Studies on Canine Transmissible Venereal Tumour of dogs in Mvomero and Morogoro municipality, Tanzania

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SUMMARY

Canine transmissible venereal tumour (CTVT) is a contagious tumour that is naturally transmitted between dogs by the allogeneic transfer of living tumour cells during coitus. A cross-sectional study was conducted in Mvomero and Morogoro Municipality between September and November 2017 in order to determine the prevalence of CTVT and level of people's awareness on the disease. The knowledge and interventions in reference to CTVT were evaluated using a structured questionnaire, whereas the status of the disease in animals was investigated through clinical examination. A total of 200 respondents were interviewed and 300 dogs were examined. Results on questionnaire showed that, most of the respondents had their dogs managed freely as stray dogs. Majority of the dog owners had one to five dogs and with no controlled breeding. It was further established that majority of the respondents knew CTVT as a disease of bleeding in dogs and had seen dogs affected by the disease suggesting that the disease is common in the study areas. Nevertheless, the real cause and treatment was not clear to most of the dog keepers. Based on clinical examination of dogs, the prevalence of CTVT in dogs was 12%, with Mvomero district having more cases of CTVT, 23 (15.4%) than Morogoro Municipality which had 13 (8.6%). In Mvomero district, Dakawa ward had the highest number of CTVT cases 12 (8.1%). Furthermore, it was found that male dogs were more affected by CTVT (15.3%) as compared to female dogs (8.7%). This study shows that magnitude of CTVT is high in the study area and insufficient knowledge and misconception on clinical presentation, spread, and treatments of the disease prevail. Therefore deliberate measures aimed at minimizing the problem need to be taken.

Key words: TVT, dogs, management, tumours

INTRODUCTION

Canine transmissible venereal tumor (CTVT) is a naturally occurring transmissible tumour which spread between dogs by the allogeneic transfer of living neoplastic cells (Strakova and Murchison, 2014). The disease can be physically transmitted through contacts such as during coitus, licking, scraping, biting (Murgia *et al.,* 2006), grooming and other maternal behavior (Ortega-Pacheco *et al,* 2006). Tumorous cells can be transmitted only across abraded mucosa with broken epithelium. Acting like an infectious pathogen, cells propagate and establish in the organism. Based on the nature of the disease, CTVT is seen as a major threat to the reproductive efficiency of canines. The disease results in the appearance of tumors mainly involving external and occasionally internal genitals of male and female dogs.

CTVT is much more prevalent in countries with tropical and sub-tropical settings (Strakova and Murchison, 2014). Uncontrolled sexual behaviors that are largely contributed by lack of awareness on the disease among people and large population of stray dogs appears to be the major reason for high incidences of the disease (Ganguly *et al*., 2013).

A considerable work regarding diagnosis, association of CTVT with urinary tract infection, risk factors associated with CTVT and therapeutic management has been reported in Tanzania (Batamuzi *et al.,* 1992, Batamuzi *et al.,* 1996). However, there is little work that has been done in Tanzania regarding the prevalence of CTVT and people's awareness on the disease. Based on this gap, the current study was planned.

The main objective of this study was to establish the prevalence of CTVT and the level of peoples' awareness on the disease in Tanzania. The findings of this study are expected to provide baseline for studying CTVT in similar geographical conditions and assist field animal health professionals and government agencies to make informed decisions on interventions that aim to prevent, control and manage CTVT.

MATERIALS AND METHODS

Study area, animals, and design

The study was conducted in Mvomero and Morogoro Municipality. Mvomero district is found at latitudes 06° 26' S and longitude 37° 32' E. It is one of the six districts of the Morogoro region in Tanzania. It is bordered to the north by the Tanga region, to the northeast by Pwani region, to the east and southeast by Morogoro Rural district and Morogoro Municipality and to the west by Kilosa district. The District is administratively divided into 4 Divisions, 30 Wards and 115 Villages with population size approximated at 312,109 based on Tanzania population and household census (PHCT, 2013).

