



Research Article

Community's Perception on Zoonotic Potential of Dog Helminthes Infections in Kangemi Slum of Nairobi, Kenya

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ABSTRACT

Dogs are the most adopted animals as pets worldwide and therefore pose a potential risk for zoonotic diseases due to the close relationship with humans. A cross-sectional study was conducted in Kangemi slum of Nairobi, Kenya between August and October 2016 to assess the community's level of awareness on zoonotic dog intestinal worms. A total of 185 questionnaires were administered; 110 to persons with dogs in their households and 75 to those without. Demographic characteristics analyzed were age, marital status, religion, education level, occupation, and source of drinking water. Among the respondents, 92.7% kept dogs for security purposes and 7.3% as pets. On dog restraint, 53.6% of respondents let their dogs to freely roam in the neighborhood while 46.4% were confined. Most households disposed dog feces either in the nearby bushes (43.6%) or in a pit latrine (30.0%) with 26.4% disposing in the nearby garbage dump. Only 10% of respondents had dewormed the dogs within the last three months of the study, getting drugs mostly (47.8%) from agro-vet shops while 21.6% had knowledge on zoonotic worms. However, 21.6% reported that dog worms cause serious diseases in humans with 58.4% giving deworming as the main strategy of control and or prevention of these worms. Most of the respondents, (89.7%) had knowledge that stray dogs were possible source of infections to humans. 55.7% were for the opinion that stray dogs should be eradicated. The limited knowledge on zoonoses associated with dog helminthes calls for health education and public awareness, to reduce transmission of these worms to humans.

Key words: Dogs, Helminthes, Zoonotic, Kangemi, Community, Awareness

INTRODUCTION

The Dog has been domesticated by man for a long time and is considered man's best friend. The close relationship between dogs and humans as companion animals, despite offering significant benefits, is also a potential health hazard risk. Parasitic infections can naturally be transmitted from dogs to humans directly or indirectly through environmental contamination (Robertson *et al.*, 2000).

Dogs act as definitive hosts for a number of endoparasites of zoonotic importance such as *Toxocara* species, Hookworms, *Giardia*, *Dipylidium caninum*, *Echinococcus granulosas* among others. Hookworms and *Toxocara* species are particularly important to humans (McManus, 2006). The migratory larvae of *Toxocara* species (especially *Toxocara canis*) cause either visceral or ocular larval migrans or both in persons with immunosuppressed immunity and or children (Larrieu *et al.*, 2001) whereas *Ancylostomum caninum* has been

reported to cause eosinophilic enteritis in humans (Torgerson and Macpherson, 2011). Eggs and larvae of these parasites are found in dog feces, a potential environmental contaminant, posing high risk for human infections. Therefore, stray and semi-domesticated dogs are one of the major public health problems worldwide especially in developing and or low social-economic level societies (Lee *et al.*, 2010). Though studies on prevalence of zoonotic helminthes have been done both in Kenya (Makau *et al.*, 2015) and elsewhere (Dagmawi *et al.*, 2012; Traversa, 2012; Lee *et al.*, 2010) awareness on the zoonotic potential of helminth seems to be low. A Questionnaire survey among owners of pet dogs' in Haramaya revealed that whereas 53.3% knew the zoonotic importance of Rabies, only 10% were aware of helminthes as parasitic zoonoses, while 36.6% had no information about zoonotic risks from pets (Tamerat *et al.*, 2015). Dagmawi *et al.* (2012) recorded 4.4% awareness of dog owners on zoonotic parasites and 95.6% on rabies in Ethiopia, while Dejene *et al.* (2013), recorded 3% and

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96.96% awareness regarding GIT parasites and Rabies respectively. A study in Ethiopia by Zewdu *et al.* (2010), did not find awareness about the zoonotic helminthes but 44.3% of respondents had awareness on zoonoses implication of Rabies. Higher awareness, 49.19%, about parasite zoonoses of pets was, however, reported by a study in Northern Italy (Zanzani *et al.*, 2014). There is scant information on community perception and the potential risk factors associated with zoonotic helminthes from dogs in sub-Saharan Africa including Kenya and therefore the need for this study.

