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# MICROBES ASSOCIATED WITH CURRENCY NOTES IN CIRCULATION WITHIN DUTSIN-MA METROPOLIS, KATSINA STATE, NIGERIA.

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**Abstract**
This study was conducted to determine the level of contamination of naira notes in Dutsin-ma metropolis. A total of 216 naira notes of all denominations (₦5, ₦10, ₦20, ₦50, ₦100, ₦200, ₦500 and ₦ 1000) were randomly collected from students, butchers, food vendors, Commercial motorcycle riders, Bus conductors and beggars and analyzed in Biology laboratory using rinse method. The eggs of some the parasites identified with various prevalence rates from the naira notes were *Ascarislumbricoides* (4.63%), hookworm (3.24%), *Trichuris trichuira* (2.31%) and *Entamoeba histolytica* (1.85%). The very dirty/mutilated notes were more contaminated (26.38%) then the dirty ones. One hundred naira (₦100) notes had the highest contamination of 33.33% followed by the ₦200 with 25.73% and ₦500 (22.22%) and ₦1000 was the least with (14.81%). Contamination was highest on naira notes collected from butchers (19.4%) and food vendors (16.7%) followed by commercial motorcycle riders (11.1%) while notes from students, beggars and bus conductors record the least prevalence rates of 8.3% each. There was a statistically significant association between parasitic eggs contamination and physical condition of the currency ($p \leq 0.05$) while the association between the prevalence of parasitic eggs contamination of the naira notes and the source was found not statistically significant ($p \geq 0.05$). The result of this study shows that currency notes in circulation within Dutsin-ma metropolis could serve as a vehicle for the transmission of diseases. Good personal hygiene practices such as washing of hands after handling currency is recommended.

***Keyword:*** *Microbes, Contamination, parasitic eggs*

## Introduction

Money is defined as a generally accepted material, even a piece of paper embodying a promise, that is, a currency note, which is used as a means of exchange and measure of value (Sanjogita and Geeta ,2014). Paper currency is extremely important because it is widely exchanged for goods and services worldwide (Pope *et al.,* 2002; El-Dars and Hassan, 2005). It is one of the earliest and most significant inventions essential to the development of trade (Ramsden, 2004). Microbial contaminants may be transmitted, either directly, through hand-to-hand contact, or indirectly via food or other inanimate objects. These routes of transmission are of great importance in the health of many populations in developing countries, where the frequency of infection is a general indication of local hygiene and environmental sanitation levels (Cooper 1991).

In day to day transactions, money is handled by persons of varying health and hygienic standards and also stored under varying environmental and personal hygienic conditions. In most of the countries, poor currency handling culture is widespread, and there is indiscriminate abuse of currency notes. An individual living in unhygienic conditions and having unhygienic habits will contaminate the notes e.g., keeping currency notes in socks, shoes and pockets, under the carpet or rugs and squeezing them in the hand frequently introduces an array of microbes to the notes Delghani *et al.,* (2011). Attitudes such as the wetting of hands or fingers with saliva or use of contaminated water to lubricate the hand in counting money and use of food contaminated fingers in handling currency notes may not only enhance the contamination of currency notes but may also increase the risk of infection from contaminated ones. In addition, contamination of currency notes can also be traced to dust, soil, water, microflora of the body of handlers (hand, skin, etc.,) (Awe *et al* .,2010).

Paper currency can also be contaminated by droplets during coughing, sneezing, touching with previously contaminated hands or other materials and by their placement on dirty surfaces (Ahmed *et al*., 2010). Contamination from the anal region, wounds and nasal secretions are also potential sources of transfer of microorganisms to currency notes during handling (Igumbor *et al.,* 2007). Source of contamination could also be due to poor or negative money handling practices like spraying during ceremonies where such notes may be trampled upon when they fall on the ground (Ogo *et al.*, 2004). In light of this study was aimed at assessing the prevalence of microbes associated with currency notes in circulation within dutsin-ma metropolis, with objectives to determine the prevalence of parasites contamination on paper currencies note (naira), and level of parasites contamination between the lower and higher denomination in circulation, as well as to determine the type of parasites found on the paper currencies note (naira).

## Material and Methods

### Study Area

The study was conducted in Dutsinma Metropolis, Katsina State North western Nigeria. The local government is located on Latitude 12° 27'18"N and longitude 7° 29'29"E, and situated in Northern Guinea savannah zone of Nigeria. The town has a total area of 527km (203sqkm). Average temperature is between $27^0$-$32^0$C and with an estimate

population of about 169,671 inhabitants. It has a tropical continental climate with distinct wet and dry season .The Local Government is bounded by Kurfi and Caranchi Local Governments to the North, Kankia Local Government to the East, Safana and Dan- Musa Local Governments to the West, and Matazu Local Government to the Southeast. Agriculture is the main occupation of the people and are predominantly farmers, cattle rearers and traders (Abaje., *et al* 2012).