Morogoro Municipality, in this study referred to as Municipality lies at latitude 5.7 to 10 °S and longitude 35.6 to 39.5°E and is situated on the lower slopes of Uluguru Mountain whose peak is about 500 to 600 metres above sea level. It is located at about 200 km to the West of Indian ocean. The municipality is divided into 29 administrative wards and 272 streets with estimated population of 315,866 based on 2012 census (PHCT, 2013).

Mvomero District and Municipality areas were chosen for the study because of their proximity and easy accessibility from the SUA. Selection of wards and villages or streets was carried out based on availability of dogs and accessibility. In Mvomero District, five wards were visited, namely Mangae, Dakawa, Doma, Melela and Henbet. Kihonda, Kihonda Maghorofani, Mazimbu, Lukobe, Boma, Mafisa and Magadu wards in Morogoro Municipality were covered. A cross-sectional study design was conducted between August-November 2017.

Study population, and questionnaire administration

Study population included all dog keepers of different age groups and all dogs of Mvomero district and Morogoro Municipality. Criteria for inclusion in the study were: dog keepers both women and men, willing to participate in the study, able to deliver information and accessibility of the place during data collection. Two hundred (200) respondents were selected purposefully, where only dog keepers were interviewed.

Structured questionnaire was used to collect information from dog keepers. The questionnaires were made with pre-coded response choices (closed-ended questions) with a few open-ended questions. The questionnaires were used to collect sociological information on whether people know the disease, what they do with the affected dog, dog health, dog welfare and implications of the disease. The questionnaire was administered through face to face conversation.

Study animals and clinical examination of TVT

A total of 300 dogs with age of one year and above of local and cross breeds from Municipality and Mvomero district were examined for TVT. Furthermore, parameters such as breed, sex and dog housing were explored from the owners. After well restraint, dogs were diagnosed by direct examination for the presence of visible features of CTVT on the genitalia, nose and mouth commissure. CTVT cases were identified with large, firm, and friable cauli flower like mass on the genitalia.

Data analysis

The questionnaire and clinical examination data were entered into a Microsoft Excel spread-sheet and analyzed using Epi Info TM Version 7 (Centre for Disease Control, Atlanta, USA). Chi-square tests at a critical probability of $P < 0.05$ were applied to test the statistical association among the factors for CTVT transmission such as district of origin, sex, breeding system, number of dogs in a household and dog housing.

RESULTS

Demographic characteristics and distribution of respondents

The study involved 200 respondents who were dog keepers from Mvomero district (n=100) and Morogoro Municipality (n=100). The study was done in 11 wards, five in Mvomero and six in Morogoro municipality (Table 1). The results show that most respondents (66.0%) were male and majorities (96.0%) were adults. However, the number of the respondents varied in different wards with Dakawa ward contributing the largest number of respondents (17.5%).

Table 1: Socio-demographic characteristics of respondents (n=200)

Parameter	Category	Frequency	Percentage
Gender	Male	132	66.0
	Female	68	34.0
Age	Below 18 years	8	4.0
	Above 18 years	192	96.0
Wards in Mvomero	Mangae	32	16.0
	Dakawa	35	17.5
	Doma	16	8.0
	Melela	8	4.0
	Henbet	9	4.5
Wards in the Municipality	Kihonda	26	13.0
	Mazimbu	15	7.5
	Lukobe	12	6.0
	Boma	8	4.0
	Mafisa	13	6.5
	Magadu	26	13.0

Dog Management System

The type of dog management system in Mvomero and Morogoro districts was almost similar as presented in Table 2. The results show that the large proportions of respondents (95%) were keeping between 1 - 5 dogs but the mean number was 2 dogs per household. Furthermore, the results show that 97.0% of dog keepers had their dogs straying. Up to 95.0% of the respondents did not neuter/spay their dogs and free mating was reported to be major breeding practice reported by most (96.9%) of the dog keepers.