MATERIALS AND METHODS

Study area

The study was conducted in Kangemi ward, a slum area in Nairobi, Kenya, approximately 10km West of central business district, on the road connecting Nairobi and Naivasha, at longitude 1.2693° S and latitude 36.7442° E. It is a low social class area with a population of 44,546 persons congested within 1.6 Km² (National census, 2009).

Study design

Questionnaire survey: This was a cross-sectional study in which a total of 185 questionnaires were administered to residents of Kangemi Ward, in Westland sub-county in Nairobi between the months of August and October 2016. The questionnaires were structured to gather information on residents' demographic characteristics, dog management, and community perception on potential health risk from zoonotic helminthes of dogs. The questionnaires were first pre-tested on a section of the community who were excluded from the study.

Inclusion and exclusion criteria

Data collection followed a systematic random sampling of residents of the study area. The first household was randomly selected and every other 5th household along the transect paths was included in the study. Persons of 15 years and above, who gave consent to participate in this study were recruited. In households with more than one person, a random sampling of one respondent was done. All children less than 15 years and those who declined consent to participate were excluded from the study.

Data analysis

Data were entered in Microsoft excel and analyzed using Stata® statistics (version 9.0; Stata Corporation, College Station, USA) for determination of frequencies in demographics, knowledge, attitude and practices of Kangemi residents with respect to dog management and possible transmission of parasitic infections to humans.

RESULTS

Demographic characteristics of the respondents

A total of 185 residents were interviewed and assessed for their knowledge, attitude and practices concerning zoonotic dog intestinal parasites with emphasis on Hookworms and Ascarids. Out of these residents, 95 (51.4%) were males and 90 (48.6%) were

females. About half of the respondents, 50.8%, (94/185) were aged between 20 and 29 years and 64.3% (119/185) were married (Table 1). Thirty two percent (59/185) of the respondents had children of age between zero and three years with those of children between eleven and fourteen giving the least percentage (4%; 8/185) Figure 1.

A higher percentage (47.6%; 88/185) had primary school as their highest level of education with the least (6.0%; 11/185) having never attended school (Figure 2). The main occupation of the respondents was self-employment (51.9%; 96/185) with protestant being the popular religious affiliation. Most people (92.4%; 171/185) had access to tap water for domestic use (Table 2).

Table 1: Age bracket of respondents and their marital status

Variable	% (Proportion)	
Age bracket in years	15-20	8.11 (15/185)
	21-29	50.81 (94/185)
	30-39	24.86 (46/185)
	40-59	11.89 (22/185)
	Above 60	4.32 (8/185)
Marital status	Married	64.32 (119/185)
	Not married	35.68 (66/185)

Table 2: Religion, occupation and source of drinking water in Kangemi

Variable	% (proportion)	
Religion	Protestant	63.75 (118/185)
	Catholic	30.27 (56/185)
	Orthodox	2.16 (4/185)
	Do not go to church	3.78 (7/185)
	Health-related	3.78 (7/185)
occupation	Housewife	23.24 (43/185)
	Self-employed	51.89 (96/185)
	Student	15.94 (28/185)
	other	5.95 (11/185)
	Source of drinking water	Tap water
	River	2.70 (5/185)
	borehole	4.86 (9/185)

Dog ownership and management

Out of the 185 households/ respondents interviewed, 59.5% (110/185) owned dogs. The majority, 92.7% (102/185) kept dogs for security purposes while 7.3% (8/185) keep them as pets. Most households, 53.6% (59/110) had their dogs outside the house at night while 43.6% (48/110) and 2.7% (3/110) kept their dogs in kennels or inside human houses, respectively. Most people (44%; 48/110) disposed dog feces in the bush while 30% (33/110) disposed it in pit latrines (Figure 3).

About half (48%; 53/110) of dog owners allowed their dogs to freely roam in the study area with 52% (57/110) confining their dogs within the compound (Figure 4). Most households (74.6%; 82/110) fed their dogs with home diet, 8.2% (9/110) commercial food, 2.7% (3/110) condemned offal while 14.6% (16/110) left the dogs to scavenge for food (Figure 5).

