

CAT VACCINATION IN BANGLADESH: DIFFERENT ASPECTS AND OWNERS' ATTITUDES TO VACCINATION.



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Abstract

This cats vaccination related study was conducted directly at the Teaching and Training Pet Hospital and Research Center (TTPHRC) of CVASU, S. A. Quadery Teaching Veterinary Hospital (SAQTVH) of CVASU and Upazilla Veterinary Hospital (UVH), Patiya. Data was also collected through online forms. Because one of the most important measures in preventing and controlling cats' infectious diseases is vaccination. So, it is important to evaluate owners' attitudes on cats' vaccinations. The goal of the current study was to identify parameters that were related to the vaccination status of cats in Bangladesh and to determine respondents' attitudes toward vaccination guidelines. Among 1025 responses, a total of 843 questionnaires were statistically analyzed. In spite of the fact that 89% of the owners were aware that their cats were susceptible to infectious diseases, our survey revealed that only 54% of cats were found vaccinated. Therefore, it is clear that owners did not give their cats adequate attention. So, our cats were not protected against different infectious diseases. Along with other factors, the vaccination rate was also affected by issues such as high costs, long travel times, difficult transportation, inappropriate clinic hours, and lengthy waiting times etc. In order to increase cats' protection against infectious diseases, owner's awareness should be increased. As well as availability of the vaccine should be increased so that others negative factors such as high cost will be reduced. So, these kinds of necessary steps should be taken to ensure adequate vaccination to our cats.

Keywords: Cat, Vaccination, Infectious diseases, Cat owners', Attitudes

Chapter 1: Introduction

One of the most fundamental methods for preventing and controlling infectious diseases in both humans and animals is vaccination. (Gaskell, et al., 2002; Habacher, et al., 2010). In order to prevent an epidemic, it has been found that >70% of cats in a population must be immunized against a certain infectious disease. (Stuetzer & Hartmann, 2014; Day, et al., 2016).

According to the global vaccination recommendations drawn up and shared via a variety of pet veterinary affiliation (e.g., World Small Animal Veterinary Association, – WSAVA, American Association of Feline Practitioners – AAFP, Advisory Board on Cat Diseases - ABCD), all cats, regardless of situations or geographical location, ought to be immunized in opposition to feline parvovirus (FPV), feline calicivirus (FCV) and feline herpesvirus-1 (FHV-1) (Day, et al., 2016; American Association of Feline Practitioners (AAFP), 2013; American Association of Feline Practitioners (AAFP), 2020; European Advisory Board on Cat Disease (ABCD), 2020). These vaccines have been described “core vaccines”. In areas of the world where rabies virus infection is endemic, vaccination in opposition to this pathogen need to additionally be considered core. The vaccine in opposition to feline infectious peritonitis (FIP) is described as not suggested (Day, et al., 2016; American Association of Feline Practitioners (AAFP), 2013; American Association of Feline Practitioners (AAFP), 2020; European Advisory Board on Cat Disease (ABCD), 2020).

Worldwide rules of the vaccination of felines and vaccination specialists (WSAVA, AAFP, ABCD) suggest that, whenever the situation allows, all felines get the advantage of vaccination. This not just safeguards the single subject, yet additionally gives an essential 'herd immunity' that limits the probability of infectious disease outbreaks (Day, et al., 2016; American Association of Feline Practitioners (AAFP), 2013; European

Advisory Board on Cat Disease (ABCD), 2020). The most recent recommendations advise revaccinating for core vaccinations every three years, particularly in low-risk environments like cats that are always kept indoor (Hosie, et al., 2015; Day, et al., 2016; Scherk, et al., 2013). For several non-core vaccines, such as *Chlamydia felis* and *Bordetella bronchiseptica*, as well as for some core vaccines in high-risk conditions, annual revaccination is advised (Gehrig, et al., 2019).

People are hesitant to vaccinate themselves or their children due to vaccine-associated adverse effects (VAAEs), which are a growing problem in human medicine (Guerra, et al., 2017). World Health Organization (WHO) has named vaccine hesitancy as one of the top 10 global health threats. Similarly, many animal owners are reluctant about vaccinating their pets, they doubt the necessity of vaccinations (Kitala, et al., 2002) and are worried about VAAEs (Day, 2006; Gehrig, et al., 2019).

