

A Survey of Parasites on Nigerian Currency Notes in Mubi, Adamawa State, Nigeria

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Abstract

A survey of parasites cysts and eggs on Nigerian currency notes in Mubi metropolis was carried out between September 2019 and March 2020. A total of one hundred (100) samples of lower denominations currency notes; 25 pieces of ₦5, ₦10, ₦20 and ₦50, were collected in separate polythene bags from traders, hawkers, butchers, students and travelers. Each note was rinsed in sterile 0.90% normal saline and the solution was centrifuged using the centrifuge machine and examine microscopically to recover parasite cysts and eggs. Of the one hundred samples examined, 30(30.0%) were contaminated with various species of parasites. The parasites encountered include *Ascaris lumbricoides* ova 9(30.0%), *Hymenolopsi nana* ova 7(23.3%), *Giardia lamblia* cysts 3(10.0%), *Diphyllobothrium latum* ova 3(10.0%) and *Entamoeba histolytica* cysts 8(26.7%). The naira notes were categorized based on physical appearances (dirty and mutilated). About 45% were dirty while 55% were mutilated. Five and twenty naira notes were the dirtiest each with 48%, while ten naira notes were the most mutilated 60%. Ten (22.2%) of the 45 dirty notes were contaminated, while among 55 mutilated notes 20(36.3%) of them were contaminated. Overall, fifty naira notes were the least contaminated with 5(16.7%) parasitic organisms, while ten naira notes were the most contaminated 10(33.3%). The study revealed that dirty naira notes are potential vehicles for parasitic infections to man during handling. Therefore, citizens should be educated on ways of handling money through personal hygiene by not abusing, mishandling or mutilating the naira. People should be encouraged to keep their money clean and secure places and not on dirty surfaces. Also, the Central bank of Nigeria should put in place fast retrieval system which will ensure that mutilated notes do not remain in circulation for too long.

Keywords: Parasites; Currency Notes; Eggs (Ova); Cysts; Adamawa State.

Introduction

The Nigerian currency is called the Naira. Currency notes are used as a means of exchange during buying and selling of goods and commodities; thereby making them agents of disease transmission (Beg and Fisher, 1997). In the past and before the advent of modern currency (notes and coins), trade by barter was used for exchange and business purposes. All over the world, countries use currencies which are often produced in notes and coins, as legal tender in all business transactions. Trade by barter which have been used for exchange, gave way to the age of paper money. The essence of money is now laid bare. Money is wanted not for its own sake but for things it will buy (Samuelson and Nordhaus, 2002).

The naira note is commonly seen to be highly abused especially in the manner by which it is handled. It is thus common to see the naira notes faded, torn,

stapled, cello-taped, squeezed and/or spoilt with pen writing on them (Awodi *et al.*, 2000) Several sources seemed to contaminate the naira including dust from the atmosphere, during storage, usage or handling. Daily transactions have made the naira notes to pass through many dirty hands and in some cases placed in a dirty spot where they could be contaminated with pathogens (Matur *et al.*, 2010). According to Awodi *et al.* (2000), the source of contamination of the naira could be as a result of deliberate careless handling practices like spraying during ceremonies where such notes may be trampled when they fall on the ground.

Parasites are organisms that live in close relationship with other organisms (host) and are capable of causing harm to their hosts. Parasites that have been observed to be contaminants of the naira notes are mainly of fecal origin (Awodi *et al.*, 2000).

Contamination of the naira with parasite cysts, eggs (ova) can be made when hands are used in cleaning up the anus after passing out faeces by an infected person, or not properly washed. Similarly, the naira notes can be contaminated through the use of contaminated water to lubricate the hands while counting currency notes (Ameh and Balogun, 1997). Currency notes being used in day to day transactions are likely to be contaminated with disease causing parasites especially if handled with unclean hands or kept in dirty environment. Hence they present a great risk to public health as communicable diseases can be spread through contact with such contaminated notes (Pope *et al.*,2002; Michael, 2002; Uneke and Ogbu, 2007).