Most people, 65.5% (72/110) cook food or have food prepared for their dogs with 66% having designated feeding bowls for dogs. Sixty percent (66/110) of the households allowed their dogs to roam and interact with other dogs and children within and without the compound while 40% (44/110) restricted their dogs within the compound. Assessment of personal opinion on the most

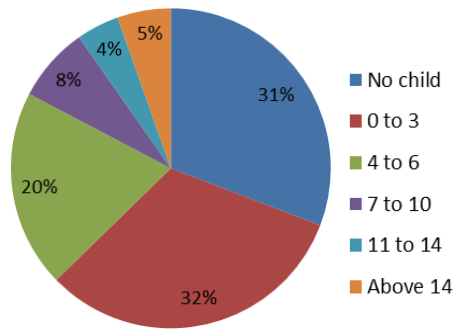


Fig. 1: The age bracket in years of children

■ no education ■ primary ■ secondary ■ post-secondary

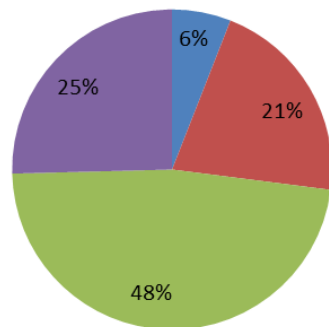


Fig. 2: Level of educational of the respondents

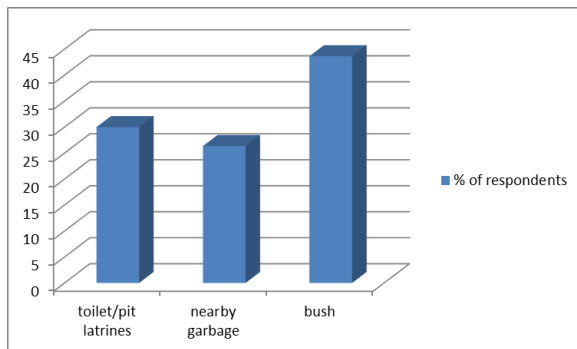


Fig. 3: Different modes of disposal of dog feces

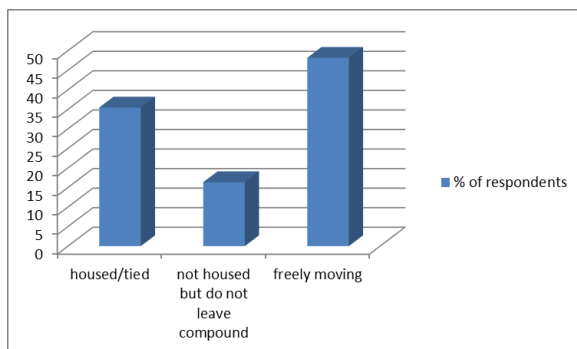


Fig. 4: Level of dog confinement in Kangemi

probable cause of puppy deaths, 40.9% (45/110) believed that teething was the main cause, 31.8% (35/110) infections, 10.9% (12/110) maternal neglect, 9.1% (10/110) reporting helminthosis whereas 7.3% (8/110) had no idea of the cause of neonatal deaths.

While fifty-six households had at least vaccinated their dogs against Rabies only 10% (11/110) had done deworming within the last three months prior to the study period and a further 31.8% (35/110) reported to have last dewormed their dogs more than three months prior to sample collection. A higher percentage 58.1% (64/110) of the respondents had never dewormed their dogs. Out of the 46 respondents who had dewormed their dogs, 47.8% (22/46) sourced the drug from Agro-vet shops, while a veterinarian and Animal health assistants, respectively gave 45.7% (21/46) and 6.5% (3/46). Sixty one (55.5%) of those interviewed only sought veterinary services on clinical cases/vaccination, 5.5% (6/110) consulted regularly while 39.1% (43/110) of them had never sought any service at all but only take their dogs for vaccination during Rabies vaccination campaigns organized by learning institutions around the area. Out of 119 respondents with children, 23.5% (28/119) had dewormed them within the last three months prior to interview, 56.3% (67/119) dewormed more than three months and 21.2% (24/119) had never dewormed their children with 61.2% sourcing the drugs from nearby Chemist/ dispensary.