Research in the UK, which assessed the mentality of respondents towards vaccination, discovered that cats that visited catteries or attended cat shows were almost 12 times greater possibly to have a contemporary vaccination status than other cats, and vaccination of kittens had a tremendous effect on the future vaccination status of adult cats (Habacher, et al., 2010).

It is necessary to assess up to date owners' mind-set about vaccination of cats. Cat owners' vaccination compliance has been until now evaluated in three studies, one from the United Kingdom (UK) (Habacher, et al., 2010), one from Germany (Gehrig, et al., 2019), and other from Italy (Filipe, et al., 2021). Therefore, the purpose of the current study was to decide the mind-set of respondents with vaccination guidelines and to pick out factors associated to the vaccination status of cats in Bangladesh.

Chapter 2: Materials and Methods

2.1. Study period

Data was collected from Teaching and Training Pet Hospital and Research Center (TTPHRC), Dhaka under Chattogram Veterinary and Animal Sciences University (CVASU) from 17th February to 16 March directly from owners. Then some data also collected from S. A. Quadery Teaching Veterinary Hospital (SAQTVH) of CVASU and Upazilla Veterinary Hospital (UVH), Patiya from 21 March to 28 April. Besides the survey was available online from 28th February to 1st June 2022 and each took about 10 min to be completed.

2.2. Study area

Face to face 371 data was recorded from TTPHRC, SAQTVH, and UVH- Patiya. A whole of 654 owners answered to the online questionnaire. Data sets of owners with cats below 8 weeks of age ($n = 2$) and respondents under 16 years of age ($n = 2$) were excluded. Veterinarians were also not allowed to participate in the study to keep away from bias.

2.3. Study design

A questionnaire comparable to the one designed in the Italy was prepared (Filipe, et al., 2021). It was sent to Cat owners to determine their mentalities towards suggested feline vaccinations.

The questionnaire consisted of 4 parts: (1) general information about owners, (2) information about cats including history of vaccinations (3) important factors to take the decision on cat vaccination, (4) owner-veterinarian relationship and veterinary recommendations. Some questions included an open-text option where owners could input their response if necessary. These included living area, owner age, occupation, number of children in the household, age of first vaccination, factors influencing vaccination choice, reason not to go to veterinarian and owners' job if not present among

the proposed answers. Owners with multiple cats were advised to provide data relating to the cat whose name was first when listed in alphabetical order and age more than 8 weeks.

2.4. Data collection

The questionnaire was firstly piloted on 10 volunteers. All questions have been subtle as required to enhance the readability and relevance of the questions. Finally, questionnaire was once organized through the online program Google Forms and the link was once mostly publicized using social networks (e.g., WhatsApp, Facebook, Messenger, Cat forums), however additionally sent by using electronic mail to acquaintances and promoted via leaflets. Concerning social networks, the questionnaire was publicized particularly on cat concerning pages. Additionally face to face data was collected from UVH - Patiya, TTPHRC & SAQTVH (CVASU).

In this survey owners were asked if their cat had been vaccinated or not. Cats that had never been vaccinated were classified as “unvaccinated”. Owners were also asked the age first vaccination, vaccination interval, veterinarian recommendation etc. Owners also asked if they were vaccinated there pet only rabies or others core vaccination also. As worldwide, are the core vaccinations (against FPV, FHV-1 and FCV).

Owners who did not indicate their age, owners less than 17 years of age, cats less than 8 weeks of age, veterinarians and owners living outside Bangladesh were excluded from further evaluation.

A total of 975 questionnaires were evaluated descriptively. Not all participants answered all questions, but all questions that were answered were included in the study. A total of 843 questionnaires were statistically analyzed.

2.5. Statistical analysis

All complied data were imported in Microsoft Excel- 2019 and transferred to STATA 3.5.1 version for statistical analysis to demonstrate frequency and percentages of different variables related to cats' owners' information, cats' information, owners' attitudes towards vaccination and owner-veterinarian relationship and veterinarian recommendations towards vaccination with the cats' vaccination status.