Materials and Methods

Study area

Mubi is geographically located between the Latitudes 10°05', and 10°30'N and the Longitudes 13°10' and 13°30'E of the Greenwich Meridian (Fig. 1). It is mainly drain by the Yedzeram River; a stream that flows northward into the Lake Chad, and is situated on the western flanks of the Mandara Mountains which forms both their drainage system and relief. The area is bounded internationally by the Cameroon Republic on the east side and within the state by Michika Local Government Area to the north, Hong Local Government Area to the West, and Maiha Local Government to the south. Also, it occupies an area of 903km² and has a population of

151, 515 people (Adebayo, 2005; National Population Census, 2006). Mubi exhibits both the dry and the wet tropical climate type which is also referred to as *Aw in koppen's* classification of world climatic region. The dry season begins in November and ends in March, while the rainy season runs from April to October each year. Annual rainfall is about 900mm with the highest frequencies in July and August. Temperature ranges from warm to hot throughout the year but cold period is experienced between November and February with a gradual increase in January to March. The relative humidity of the area is low but begins to rise from April to August.

Land Use and Socio-economic Activities

The growth of Mubi metropolis is traced to the agricultural, administrative, and commercial functions it performs. Mubi metropolis is geographically well placed and functions not only as a Centre of commerce in the region but also extends its sphere of influence to countries such as Cameroun Republic, Central Africa Republic, and Chad. Numerous banks, filling stations and hotels exist in Mubi to support the commercial activities. Another factor that led to the growth of the area is rural-urban migration being experienced from the surrounding villages. Moreover, the area has become a Centre of learning with numerous tertiary and secondary institutions established.

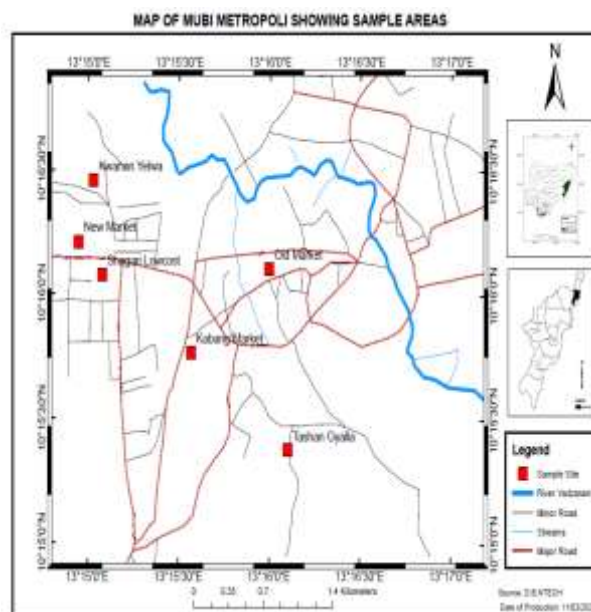


Figure 1: Map of the Study Area

Source: Adebayo, (2004)

Sample collection

A total of 100 samples of Nigerian currency notes consisting of 25 pieces each of lower denomination from 5 naira to 50 naira was collected from butchers, students, traders, travelers, and hawkers from different parts of the town, around Mubi metropolis from September-November 2019. The Naira notes were collected aseptically with hand gloves into a sterile polythene bag and the notes were conveyed to the department of Zoology laboratory of Adamawa State University, Mubi for parasitological examinations.

Grouping of samples

The currency notes were in various physical conditions and were categorized as dirty and mutilated (i.e. damaged, soiled, and squeezed with sole taped).

Ethical considerations

A pre-survey visit to the Central Bank of Nigeria Yola branch was carried out. The intent and justification for the study was discussed with the officials.

Laboratory examination

Laboratory examination of parasites on notes was done following the method described by Matur *et al.* (2010) was used. The working bench was swabbed with 70% ethanol. Each currency note was folded and inserted into a sterile bottle, and 10ml of 0.90% sterile normal saline was dropped on each of the currency notes using a 10ml syringe. Each bottle

was covered and shake vigorously and was left standing for 30minutes and shake all over. The notes were removed using a pair of forceps and was transferred in to sterile polythene bags. The content of each bottle was centrifuged in a 15ml centrifuge at 1500 revolutions per minute for 2minutes. The resultant sediment was examined with a clean grease free slide with a drop of lugols iodine and was examined microscopically at x10 and x40 objective respectively for the presence of parasite cysts and eggs under a binocular microscope.

Statistical analysis

The data obtained was statistically analyzed using chi-square test to evaluate the occurrence of parasites among different naira notes.