Table 2: Dog management system in Mvomero and Municipality

Parameter assessed	Category	Number (%) of respondents in the study districts		
		Mvomero (n=100)	Municipality (n=100)	Total (n=200)
Number of dogs kept	1 – 5	94 (94.0)	96 (96.0)	190 (95.0)
	6 -10	6 (6.0)	4 (4.0)	10 (5.0)
Dog housing	Straying	98 (98.0)	96 (96.0)	194 (97.0)
	Confined	2 (2.0)	4 (4.0)	6 (3.0)
Dog neutering/spaying	Yes	3 (3.0)	7 (7.0)	10 (5.0)
	No	97 (97.0)	93 (93.0)	190 (95.0)
Breeding management	Free mating	98 (98.0)	91(95.8)	189 (96.9)
	Controlled breeding	2 (2.0)	4 (4.2)	6 (3.1)

Knowledge on CTVT and the source of information

Regarding knowledge on CTVT, 59.3% of respondents had seen/heard about the Canine Transmissible Venereal Tumor, of which 75.6% had seen/heard about the disease more than once (Table 3). The sources of the knowledge were reported by the majority (97.3%) of the respondents that was by seeing dogs discharging blood at their homes or to neighbours. The most common mode of transmission of CTVT reported by respondents was mating (53%). It was further established that majority of the dog keepers (97.5%) reported to see some clinical signs like swollen mass on vagina or penis associated with blood discharges which they associated them with CTVT but they did not know the real cause. On the management of CTVT, majority of the respondents (84.0%) said that they do nothing

Table 3: Knowledge of respondents (dog keepers) on CTVT and its management

Parameter	Category	Frequency	Percentage
Seen/heard about CTVT	Yes	119	59.5
	No	81	40.5
How many times	Once	29	24.4
	More than once	90	75.6
Source of information	Home/neighbors	115	96.6
	Radio/Newspaper	3	2.5
	Animal clinics	1	0.8
Mode of transmission	Mating	63	52.9
	Blood discharges contact	4	3.4
	Biting	1	0.8
	Inhalation of droplets with the infection	1	0.8
	Don't know	50	42
How do you detect TVT in dogs	Clinical signs	116	97.5
	Don't know	3	2.5
How do you manage cases of CTVT in dogs?	Kill the dog	8	6.7
	Give medical care, and regularly dip the dog in acaricides	7	5.9
	Report to a nearby livestock officer	4	3.4
	Nothing is done	100	84.0

Biodata and distribution of dogs in the study areas

The study involved 300 adult dogs which all of them were non-pedigree dogs. The details on biodata and distribution of dogs in the study areas are shown (Table 4). A total of 150 dogs were examined in each of the study area. There was equal sex distribution among the examined dogs. It was found that most of the dogs examined (95.3%) were from households that had dogs that ranged between one and five. Similarly, majority of the dogs (93.7%) were roaming around households (stray dogs). The number of dogs varied between wards with Mangae ward contributing the largest number of dogs (22.7%) examined

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Table 4. Demographic characteristics and distribution of dogs (n=300)

Parameter	Category	Frequency	Percentage
Sex	Male	150	50.0
	Female	150	50.0
Number of dogs in a household	1 – 5	286	95.3
	6 – 10	14	4.7
Dog housing	Straying	281	93.7
	Confined	19	6.3
Ward	Boma	37	12.3
	Dakawa	64	21.3
	Kihonda	15	5.0
	Kihonda Maghorofani	23	7.7
	Mafisa	13	4.3
	Magadu	31	10.3
	Mangae	68	22.7
	Mazimbu	32	10.7
	Melela	17	5.7
Total per study area	Municipality	151	50.3
	Mvomero	149	49.7

Prevalence of CTVT and the risk factors for infection

Out of 300 dogs that were examined in the two districts, 36 (12%) had CTVT. Overall, Mvomero district had more cases of CTVT 23 (15.4%) as compared to the municipality with only 13 cases of CTVT or 8.6% of all cases and the difference was statistically significant (p=0.0361189397). In Mvomero district, Dakawa ward had the highest number of CTVT cases (12) or 8.1% of all CTVT. Other wards in Mvomero district with their number of CTVT included: Mangae (6), (4.1%), and Melela (5). In Morogoro Municipality, the ward with more cases of CTVT was Mazimbu 5 (3.3%). Other were: Magadu 3 (2%), Kihonda 3 (2%), Boma 1 (1%), Kihonda Maghorofani 1 (1%) and Mafisa 0 (0.0).