Chapter 3: Results

3.1. Information about cats' owners

In this study, here around 56% (n=470/843) owners were middle age (20-29 years), 40% (n=334/843) owners were young (17-20 years), and only 4% (n=39/843) owners were adult (>30 years). 70% (n=592/843) of the owners were female, rest 30% (n=251/843) were male. In terms of highest educational degree, 42% (n=355//843) owners had bachelor's degree, 31% (n=258/843) had HSC degree, 18% (n = 146/843) had SSC degree and only 10% (n=84/843) had Ms. degree . In case of occupation, 71% (n=602/843) of cats' owners were students, 15% (n=126/843) were job holders, 7% (n=62/843) were housewives, 4% (n=35/843) were businessmen, 2% (n=14/843) were unemployed and about 1% (n=3/843) were from other different occupations.

General information about owners is summarized in Table 1.

Table 1. Frequency and percentages of different variables related to cats' owners information with vaccination status.

Variable	Co-variable	Total (%)	No. (%) Vaccinated at (≤ 3 months)	No. (%) Vaccinated at (> 3 months to ≤ 6 months)	No. (%) Vaccinated at (> 6 months)	No. (%) unvaccinated	P-value
Age of respondent	Young	334(40)	33(10)	88(26)	53(16)	160(48)	0.00
	Middle age	470(56)	126(26)	82(17)	57(12)	205(44)	
	Adult	39(4)	20(51)	4(10)	5(13)	10(25)	
	Total	843	179	174	115	375	
Gender	Female	592(70)	143(24)	123(21)	105(18)	221(37)	0.00
	Male	251(30)	36(14)	51(20)	10(4)	154(61)	
	Total	843	179	174	115	375	
Level of Education	Secondary school certificate	146(18)	20(14)	47(32)	6(4)	73(50)	0.00
	Higher secondary school certificate	258(31)	49(19)	66(26)	19(7)	124(48)	
	Bachelor's degree	355(42)	77(22)	60(17)	70(20)	148(42)	
	Master degree	84(10)	33(39)	1(1)	20(24)	30(36)	
	Total	843	179	174	115	375	
Occupation	Artist	2(1)	0(0)	0(0)	1(50)	1(50)	0.00
	Defense	1(1)	0(0)	0(0)	1(100)	0(0)	
	Business	35(4)	3(9)	3(9)	2(6)	27(77)	
	Job	126(15)	63(50)	19(15)	16(13)	28(22)	
	Housewife	62(7)	33(53)	3(5)	5(8)	21(34)	
	Students	602(71)	80(13)	148(25)	89(15)	285(47)	
	Unemployed	14(2)	0(0)	0(0)	1(7)	13(93)	
	Others	1(1)	0(0)	1(100)	0(0)	0(0)	
Total	843	179	174	115	375		

3.2. Information about cats

In our study, 36% (n=300/843) cats were kitten (6 weeks to 6 months), 38% (n=321/843) cats were young (over 6 months to 1 year) and 26% (n=222/843) cats were adult (over 1 to 4 years). 75% (n=633/843) of cat owners had multiple cats but less than five, 22% (n=184/843) owners had between 5 to 10 cats, and only 3% (n=26/843) had more than 10 cats. 44% (n=368/843) cats were adopted (not from relatives or friends but free of cost), 22% (n=182/843) were collected from animal shelter or charity, 13% (n=111/843) were collected from relatives or friends, 11% (n=95/843) were bought from breeder / shop directly and 10% (n=87/843) were bought from internet. In terms of breed, 64% (n=540/843) of the cat's breed were Deshi (Local) breed. Among other breeds Persian breed were maximum around 20% (n=172/843), 15% (n=129/843) cats were cross breed and less than 1% (n=2/843) were others pure breed cats. In terms of vaccination, all core vaccine along with rabies vaccinated were 36% (n=301/843), without rabies were 5% (n=45/843) and only rabies was 14% (n=122/843). The majority of cats lived indoor which was around 71% (n=602/843) and other 28% (n=240/843).had mixed indoor and outdoor access.

The information about Cats including history of vaccinations is summarized in Table 2.

Table 2. Frequency and percentages of different variables related to cats' information with vaccination status.