Results

Of the 100 samples of currency notes examined, 45% were dirty while 55% were mutilated. Five naira and twenty naira notes was the dirtiest each with 48%, while 10 naira notes were the most mutilated 60%. Overall 30% Of the notes were contaminated with ova and cysts of parasites. Ten (22.2%) of the 45 dirty notes were contaminated, while among 55 mutilated notes, 20 (36.3%) of them were contaminated with parasitic agents as shown in Table 1. Overall, fifty naira notes were the least contaminated with parasitic agents 5(16.7%), while ten naira notes were the most contaminated 10 (33.3%), followed by five naira notes 9 (30%). The difference was not statistically significant (P=0.519).

Table 1: Physical condition of the 100 naira notes and number contaminated

Denomination (Naira)	No examined	Dirty note Frequency (%)		Mutilated note Frequency (%)		Total contaminated No. (%)
		Frequency No.	Number contaminated	Frequency No.	Number contaminated	
5 note	25	12 (48.0)	3(25.0)	13(52.0)	6(46.2)	9(30.0)
10 note	25	10 (40.0)	3(30.0)	15(60.0)	7(46.7)	10(33.3)
20 note	25	12 (48.0)	2(16.7)	13(52.0)	4(30.8)	6(20.0)
50 note	25	11 (44.0)	2(18.2)	14(56.0)	3(21.4)	5(16.7)
Total	100	45 (45.0)	10(22.2)	55(55.0)	20(36.3)	30(30.0)

Cysts and ova of five parasites were recovered. *Entamoeba histolytica* cyst (26.7%), *Giardia lamblia* cysts (10%), *Ascaris lumbricoides* ova (30%), *Hymenolopsi nana* ova (23.3%) and *Diphyllobothrium latum* ova (10%) as shown in Table 2. *Ascaris lumbricoides* ova were more

prevalent on the currency notes with 30%, followed by *histolytica* cyst with 26%, *nana* ova with 23.3%, *lamblia* cysts, while *latum* ova were the least prevalent at 10% each on the currency notes. The difference was not statistically significant (P=0.899).

Table 2: Prevalence of parasitic organisms observed on the currency notes

Denomination (Naira)	Number Contaminated	<i>Entamoeba histolytica</i> cyst (%)	<i>Giardia lamblia</i> cysts (%)	<i>Ascaris lumbricoides</i> Ova (%)	<i>Hymenolopsi nana</i> ova (%)	<i>Diphyllobothrium latum</i> ova (%)
5	9	3(37.5)	1(33.3)	2(22.2)	2(28.6)	1(33.3)
10	10	1(12.5)	1(33.3)	3(33.3)	3(42.9)	2(66.7)
20	6	2(25.0)	0(0.0)	3(33.3)	1(14.3)	0(0.0)
50	5	2(25.0)	1(33.3)	1(11.1)	1(14.3)	0(0.0)
Total	30	8(26.7)	3(10.0)	9(30.0)	7(23.3)	3(10.0)

$X^2 = 6.329$; $df = 12$; $P = 0.899$

Discussion

The result obtained from this study showed that Nigerian currencies in circulation within Mubi metropolis are likely to be contaminated with different parasite species as was discovered elsewhere in Nigeria (Ogo *et al.*, 2004; Ameh and Balogun, 1997). A prevalence rate of 30.0% was recorded for cysts and eggs of various parasites on different categories of dirty and mutilated naira notes. This agrees with the findings of Jalaoso (1991) and Ameh and Balogun, (1997) that dirty naira notes are a potential source of contacting disease agents. It was observed that the presence of dirt on the notes was related with the presence of cysts or eggs of parasites. Once a note had dirt on it, there was a high chance that it could harbor cysts and eggs of parasites on it, this was the general trend among lower denominations. The findings from this study strongly reveal the reflection of the present situation in the country where by, despite the poor economic circumstances, the lower denominations are used in daily transactions, has suddenly flooded the markets and became readily available at all levels of daily transactions.

Moreover, the findings from this research showed, the fact that five (N5) and ten (N10) naira notes are polymer type and yet are highly contaminated, suggest the fact that these currencies are commonly seen in the hands of children, beggars and small petty traders who are the most vulnerable groups to parasitic infection. Previous researches have revealed that parasite cysts and eggs are most prevalent on very dirty and mutilated currency notes (Ogo *et al.*, 2004; Uneke and Ogbu, 2007; Elom *et al.*, 2012).