In all the examined dogs, 23 male dogs were found to have CTVT equivalent to 15.3% as whereas 13 female dogs (8.7%) were also found to have CTVT in the study areas. All the CTVT cases were observed in households with no breeding control, free roaming dogs and also in households that had dogs between one and five.

Table 5. Prevalence of CTVT and the risk factors for infection (n= 300)

Variable	Category	Frequency (%) of CTVT	Frequency (%) of CTVT-free	Odds ratio	95% CI	P value
District	Municipality	13 (8.6)	138 (91.4)	1.9377	0.9416 - 3.9877	0.03612
	Mvomero	23 (15.4)	126 (84.6)			
Sex	Female	13 (8.7)	137 (91.3)	1.9085	0.9274 - 3.9276	0.03958
	Male	23 (15.3)	127 (84.7)			
Breeding	Controlled	0 (0.0)	7 (100.0)	-	-	-
	Free	36 (12.3)	257 (87.7)			
Dogs per household	1 – 5	36 (12.6)	250 (87.4)	-	-	-
	6 – 10	0 (0.0)	14 (100.0)			
Housing of dogs	Confined	0 (0.0)	19 (100.0)	-	-	-
	Free straying	36 (12.8)	245 (87.2)			

* Statistically significant when P<0.05 at 95% confidence interval

DISCUSSION

The overall purpose of this study was to assess the prevalence of CTVT and the level of people awareness on the disease in Mvomero district and Morogoro Municipality. Generally it was established that majority of the people were aware about CTVT and dogs were not confinement, not neutered and breeding was not controlled. The management practices in the study areas predisposed the dogs to CTVT. In agrrement to previous findings by Batamuzi et al (1992, 1996), it was further observed that the knowledge on CTVT management was very low since most of people did not take measures when they encounter the disease in dogs and were not aware if treatment for the condition exists. The overall prevalence of CTVT was 12% in Mvomero and Morogoro Municipality which imply that the disease is endemic in the areas. Presence of untreated CTVT infected dogs in these areas act as reservoirs of the disease and predisposes more dogs to the CTVT transmission. With the current dog management system in the study areas, CTVT prevalence is likely to keep on increasing and more dogs will keep on suffering from this debilitating disease.

The current study established that most of the people involved in dog handling are males (66.0%). In Tanzania, dog keeping is common in pastoral and agropastoral communities who normally keep big flocks of dogs for herding of livestock. According to job distribution, livestock related activities are mostly handled by men so as the dog handling. Similar results have been published by Knobel et al. (2008) who found that men had positive attitude towards dogs than females. Other studies by Hsu et al. (2003) and Al-Fayez et al (2003) also reported same findings on dogs being close to men than females. Nevertheless, a study by Westgarth et al. (2007) and Wise et al. (1984) found that female had more interest with dogs than males. Differences in affections to dogs between men and females sometimes may be determined by the traditional and culture of a place, type of dogs and purpose of keeping dogs and many other factors.

This study further observed that, out of five wards of Mvomero district, Dakawa ward had more dog keepers (17.5%) compared to the other wards. Knobel et al. (2007) in their study reported that dog ownership was associated with livestock keeping and that dogs were more kept in rural areas that in urban areas. Indeed, most of Dakawa areas are rural areas and its inhabitants are livestock keepers suggesting relationship between keeping dogs and other livestock keeping.

In both, Mvomero and Morogoro districts most of the dogs (87.2%) were kept freely with no confinement. Most of these dogs were not spayed/neutered hence they were haphazardly mating in the streets and this increased the likelihood of CTVT transmission. Confinement of dogs was difficult because almost all households are not fenced such that even dogs that were confined during the day were straying at night. Awan et al. (2016) in their study found that with compromised biosecurity, certain factors (i.e. stray dog population in the area, dogs in neighborhood, high density human population area and number of dogs per household) favour the introduction of infected dog and consequently the disease spread rapidly. In the study areas, majority of the households who were keeping more than one dogs, were more affected with CTVT. Again Awan et al. (2016) reported the increase of the risk for CTVT in households with more than one dogs and sharing a breeding dog.