Variable	Co-variable	Total (%)	No. (%) Vaccinated at (≤ 3 months)	No. (%) Vaccinated at (> 3 months to ≤ 6 months)	No. (%) Vaccinated at (> 6 months)	No. (%) unvaccinated	P-value
Age of this cat	Kitten	300(36)	61(20)	4(1)	1(1)	234(78)	0.00
	Young	321(38)	64(20)	93(29)	47(15)	117(36)	
	Adult	222(26)	54(24)	77(35)	67(30)	24(11)	
	Total	843	179	174	115	375	
Number of total cats in the house	≤ 5	633(75)	117(18)	86(14)	78(12)	352(56)	0.00
	> 5 to ≤ 10	184(22)	55(30)	79(43)	28(15)	22(12)	
	> 10	26(3)	7(27)	9(35)	9(35)	1(4)	
	Total	843	179	174	115	375	
Origin of this cat	Adoption	368(44)	79(21)	96(26)	53(14)	140(38)	0.00
	Animal shelter/ Charity/ Stray	182(22)	16(9)	29(16)	20(11)	117(64)	
	Breeder/ Shop	95(11)	23(24)	42(44)	21(22)	9(9)	
	Internet	87(10)	28(32)	0(0)	15(17)	44(51)	
	Relatives/ Friends	111(13)	33(30)	7(6)	6(5)	65(59)	
	Total	843	179	174	115	375	
Breed of this cat	Deshi Cat	540(64)	140(26)	84(16)	60(11)	256(47)	0.00
	Persian	172(20)	37(22)	41(24)	40(23)	54(31)	
	Egyptian	1(1)	0(0)	0(0)	1(100)	0(0)	
	Bengal	1(1)	0(0)	0(0)	0(0)	1(100)	
	Cross	129(15)	2(2)	49(38)	14(11)	64(50)	
	Total	843	179	174	115	375	
Name of the vaccine	Rabies	122(14)	31(25)	17(14)	74(61)	0(0)	0.00
	Combined PCH	45(5)	30(67)	15(33)	0(0)	0(0)	
	Both	301(36)	118(39)	142(47)	41(14)	0(0)	
	N/A	375(44)	0(0)	0(0)	0(0)	375(100)	
	Total	843	179	174	115	375	
Indoor/Outdoor access	Indoor only	602(71)	121(20)	129(21)	95(16)	257(43)	0.072
	Indoor and outdoor	240(28)	58(24)	45(19)	20(8)	117(49)	
	Outdoor only	1(1)	0(0)	0(0)	0(0)	1(100)	
	Total	843	179	174	115	375	

3.3. Owners' attitudes towards vaccination

It was found that 76% (n=644/843) owners said cost was an important factor for vaccination. Also 92% (n=777/843) of owners said veterinarian advice were also important for proper vaccination. Infectious disease level of danger was known by 91% (n=771/843) owners and 89% (n=754/843) owners thought their cats were susceptible to infectious disease. Among them 22% (n=163/843) were vaccinated their cats within 3 months, 21% (n=156/843) were vaccinated between 3 to 6 months, and 15% (n=112/843) were vaccinated their cats after 6 months of age. Whereas 43% (n=323/843) of them did not vaccinate their cats even if they knew that their cats were susceptible to infectious diseases. This result showed significant value (0.006). 93% (n=786/843) of cats' owner reported that cats age was important for proper vaccination. 89% (n=749/843) owners said effectiveness of vaccination and time necessary to vaccinate the cats were also important factor for vaccinate the cats. Relation with current cats' disease/therapy with vaccination was known by 73% (n=617/843) of cats' owners.

The important factors related to owners' decision of vaccinate their cats are summarized in Table 3.

Table 3. Frequency and percentages of different variables related to owners' attitudes towards vaccination with the cat's vaccination status.

Variable	Co-variable	Total (%)	No. (%) Vaccinated at (≤ 3 months)	No. (%) Vaccinated at (> 3 months to ≤ 6 months)	No. (%) Vaccinated at (> 6 months)	No. (%) unvaccinated	P-value
Cost	Important	644(76)	158(25)	140(22)	42(7)	304(47)	0.00
	Unimportant	199(24)	21(11)	34(17)	73(37)	71(36)	
	Total	843	179	174	115	375	
Veterinarian's advice	Important	777(92)	162(21)	155(20)	105(14)	355(46)	0.096
	Unimportant	66(8)	17(26)	19(29)	10(15)	20(30)	
	Total	843	179	174	115	375	
Cat's susceptibility to infectious diseases	Susceptible	754(89)	163(22)	156(21)	112(15)	323(43)	0.006
	Unsusceptible	89(11)	16(18)	18(20)	3(3)	52(58)	
	Total	843	179	174	115	375	
Infectious diseases' level of danger	Known	771(91)	149(19)	171(22)	113(15)	338(44)	0.00
	Unknown	72(9)	30(42)	3(4)	2(3)	37(51)	
	Total	843	179	174	115	375	
Effectiveness of vaccination	Important	749(89)	176(24)	154(21)	95(13)	324(43)	0.00
	Unimportant	94(11)	3(3)	20(21)	20(21)	51(54)	
	Total	843	179	174	115	375	
Time necessary to vaccinate the cat	Known	749(89)	163(22)	170(23)	92(12)	324(43)	0.00
	Unknown	94(11)	16(17)	4(4)	23(24)	51(54)	
	Total	843	179	174	115	375	
Cat's age	Important	786(93)	150(19)	174(22)	109(14)	353(45)	0.00
	Unimportant	57(7)	29(51)	0(0)	6(11)	22(39)	
	Total	843	179	174	115	375	
Current cat's disease/therapy	Known	617(73)	106(17)	142(23)	78(13)	291(47)	0.00
	Unknown	226(27)	73(32)	32(14)	37(16)	84(37)	
	Total	843	179	174	115	375	

