year of age (Pedersen, 2014; Addie *et al.*, 2020). Although the underlying processes are yet unknown, the increased occurrence in females relative to males across all age groups may be due to behavioral or hormonal differences. These discrepancies may be clarified by more research on immune responses and sex-linked susceptibility. These findings emphasize the necessity of preventive measures aimed at younger populations, such as reducing environmental stress, upholding hygiene, and introducing early screening for FCoV infection in catteries or shelters. Genetic predisposition and limited genetic variation among pure breeds may be responsible for Persian cats' somewhat greater infection rate, which can lower general immunity (Pedersen, 2009). Despite being exposed to a wide range of environmental conditions, mixed breed cats seemed to have relatively low rates of infection and mortality, which may be explained by their hybrid vigor or improved adaption. The results are in line with earlier studies that found immune response variation and breed variations in populations affected by FIP (Riemer *et al.*, 2016; Pedersen, 2014). The results show that breed and sex have a major impact on cats' susceptibility to and prognosis from FIP. Particularly for purebred populations like Persian cats, preventive measures emphasizing better hygiene, immunization, and early diagnosis are crucial. According to previous research (Pedersen, 2014; Tekes and Thiel, 2016), the two main clinical manifestations of FIP are the dry and wet variants. While the dry type (non-effusive FIP) typically exhibits granulomatous lesions in multiple organs and frequently has a longer illness course, the wet form (effusive FIP) is characterized by fluid accumulation in body cavities, leading to more severe and fast progression (Addie *et al.*, 2009). Previous findings that the wet form is more deadly and clinically acute are supported by the greater fatality rate linked to it in our investigation (Pedersen, 2009; Felten and Hartmann, 2019). Although less frequent, the neurologic form seen in a lesser percentage of cats suggests that the infection may have progressed to the central nervous system, which is linked to a negative outcome (Tasker, 2018). Ocular involvement may emerge in advanced or chronic instances, according to the rare incidence of the ocular form. These findings demonstrate that the most common clinical forms of FIP in the cats under study are the wet and dry variants, with greater fatality rates in females. In order to improve survival outcomes for cats infected with FIP, the observed trends highlight the significance of early identification and symptom-based treatment techniques. A crucial biochemical sign for the diagnosis of FIP is the reduced A/G ratio (<0.6) (Pedersen, 2009; Hartmann, 2005). As previously noted by Felten and Hartmann (2019), the preponderance of strong and high indication levels among females may suggest either stronger immune complex development or higher disease progression. Because females frequently show different antibody responses to viral infections than males, differences between the sexes may be explained by hormonal effects on immune function (Addie *et al.*, 2009).

These results suggest that local and mixed breeds were more likely to show changed blood protein ratios, possibly as a result of increased exposure to environmental stresses and diseases. Persian cats, on the other hand, had a larger percentage of strong and high indications but fewer mild indication instances, indicating a more severe and acute form of FIP once infected. This is consistent with earlier findings that purebred cats are more vulnerable to FIP (Pedersen, 2014; Tekes and Thiel, 2016). The observed pattern is consistent with the established pathophysiology of FIP, in which chronic immunological stimulation and viral replication cause hyperglobulinemia and hypoalbuminemia to result in a lower A/G ratio (Paltrinieri et al., 2007; Riemer et al., 2016). One of the most helpful supporting diagnostic markers for distinguishing FIP from other feline illnesses is still this biochemical profile. The severity of FIP as indicated by blood protein levels in this investigation seems to be influenced by both sex and breed. The A/G ratio showed more marked declines in female cats and purebred (Persian) populations, which may indicate a genetic or immunological predisposition to severe FIP progression.

Conclusion

Important epidemiological and clinical information about Feline Infectious Peritonitis (FIP) in domestic cats in Bangladesh is provided by this study. Mixed-breed and Local cats were more susceptible than Persian cats, and the overall prevalence of FIP was noticeably high. Young cats, especially those between the ages of 60 and 120 days, were the most impacted. Additionally, male cats had comparatively better recovery outcomes whereas female cats had a greater infection and mortality rate. Clinically, the infected cats had both the wet and dry forms of FIP, with the wet form showing the highest fatality rate. Although less frequent, neurologic and ocular manifestations nevertheless contributed to deaths from the illness. These findings were corroborated by blood protein profile using the albumin-to-globulin ratio, which showed that infection severity was more strongly indicated in female and Local cats. The findings indicated that there is a significant occurrence of FIP among domestic cats in Bangladesh, underscoring the need for improved diagnostic monitoring, prompt clinical recognition, and targeted management strategies. Additional studies on breed-specific susceptibility, immune response analysis, and molecular characterization could enhance our understanding of the pathophysiology and treatment of FIP.

Competing Interest

The authors declare that they have no competing interest.

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