The fact that, majority of the respondents knew CTVT as a disease of bleeding in dogs and they had seen dogs affected by the disease implies that, CTVT is known and is common in the study areas. However about 42% of the respondents didn't know at all the cause of the disease; others thought that the transmission was through inhalation of air droplets and some respondents considered the disease to be similar to gonorrhea of human. In some cases, respondent believed that when female dogs bleed because of CTVT it was the time for breeding and owners will consider looking for breeding males. Awan et al (2016) established that considering red vulva discharge as sole breeding indicator, and failure to know the difference between normal red discharge and clotted blood discharged in CTVT contributed to the spread of the disease. According to Strakova and Murchison (2014), lack of knowledge and education about CTVT as well as its nature and

route of transmission can also contribute to increasing transmission of CTVT from street dogs. Strakova and Murchison, (2014) further commented that many owners are unaware that CTVT can be transmitted sexually and therefore they let their dogs roam freely and breed, even though they seem to have a bloody discharge or visible tumours on their genitalia.

Similarly, 84% of the respondents reported not do anything to their dogs infected with CTVT. Only few individuals considered medical care (Table 3) and dipping in acaricides in an attempt to treat the disease. Lack of awareness on the disease, negligence and poor access to veterinary care makes the dogs to go untreated which leads to long term sufferings and debilitations. These impact the welfare of such dogs and they have to be addressed.

Mvomero district had more cases of CTVT. Surprisingly, there are fewer dogs in Mvomero than in Morogoro municipality (Table 1). Such observations may be explained by the fact that more stray dogs were observed in Mvomero compared to Morogoro Municipality. According to Strakova and Murchison (2014), prevalence of CTVT is not linked to the actual number of dogs but rather to the number of free roaming dogs. The management practices of dogs in Mvomero villages can be explained by the purpose of keeping dogs such as hunting and livestock guarding, as opposed to the municipality where dogs re mainly kept as guard or pet dogs and practices more confinement compared to Mvomero area (Table 5).

In Mvomero district, Dakawa ward had the highest number of CTVT cases 12 (8.1%). This is probably because Dakawa ward had more dog keepers (17.5%) most of which had their dogs roaming freely (Table 2 and 4). It has been established in this study that the number of free roaming dogs was found to be associated with CTVT cases and a clear linkage between prevalence of CTVT and presence of free roaming dogs was observed (Table 5). Conditions favoring free roaming and CTVT in dogs include uncontrolled breeding, higher number of entire (non-spayed/neutered) dogs and poor living conditions. These conditions would provide a ground for dissemination of CTVT through sexual transmission.

In this study, CTVT was found to be more in male dogs (Table 5) and the difference between sexes was statistically significant ($p=0.03958$). Similar results were obtained by Brown (1980) and Osipov et al. (1976). In contrast Sobral et al, (1996) and Gandotra et al. (1993) reported that CTVT is more common in female dogs than in male dogs and Strakova and Murchison, (2014) reported that there is no gender predisposition for CTVT infection. The observed high prevalence in male dogs may be due to the tendency of one male dogs mating with many females and male dogs are sexually active all the time provided there is a female in heat.

Overall, the results of the current study provide a survey of the current occurrence of CTVT in Mvomero district and Morogoro Municipality, indicating that the disease is endemic in the area. Also the analysis has highlighted factors that contribute to the high occurrence of the disease which include large number of free roaming dogs, random mating, unspayed/unneutered dogs and possession of few numbers of dogs. The study also concludes that poor knowledge and misconception concerning clinical presentation, spread, and treatments of CTVT are common in Mvomero and Morogoro Municipality. These are obstacles in the cure, prevention and control of the disease and major contributors to poor animal welfare.

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CONFLICT OF INTEREST

The authors declare that they have no conflict of interest.

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