3.4. Owner-veterinarian relationship and veterinarian recommendations

70% (n=586/843) of cats' owners were reported that the revaccination time was every year, only 7% (n=56/843) owners said it was every two / three years and 24% (n=201/843) owners had no idea about revaccination time. Only 24% (n=206/843) owners got vaccination information from veterinarian, more than half of them which was about 59% (n=500/843) got the vaccination information from internet, 8% (n=66/843) were got vaccination information from pet shop, 6% owners got this information from friends or relatives, 2% (n=16/843) were suggested by relatives or friends and very few are gained this knowledge from books which is less than 1% (n=1/843). 41% (n=349/843) respondents took often their cat to a veterinarian regularly but 32% (n=273/843) usually did not go to veterinarian due to cost. 15% (n=130/843) owner said they did not go to veterinarian their cats had never serious health problem, 7% (n=60/843) said they did not visit veterinarian due to unsuitable clinic opening hours and lengthy waiting time, 4% (n=30/843) said that the didn't go to clinic due to distance to clinic from them and because not ease of transport system, less than 1% (n=1/843) said they did not take their cats just because cat's stress.

Owners - veterinarians' relationship and veterinarian recommendations to vaccination are presented in Table 4.

Table 4. Frequency and percentages of different variables related to owner-veterinarian relationship and veterinarian recommendations towards vaccination with the cat's vaccination status.

Variable	Co-variable	Total (%)	No. (%) Vaccinated at (≤ 3 months)	No. (%) Vaccinated at (> 3 months to ≤ 6 months)	No. (%) Vaccinated at (> 6 months)	No. (%) unvaccinated	P-value
Revaccination recommendation by the veterinarian	Every year	586(70)	101(17)	125(21)	110(19)	250(43)	0.00
	Every two/three year	56(7)	31(55)	4(7)	2(4)	19(34)	
	Unknown	201(24)	47(23)	45(22)	3(1)	106(53)	
	Total	843	179	174	115	375	
Main factors for not making an appointment with the veterinarian	Cost	273(32)	32(12)	49(18)	21(8)	171(63)	0.00
	Distance to clinic & transport	30(4)	1(3)	2(7)	2(7)	25(83)	
	Clinic opening hours & waiting time	60(7)	30(50)	0(0)	30(50)	0(0)	
	Finding and catching the cat (Cat's stress)	1(1)	0(0)	0(0)	0(0)	1(100)	
	None (I go to veterinarian)	349(41)	100(29)	94(27)	47(13)	108(31)	
	The cat has never had health problem	130(15)	16(12)	29(22)	15(12)	70(54)	
	Total	843	179	174	115	375	
Source of information about vaccination	Books	1(1)	0(0)	1(100)	0(0)	0(0)	0.00
	Breeder	16(2)	1(6)	0(0)	2(13)	13(81)	
	Internet	500(59)	95(19)	83(17)	57(11)	265(53)	
	Pet shop	66(8)	1(2)	36(55)	17(26)	12(19)	
	Relatives/friends	54(6)	2(4)	18(33)	4(7)	30(56)	
	Veterinarian	206(24)	80(39)	36(17)	35(17)	55(27)	
	Total	843	179	174	115	375	