Nock and Tanko (2000) reported on the prevalence of cysts and eggs on the contamination of currency notes in after visiting the toilets by staff and students. Similar result was obtained in Zaria in

which oocysts and coccidian was reported with the highest prevalence of 64%; cysts of *Entamoeba* 16% and eggs of *Ascaris* 45% and hookworm 35% respectively. Awodi *et al.* (2000), reported a total of 7.9% prevalence of parasitic cysts and eggs on the finger nails of primary school pupils of both (public and private) in Zaria of which *Schistosoma mansoni* (1.3%) *Taenia* (11.4%), *Ascaris* (19%), *hookworm* (18%) mite and adult louse of 13% (ecto-parasite), mite eggs 38% were observed. Counting 24 bunches of Naira notes resulted in recovery of oocysts of *isospora* species and eggs of *Taenia spp*, hookworm and mites from the hands of those counting the notes (Awodi *et al.*,2000).

Automated teller machines and currency counting machines have been observed to be infected with parasite cysts presenting a risk to bankers and customers (Enemuor *et al.*, 2012). A study in Nigeria reported that contamination was significantly correlated with the denomination of notes. Lower denomination notes were more contaminated than higher denomination notes. Higher denominations currency showed lower contamination of parasite cyst (Neel, 2012).

Parasite cysts and eggs isolated from the notes are those of high socio-economic importance that pose danger and great health consequences to man. For instance, the ova of *Ascaris lumbricoides* 9(30.0%) and cyst of *Entamoeba histolytica* 8(26.7%) that was observed as contaminant of naira notes earlier can be easily transmitted via the oral route, hence, this can be very troublesome and risky when we look at the fact that it is common to see people tongue-wetting their fingers when counting money, storing currency notes in socks, bras, under caps and carpets thereby possibly contaminating their fingers used to handle or eat food. Moreover, it is common to see people continuing their normal activities after counting money with their hands without bothering

to wash/clean their hands, no matter the condition of the currency. Also, it is common in this area to see children and even adults putting naira notes in their mouth which facilitates infection. The source of contaminating the naira note has long been discovered to include poor handling practices such as spraying during ceremonies and mingling on dirty hands contaminated with human and animal fecal matters (Dada and Bellino, 1979; Fashuyi, 1983; Adelowo, 1990).

In this study, the eggs/ova of *A. lumbricoides* ova 9(30.0%), *E. histolytica* cyst 8(26.7%), *Giardia lamblia* cyst 3(10.0%), *Hymenolopsi nana* ova 7(23.3%) and as well as *Diphyllobothrium latum* ova 3(10.0%) were isolated from the naira notes. The isolation of these parasite species transmits a serious warning of the consequent health implication to man due to contamination of the naira notes. It is clear that naira notes and their circulation have no borders; hence everybody is at risk and also need to take caution. Our findings obviously suggest that the results from this study is far from being exhaustive as more parasite eggs and cysts could be detected with increase in screening as suggested previously (Hotez *et al.*, 2003).

Recommendation

- The government should enhance public enlightenment campaigns against the abuse of the naira and create awareness on the possible consequences of the naira abuse.
- The government should enforce laws against open defecation, poor animal husbandry and improper wastes disposal. The public should be educated on the need to wash hands after counting money and after visiting toilet.
- People should be educated on the need to use wet pads or simply clean water instead of tongue wetting the fingers while counting money.
- Very dirty and mutilated naira notes should not be allowed to continue circulating in the markets. They should be withdrawn from circulation whenever they are received by banks.

Conclusion

The findings from this study are in agreement with previous reports on possible contamination of the currency notes by different parasite species. The

result also revealed that the naira notes circulating in the study area are not only poorly handled but could be a potential source of contacting parasitic infections as reported earlier in other parts of Nigeria (Jalaoso, 1991; Ameh and Balogun, 1997). Therefore, strategies to reduce the contamination of our dear currency (naira), especially where environmental conditions favor the abundance of many parasites should therefore be recommended. The potential of contacting parasitic infections from dirty naira notes probably depends on the length of time they are allowed in circulation. In Nigeria, it is commonly observed that banks continue to release dirty and even mutilated notes into circulation, these notes emit very bad odor apart from being an eye sore (Jalaoso, 1991, Ameh and Balogun, 1997).

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