Community perception on dogs as potential sources of infectious diseases and helminthes to humans

Out of the 185 persons interviewed regardless of owning a dog, 55.7% (103/185) knew at least one disease that affect dogs though most of them knew them in their local language, while 44.3% (82/185) did not know of any disease affecting dogs. Most reported diseases were ‘mad dog’ disease (Rabies) at 50.3% (93/185), loss of hairs at 30.3% (56/185), and diarrhea at 33.0% (61/185). About half 50.3% (93/185) of the respondents had knowledge that rabies could be transmitted from dogs to humans, however, for among those with dogs in their households, 60.0% (66/110) knew that rabies was zoonotic. On assessment whether they knew about dog worms, 56.8% (105/185) knew that dogs have worms but only 26.5% (49/110) had knowledge of possible crossing over to humans. However, a higher percentage 33.6% (37/110) of those with knowledge on potential zoonoses of dog helminthes was recorded in those having dogs in their compound. Most respondents (45%; 83/185) thought that dog helminthes do not cause disease in humans (Figure 6).

A number of respondents (45.40%; 84/185) believed that dogs acquire intestinal worms from contaminated and spoiled food while 10% reported human feces, other dogs, or lactating bitches as the sources of helminth infections in dogs.

During assessment on knowledge of dog hookworms and ascarids, only 38.9% (72/185) knew that dogs harbor these worms. However, in those with dogs, 50.9% (56/110) were aware that dogs harbor these worms but less than 10% were aware of their zoonotic potential. School gave the highest (51%) source of knowledge of these worms with least knowledge from health centers (3%) (Figure 7). Most respondents, 46% gave contact with dog feces as the main mode of transmission (Figure 8) with washing hands with soap and water as the main (97%) action taken when exposed to dog feces (Figure 9). Most people 58% (108/185) considered deworming as the main mode of parasite prevention/ control strategy with only 2% (2/185) giving animal birth control as an important strategy (Figure 10).

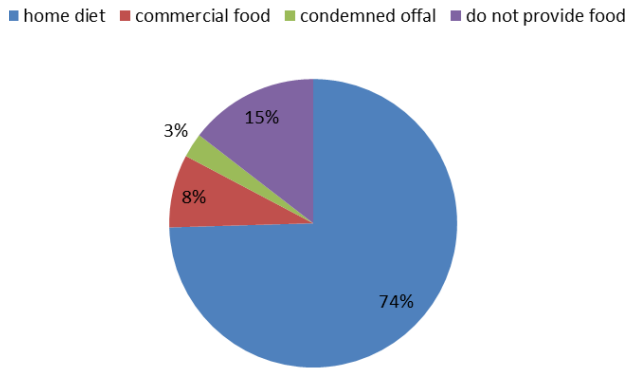


Fig. 5: Types of food for dogs in Kangemi

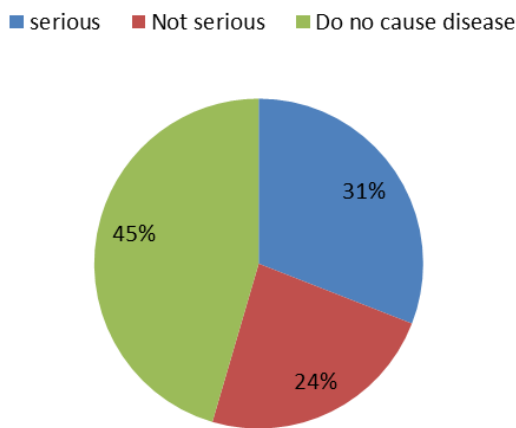


Fig. 6: Perception on possibility of dog worms causing disease in humans.