Chapter 4: Discussion

The most vital element in the prevention of infectious diseases is vaccination, which has become a big component of pet healthcare. All cats, regardless of circumstances or location, should be vaccinated against feline parvovirus (FPV), feline calicivirus (FCV), and feline herpesvirus-1 (FHV-1) according to the international vaccination guidelines developed and shared by various pet veterinary associations (e.g., World Small Animal Veterinary Association, WSAVA, American Association of Feline Practitioners - AAFP, and Advisory Board on Cat Diseases - ABCD) (Day, et al., 2016; American Association of Feline Practitioners (AAFP), 2013; American Association of Feline Practitioners (AAFP), 2020; European Advisory Board on Cat Disease (ABCD), 2020). These vaccinations have been classified as "core vaccines." The immunization against the rabies virus should also be regarded as essential in regions of the world where rabies virus infection is widespread.

First off, like other studies of a similar nature (Gehrig, et al., 2019; Habacher, et al., 2010), we used a web-based questionnaire for our research. A web-based strategy was adopted for this study for two primary reasons: it made it possible to collect data on unvaccinated cats and cats that weren't registered with a veterinary clinic. Additionally, the web-based strategy is a very quick and cost-effective method for gathering data from all over the Bangladesh, allowing us to get a sizable sample size. In order to prevent bias from assumptions on opinions toward vaccination, the questionnaire was referred to as the "Cat Information Questionnaire." For the same reason, it was decided not to post the questionnaire on websites devoted to cat vaccination or health issues in order to reduce the possibility of selection bias.

It has been determined that in order to prevent an epidemic of a certain infectious disease, >70% of the cats in a population must be protected (Day, et al., 2016; Stuetzer & Hartmann, 2014). In this study it is found that only 54% cats are vaccinated, among them all core vaccine along with rabies vaccine were 36%, without rabies was 5% and only

rabies was 14%. Study in the Germany found that recently vaccinated (within 3 years) was 77.9% (Gehrig, et al., 2019), in the Italy it was 80% (Filipe, et al., 2021). So, vaccination rate in Bangladesh is very low compare than other countries where previously similar studies are done. So, it is clear that our cat population are not protected from different infectious diseases. One reason might be due to economic loss linked to the COVID -19 pandemic that may also reduce the likelihood of cats' vaccination. Another reason might be most of cats' owner are young (40%) and middle age (56%); most of them are students (71%), majority of them have no good source of income. It was found that the vaccination status of cats was influenced by the income of the owners, and 32% owners considered vaccination costs was as a reason for non-vaccination/ not taking appointment with veterinarian. It is crystal clear that to increase protection against infection disease, vaccination rate should be increased. Awareness program should be done regularly and price of vaccine should be reduced by increasing availability.

Core vaccines, which include the FPV, FCV, and FHV-1 vaccines, should be administered as frequently as every three years, according to current recommendations for vaccination (Hosie, et al., 2015; Day, et al., 2016; Scherk, et al., 2013). Following basic immunization, it is advised to revaccinate for FPV every three years and for FHV-1 and FCV every year to every three years, depending on the recommendations and the individual cat's circumstances (Hosie, et al., 2015; Day, et al., 2016; Scherk, et al., 2013). In this study it was found that revaccination time known by 70% owners for all kind of vaccine was every year. The reason might be more than half of them got source of vaccination information from internet/social media which was about 59%. So, proper information should be provided to cat owners & should be discouraged them not to take all information as correct from social media.

The first vaccine series for kittens should begin at 6–8 weeks of age, followed by booster shots every 3–4 weeks until the age of 16 weeks, and a booster shot 11–13 months later as a foundation for a strong immunity (Hosie, et al., 2015; Day, et al., 2016; Scherk, et al., 2013). Owners need to be made aware of this. The frequency of "recent vaccination" records was higher in cats without treatment for health issues. This is consistent with

vaccination guidelines, which state that only healthy cats should receive vaccinations in order to maximize their safety and effectiveness (Day, et al., 2016; Truyen, et al., 2009).

Cats older than 10 years old had a lower prevalence of "recent vaccination status" than cats younger than that age. Due to a longer history of vaccinations, older cat owners can believe that their pets have a higher likelihood of being immune to infectious diseases. All cats, regardless of age, should receive regular boosters (Hosie, et al., 2015; Day, et al., 2016; Scherk, et al., 2013). There are currently no vaccination guidelines specific to older cats, and no research has been done to suggest that they need any fewer or additional shots than younger cats (Hosie, et al., 2015; Day, et al., 2016). According to one study, many cats and dogs who had their first rabies vaccination at an advanced age could not generate a sufficient immune response to the virus (Mansfield, et al., 2004). In contrast, antibodies against FPV, FHV-1, and FCV persisted for considerably longer than 3 years following vaccination in another study, suggesting that the majority of elderly cats are probably protected (Scott & Geissinger, 1999). Additional research is required to assess the immunological response in elderly pets in order to decide whether particular vaccination recommendations should be made.

