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Research Article

Contamination of Keys with Parasite Eggs/Cysts within Ahmadu Bello University (Samaru Campus), Zaria, Kaduna State, Nigeria

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ABSTRACT

Infections caused by intestinal parasites are widespread causing significant problems in individuals and have become a public health menace. The prevailing environmental factors alongside contamination of various objects with different stages of parasites aid the fast distribution and infection of various species of parasites. The prevalence of parasitic eggs, cysts, and oocysts on keys used for door locks and other similar locks was investigated within the Samaru Campus of Ahmadu Bello University, Zaria. One hundred and four (104) key sets were collected and examined, one set at a time using the formol-saline sedimentation technique. Seven parasites comprising of Coccidian oocysts 11(10.6%), *Cryptosporadium* spp 3(2.9%), *Ascaris lumbricoides* 1(1.0%), *Toxocara* spp 1(1.0%), *Strongyloides* spp 2(1.9%), *Schistosoma mansoni* 1(1.0%), Mites 2(1.9%) and a mixed contamination of *A. lumbricoides* and *Toxocara spp* 1(1.0%) were identified. Chi-square was used to analyze data and among the risk factors tested, keys that are few in a bunch are seen to have the highest prevalence of contamination with parasitic eggs, cysts, and oocysts, which were also statistically significant (P=0.03346). The findings of this study show that different parasites of public health occur on keys, therefore, it can be concluded that the keys can serve as channels through which parasitic eggs, cysts, and oocysts can be disseminated; and should be disinfected appropriately and often.

Keywords: Keys, Parasites, Eggs, Cysts, Infections

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INTRODUCTION

Intestinal parasitic infections are caused by intestinal helminths and protozoan parasites, which are the most common infections in developing countries (Umeanaeto *et al.,* 2021). Intestinal parasites have been an age-long major global public health problem, especially in the developing world (Langbang *et al.,* 2019; Chege *et al.,* 2020). It is estimated that over 3.5 billion people globally host at least one species of intestinal parasite at some point in time, leading to over 450 million disorders (Chege *et al.,* 2020). These parasites thrive more in the environment probably due to factors such as poor sanitation, inadequate personal hygiene, poverty, illiteracy, tropical hot and humid weather conditions and contaminated drinking water resources (Langbang *et al.,* 2019).

Microorganisms such as bacteria, fungi, protozoans and helminths are present on virtually all types surfaces/objects and they have been evidently identified on surfaces of Naira notes (Awodi *et al.,* 2001; Ahmed & Mujittapha, 2015; Pam *et al.,* 2021),

on computer mouse, keyboards and users hands within Samaru, Zaria (Ndams and Jimoh, 2006) and on door handles (Umeanaeto *et al.,* 2021), among other objects and surfaces. Most of these pathogens are often transported via those objects when in contact with the contaminated hands, resulting in faecal-oral transmission (Ijaz *et* al., 2013; Umeanaeto *et al.,* 2021). These show the dynamic networks that exist in the Nigerian environment through which parasites can easily gain contact with and infect man and since door handles have been implicated, it is essential to investigate other accessories that are associated with door handles/knobs. Hence, this study investigated the occurrence of parasites' cysts, oocysts and/ or eggs on keys within the Samaru Campus of Ahmadu Bello University, Zaria, Kaduna State.

MATERIALS AND METHODS

Study Sites and Design

The research was conducted in the Samaru Campus of the Ahmadu Bello University, Zaria, Kaduna State of Nigeria. Key bunches were sampled from students and staff who consented and submitted their keys to be sampled. A bunch of keys was considered as a sample as well as a single key.

Sample Collection

One hundred and four (104) keys were sampled from staff and students of the Samaru campus of Ahmadu Bello University, Zaria. During key swabbing, hands were covered with gloves, and key/keys were swabbed one at a time using formal-saline solution-wetted swab sticks. Each key or bunch of keys was swabbed and placed in a well-labelled bottle containing 5ml formal-saline solution. Bottles were placed in a collecting box and transported to the Department of Parasitology and Entomology of the School of Veterinary Medicine, Ahmadu Bello University, Zaria, for parasitic examination. The oral interview was also used to obtain information on some possible risk factors.

Laboratory Analysis

Sample bottles were shaken thoroughly at the laboratory before removing the swab sticks using forceps and discarded accordingly. The forceps were disinfected using disinfectants on every use to avoid cross- contamination of samples. The resulting solutions were centrifuged at 2000rpm for 3 minutes as described by Neva and Brown (1994) and the resulting solution was decanted, leaving the sediments, of which a drop was dropped on a glass slide using a Pasteur pippete. A drop of Lugol's iodine was added and covered with a glass slide cover. The slide was viewed under a light microscope at ×10 and ×40 (Jeffrey and Leach, 1975; Cheesbrough, 2013).

Data Analysis

Data obtained were entered into the Microsoft Excel sheets and also analyzed using Microsoft Excel 2016. Chi-square was used to analyze the data obtained.

RESULTS

The eggs and cysts of parasites were observed to contaminate 22(21.2%) of the 104 keys examined, accounting for 1(1.0%) of *Ascaris lumbricoides*, 11(10.6%) of Coccidian oocysts, 2(1.9%) of Mites, 1(1.0%) of *Toxocara* spp, 2(1.9%) *Strongyloides* spp, 3(2.9%) *Cryptosporadium* spp and 1(1.0%) *Schistosoma mansoni*. There was also a co-infection of both *A*. *lumbricoides* and *Toxocara* spp 1(1.0%) (Table 1).

From Table 2, keys that are more in number in a bunch had a higher prevalence of parasite contamination (66.7%) while keys less in a bunch had a lower prevalence. This result is statistically significant (P = 0.03346).