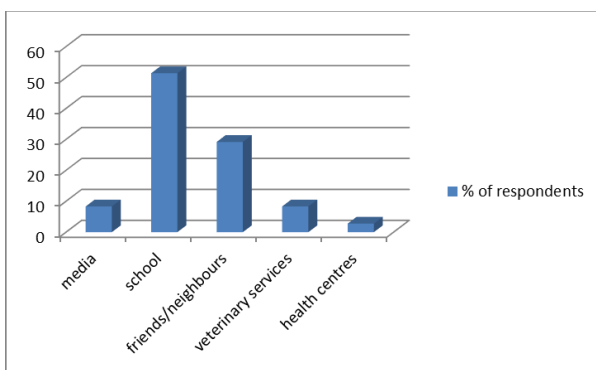


Fig. 7: The source of information on dog hookworms and ascarids

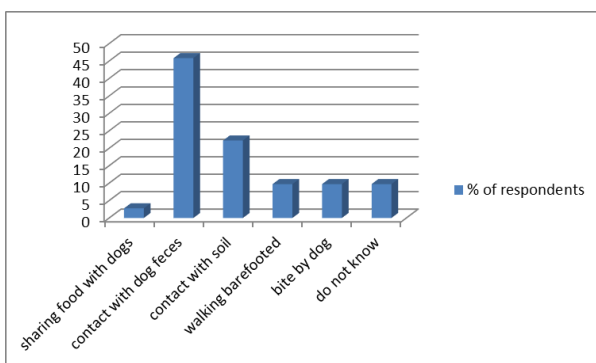


Fig. 8: Routes of transmission of dog hookworms and ascarids

Most respondents, 55.7% (103/185) believed that stray dogs should be eradicated while 29.2% (54/185) said that their population should be controlled through birth control (spay/castration) but 15.1% (28/185) do not bother about free roaming dogs. Six (3.2%; 6/185) of the respondents had encountered persons suffering from suspected parasitic diseases from dogs in other parts of the country. Most (98.9%; 183/185) were willing to participate in dog deworming and public awareness campaign programs in the area.

Risk factors of helminthes zoonoses associated with dog ownership in the study area

Disposal of dog feces: Of the 110 respondents who owned dogs, 43.6% (48/110) disposed feces in the bush, 30.0% (33/110) in pit latrines/toilet, and 26.4% (29/110) in garbage dumps (figure 3).

Roaming dogs and inadequate deworming: 47.3% (52/110) of households allowed their dogs out of the compound and out of these, 73.1% (38/52) have never had their dogs dewormed at all with only 5.8% and 21.2% dewormed less and more than 3 months prior to interview respectively.

Young children interacting with dogs: Half of the households owning dogs interviewed had children between zero and 6 years of age (figure 1). Out of 59 households, having dogs freely moving and interacting with other dogs and children, 23.7% (14/54) and 8.5% (5/54) had children of age range between 0-3 and 4-6 respectively.

Lack of awareness of zoonotic potential of canine hookworms and ascarids: 50.9% (56/110) of persons with dogs knew that dogs have these parasites with only less than 10% aware of their zoonotic potential. Out of these, 46.4% had no idea on the possible mode and route of transmission of these worms to humans with Chi square of 7.12 and p= 0.08.

DISCUSSION

The present study provides a base line data of community perception of zoonotic dog helminthes with particular emphasis on Hookworms and ascarids. The results of this study showed that the general community knowledge of dogs (regardless of owning a dog) being a potential threat to human health was low. However, the finding in this study that 26.5% of the respondents had knowledge that dogs could transmit worms to humans, was higher than what has been reported by others, 3% (Dejene *et al.*, 2013) and 10 % (Tamerat *et al.*, 2015). The study revealed greater knowledge on Rabies (50.3%), which is comparable to the findings by Tamerat *et al.*, (2015) of 53.3%. Dejene *et al.* (2013) has reported higher (96.6%) knowledge on zoonotic potential of rabies in their study on dogs in Mekelle city, Ethiopia with only 36.6% having knowledge on zoonotic helminthes while Zanzani *et al.*, 2014 have reported the highest awareness (49.2%) of parasitic zoonoses in urban area of Northern Italy. The variation noted in the findings of these studies could be attributed to differences in access by dog owners to various sources for awareness such as media, animal care services and public health information.