The majority of the questionnaire respondents were female which was around 70%. Similarly study in the UK, female respondents were 86% (Habacher, et al., 2010), in the Italy it was 92% (Filipe, et al., 2021). Unknown factors may have contributed to the fact that there were more female respondents to the survey than male respondents, but it might be because there are more female cat owners than male cat owners. Additionally, women are said to have greater empathy for animals, show greater interest in health-related issues, and be more responsible than men for their pets' healthcare, which may have contributed to an increase in the number of vaccinations of their cats compared to the number of vaccinations of male owners' cats.

71% cats were indoor cats, 28% cats had indoor and outdoor access. Similarly study in the Italy it was found 63% cats were lived indoor only, in the Germany the indoor cats

were 67.2% but in the UK 21% were indoor cats and 79% had both indoor and outdoor access. Due to high percentage of solely indoor cats, Bangladeshi owner thought vaccination was less important as their indoor only pets didn't go to other pets' contact, which might be another reason of lower percentage of vaccination in this study. Global recommendations, however, advise booster vaccinations every 3 years also for indoor-only cats (Day, et al., 2016; American Association of Feline Practitioners (AAFP), 2013; European Advisory Board on Cat Disease (ABCD), 2020; Dall'ara, 2020; Hosie, et al., 2015). Veterinarians should take this finding into account and inform cat owners of the value of appropriate vaccination protocols and boosters, even for cats that only live indoor, in order to enhance the vaccination status of cats.

75% of cat owners had multiple cats but less than five. 44% cats were adopted which were free of cost and most of the cat's breed were domestic breed which was about 64%. Among other breeds Persian breed were maximum around 20%. In purebred cats as opposed to domestic cats, "recent vaccination" records were more frequently found. This might be because purebred cat owners are more conscious of the need to vaccinate their pets; the expensive cost of purebred cats combined with the worry that they can get an infectious disease could be the cause of this.

92% of cats' owners said veterinarian advice was important for proper vaccination. As pets are rapidly increasing in Bangladesh and most of the owners does not have proper information about pet rearing and their management they usually depend on social media and internet. Most of the time they do not get right information and thus they are being misled. So, it is essential to increase quality veterinary services to serve increasing pet population accurately.

89% owners said effectiveness of vaccination is important factor for vaccinate the cats. It was very common to find infected cats which were previously vaccinated. The transportation and preservation of vaccine should be monitored carefully. Vaccination should be done with proper care with specific dosage and in the right route.

7% owners claimed extremely long waiting times as a major barrier to getting their cats vaccinated. Further 4% owners said distance to clinic & transport were also important factors for not visiting clinics. Because of this, veterinarians ought to shorten wait periods and perhaps even conduct home visits.

From this study we found that our cat population were not protected against infectious diseases. Because only 54% cats were found vaccinated though 89% of the owners knew that their cats were susceptible to infectious diseases which reflects the negative attitude of owners towards vaccination. Besides some others aspects also reduce the vaccination rate such as high cost, high distance to clinic, complex transport system, unsuitable clinic opening times and long waiting time etc.

Conclusion

From this study we found that our cats' population were not received adequate number of vaccines. Vaccination rate should be increased above 70% which was found only 54% in our study. So, owner's attitudes should be improved towards vaccination. Besides others negative factors such as high cost of vaccination, less availability, inappropriate clinics facilities etc. should be reduced to increase vaccination rate.

Limitations

Due to the fact that it necessitates respondents to be computer skilled and have access to a computer, the web-based data collection was unrepresentative. Additionally, the survey's sample of cat owners was self-selected, which might have contributed to the age and gender bias. So, we also did direct face to face survey from different veterinary clinics as well to reduce this bias. Although the web-based survey covered a wide area, face-to-face data was collected only from Dhaka and Chattogram urban areas. Thus, it is recommended that future studies will cover a wider area to reduce this selection bias.

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