Keys that were owned by a single user were seen to have a high prevalence of parasite contamination as compared to keys that are shared among multiple users; however, the type of key usage was not statistically significant (P=0.66) (Table 3).

Table 4 presents the location of sampling and keys collected from Ribadu Hall 6(30.0%) and 6(30.0%) Suleiman Hall had the highest prevalence of parasitic contamination while those collected from other areas around the campus had a lower prevalence of contamination 3(12.5%). This result is not statistically significant (P=0.289).

Table 1: Parasites identified from keys collected with Ahmadu Bello University, Zaria

Parasites identified	Number of keys contaminated (%)
Coccidian oocysts	11(10.6%)
Cryptosporadium spp	3(2.9%)
Ascaris lumbricoides	1(1.0%)
Toxocara spp	1(1.0%)
Strongyloides spp	2(1.9%)
Schistosoma spp	1(1.0%)
Mites	2(1.9%)
A. lumbricoides and *Toxocara spp*	1(1.0%)
Total	**22(21.2%)**

Table 2: Prevalence of parasites eggs and cysts based on Number of keys (n = 104)

No. of keys Range	No. of keys examined	No. of keys contaminated	Percentage positive	P value
1-7 keys	89	18	20.2%	
8-14 keys	12	2	16.7%	0.0335
15-21 keys	3	2	66.7%	
Total	**104**	**22**	**21.2**%	

Table 3: Prevalence of parasites eggs and cysts based on type of Usage (n=104)

Type of usage	No. of keys examined	No. Positive (%)	P value
Personal	79	20(25.3%)	0.66
Shared	25	2(8).0%	
Total	**104**	**22(21.2%)**	

Table 4: Prevalence of parasites eggs and cysts in regards to location of collection (n=104)

Location	No. of keys examined	No. Positive (%)	P value
Amina Hall	20	4(20.0%)	
Ribadu Hall	20	6(30.0%)	
Suleiman Hall	20	6(30.0%)	0.289
ICSA/Ramat Hall	20	3(15.0%)	
Others	24	3(12.5%)	
Total	**104**	**22(21.2)**	

DISCUSSION

The prevalence of parasite eggs and cysts in this 22(21.2%) showed that keys can serve as channels for transmission of parasites among humans. This can be a result of poor handling and hygiene behavior of the handlers since it is an established fact that when hands are contaminated with eggs and cysts, they can easily be transferred to other objects or surfaces they have contact with (Idowu and Rowland, 2006; Ijaz *et al*., 2013; Umeanaeto *et al*., 2021). Prevalence of parasites eggs and cysts have been reported by Ahmed and Mujittapha (2015) and Nnachi and Chinwe (2023) on naira notes to be 21.9% and 37.5% respectively. A prevalence of 30.8% was reported by Umeanaeto *et al*. (2021) on door handles within Nnamdi Azikiwe University, Awka while Hajipour *et al*., (2020) reported the prevalence of parasites on coins (19.4%) and banknotes (23.6%) within Iran which confirms that parasites eggs and cysts can persist on various object types.

Some of the eggs and cysts of the parasite identified in this study were also reported by other researchers such as Awodi *et al*. (2001), Mujittapha (2015), Umeanaeto *et al*. (2021), Pam *et al.,* (2021), Tadege *et al*., (2022) and Khanum *et* al., (2023); especially *Ascris lumbricoides* and *Strongyloides* spp which were recorded in all the studies. These parasites are those of high socio-economic importance that pose danger and great public health threat to man.

The high prevalence of coccidian oocysts in this study can be attributed to the fact that oocysts generally

have a high tolerance level to harsh conditions as compared to cysts and eggs of other parasites. This tends to make them resistant and they can stay for as long as possible on surfaces, objects, or around the environment, which can lead to their easy transmission to humans and other animals (Berto, *et* al., 2014; Shapiro *et al.,* 2019; N'docho *et al*., 2021).

Although the type of key usage was not statistically significant, personally owned keys had the highest occurrence of intestinal parasites. This shows the extent to which poor personal hygiene of an individual can lead to the dissemination of parasites of public health importance. Shared keys can also pose a danger as the eggs and cysts might have rubbed off onto other handlers' hands leading to a low number of parasites on the shared keys.

The number of keys is statistically significant with high parasitic occurrences in key bunches with more keys, where the number of keys tends to trap eggs and cysts of parasites and this in turn gets rubbed off onto the handler's hands, leading to oral transmission. Ademola, (2012) and Ucheagwu (2015) reported the prevalences of 47.5% and 35.7% respectively, of parasites contamination of hands examined within Zaria and Usman and Aisha (2019) 45.9% prevalence of parasite contamination of fingernails within Kastina. In Ethiopia, Hajare *et al*., (2021) and Tadege *et al*., (2022) reported a prevalence of 46.3% from the hands of food handlers and a 24.3% prevalence of various helminth eggs in fingernails of School children respectively; while Khanum *et* al., (2023) had a very high prevalence of 64% in fingernails of children in Dhakar. This shows how most hands are highly contaminated with parasites which can also be transferred to keys, and where more than one key is in the bunch and is shared by two or more individuals, transmission of parasite cysts or eggs is inevitable.

CONCLUSION

The findings from this study show that eggs and cysts of various parasites occur on keys and the result agrees with previous reports on possible contamination of the different handy objects such as currencies, door handles, keyboards, mouse and phones by different parasite species. The result also revealed that keys can serve as a potential source of infection with intestinal protozoans and helminths, hence, there is a need for keys to be disinfected often and good hand-washing practices should be observed.

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