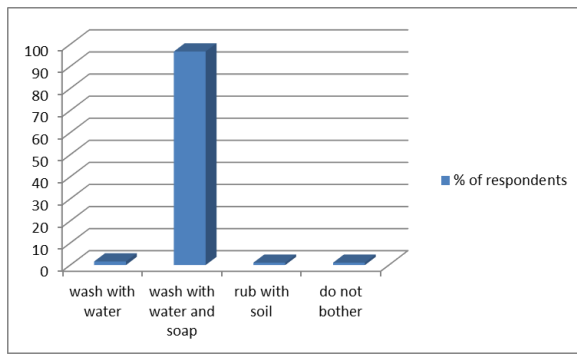


Fig. 9: Action taken when in contact with dog feces

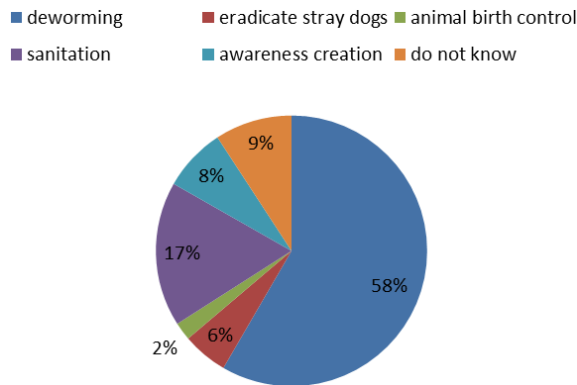


Fig. 10: Parasite prevention/control strategies

The above studies were generally on the awareness of helminthes worms rather than the specific parasites as in this present study. Slightly higher percentage (33.6%; 37/110) of awareness was recorded in those who had dogs in their compounds that revealed that owning a dog was a factor influencing the level of awareness of their potential health risk to humans. Tamerat *et al.* (2015) reported that among those who were aware of zoonotic potential of dog intestinal parasites, 60% gave fecal contamination of food materials as the main mode of transmission while 40% were of the opinion of direct contact with infected pet. This percentage was smaller than the finding of this study of 68.05% of those respondents aware of zoonotic importance of dog helminthes who gave contact with dog feces or contaminated soil as the main modes of transmission. Only 2.7% of the respondents shared their houses with dogs during the night as compared to 100% in a study in Ethiopia (Jones *et al.*, 2011). This study found out that 70% households dispose dog feces in either the nearby garbage or bush, which was comparable to the 73% recorded (Tamerat *et al.*, 2015). In the present study, those who deworm their dogs used conventional medicine from pharmacy or shopping centers and none of them used traditional medicine unlike in the study Jones *et al.*, 2011 that reported 24% people used traditional preparations. A higher percentage, 65.45% cooked food for their dogs contrary to the findings in a study by Tamerat *et al.* (2015) that reported none. The presence of free roaming or semi-domesticated dogs in the study area was a potential source of environmental contamination. Katagiri *et al.* (2007) reported that 70.10% of the respondents did not know the way dogs acquire worms contrary to the findings of this study of 9.2%. The lack of or insufficient deworming of dogs (only 10% within three

months and 31.8% more than three months) signifies inadequate care of dogs and therefore continued development, spread and possible transmission of zoonotic dog parasites to humans.

In this study, only 2.7% fed their dogs condemned offal a finding that was in contrast to the 50% reported in Ethiopia (Jones *et al.*, 2011). The proportion for owners seeking veterinary services regularly was 5.5%, which is lower than 31.2% in Brazil (Katagiri *et al.*, 2007). However, those who sought veterinary help in clinical cases or vaccination (61.6%) was higher than 48.1% reported in Brazil (Katagiri *et al.*, (2007). On the perception on dog worms causing disease in humans, 18.9% reported not serious which is lower than 56% reported in Ethiopia (Jones *et al.*, 2011) whereas those that reported serious (21.6%) and do not cause disease (59.5%) were higher than 12% and 32%, recorded in Ethiopia (Jones *et al.*, 2011) respectively. This study reported a lower percentage of people who knew that dogs have worms compared to 67.5% reported in Brazil (Katagiri *et al.*, 2007). This study noted a low percentage (9.2%) on lack of knowledge on strategies of prevention and control of dog intestinal worms compared to 52.2% reported in Brazil (Katagiri *et al.*, 2007). An important observation in this study is that though knowledge on zoonotic potential of dog intestinal worms is low, virtually every respondent (98.9%) were willing to participate in dog deworming and public awareness campaign programs in the area. This would therefore result in controlling these zoonotic helminthes in this community.

Conclusion

The study revealed that there was limited knowledge on potential health risk posed by dogs among communities living in Kangemi. It was also concluded that people did not prioritize their dogs' health as far as regular treatment and deworming were concerned. Therefore, intervention measures are necessary, mainly health education and public awareness on health risks from dog helminthes, to reduce transmission of these worms to humans.

Moreover, further studies on epidemiology and prevalence of zoonotic intestinal parasites of dogs should be conducted in both humans and dogs to determine their densities especially in slums.

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