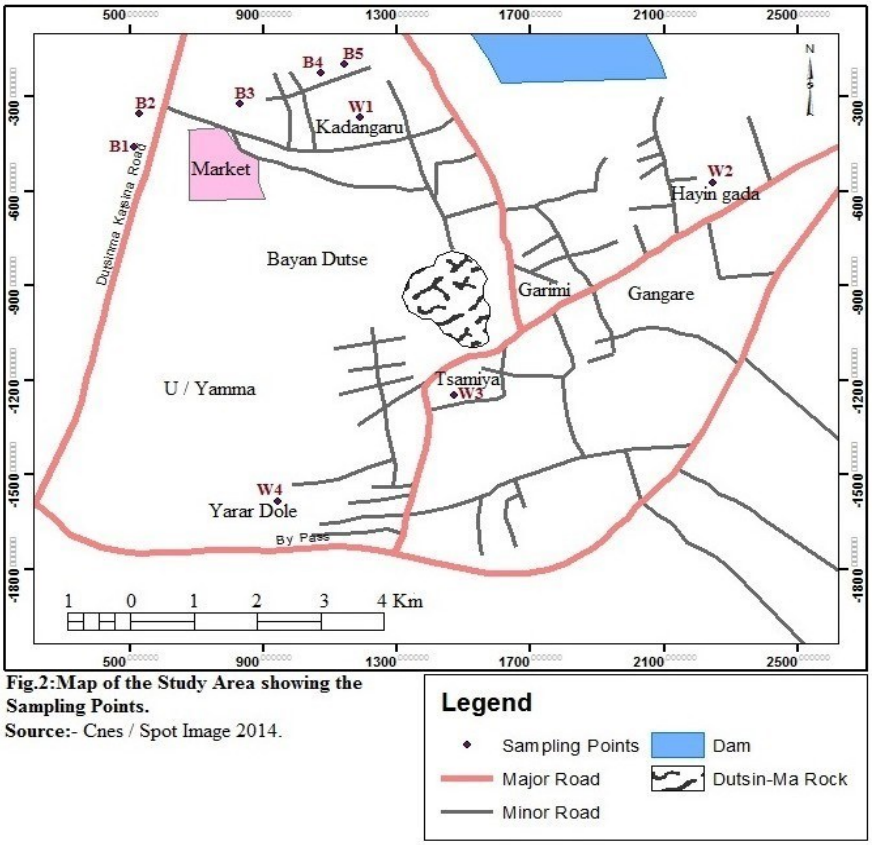


**Fig.2:Map of the Study Area showing the Sampling Points.**
**Source:**- Cnes / Spot Image 2014.

**Map of Dutsin-ma metropolis**

### Sample Collection and Categorization

A total of 200 samples of Nigerian currency naira notes of all denominations (N5, N10, N20, N50, N100, N200, N500 and N 1000 notes) in Dutsin-ma local government area were randomly collected from different sources including students, food vendors, butchers, car drivers, beggars, bank workers and petrol stations attendants between may 2017 and August 2017. Each currency note was collected using hand gloves and directly put into polythene bags appropriately labeled according to their denominations and transported to the Laboratory of the Department of Biological Sciences Federal University Dutsin-ma for eggs examinations. The bank notes were separated into three categories based on their physical conditions which include clean, dirty, and very dirty/mutilated. The term "clean" described notes that had clean appearance without any obvious damage. The dirty notes referred to notes that have considerable amount of dirty on them. The very dirty/mutilated notes were those that were faded, damaged, soiled or held together with bits of sticky tape

### Procedure for Examination of the Naira Notes for Parasitic Contamination

The rinse method of 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 10 ml of 0.85% sterile normal saline was dropped on each of the currency notes using a 10 ml syringe. Each bottle was covered and 'stirred vigorously and left standing for 30 minutes and 'stirred all over again. The notes were removed using a pair of sterile forceps and transferred to sterile polythene bags. The content of each bottle were centrifuged in a 15 ml centrifuge at 1500 revolutions per minute for 2 minutes. The resultant sediment was stirred with a clean applicator stick and a drop was placed on a clean grease free slide with a drop of Lugols iodine (5%) and examined microscopically at x40 and x100 for the presence of parasite eggs and cysts under a compound binocular microscope

**Method of data analysis**

Data obtained from the laboratory examination of the naira notes was analyzed using tables, Simple percentage and Chi square test at 0.05% level of significance.

Results of the 216 samples of currency notes examined for parasitological contamination 26 (12.04%) were contaminated with eggs of *Ascaris lumbricoides* (4.62%), *Hookworm* egg (3.2%), *Trichuris trichuira* eggs (2.31%) *Entamoeba histolytica*cyst (1.85%). One hundred naira (₦100) notes were the most contaminated (33.33%) followed by ₦200 (25.92%) then ₦ 500 and ₦ 1000 each having a contamination rate of 22.22% and 14.81% respectively. None of the polymer naira notes (₦5, ₦10, ₦20, ₦50) had any parasitic eggs contamination eggs.

**Table 1. Prevalence of parasite species in relation to currency denominations**

| Denomination (naira) | Number Examined | Number Contaminated (%) | *Ascaris* Eggs (%) | *Hookworm* Eggs (%) | *Trichuris Trichuira* Eggs (%) | *Entamoeba histolytica* Eggs (%) |
|---|---|---|---|---|---|---|
| 5 | 27 | 0(0) | 0(0) | 0(0) | 0(0) | 0(0) |
| 10 | 27 | 0(0) | 0(0) | 0(0) | 0(0) | 0(0) |
| 20 | 27 | 0(0) | 0(0) | 0(0) | 0(0) | 0(0) |
| 50 | 27 | 0(0) | 0(0) | 0(0) | 0(0) | 0(0) |
| 100 | 27 | 9(33.33) | 5(18.52) | 2(7.40) | 1(3.70) | 1(3.70) |
| 200 | 27 | 7(25.73) | 3(11.11) | 2(7.40) | 2(7.40) | 0(00) |
| 500 | 27 | 6(22.22) | 1(3.70) | 1(14.28) | 2(7.40) | 2(7.40) |
| 1000 | 27 | 4(14.81) | 1(3.70) | 2(7.40) | 0(00) | 1(3.70) |
| Total | 216 | 26(12.04) | 10(4.63) | 7(3.24) | 5(2.31) | 4(1.85) |

Table two shows that very dirty/mutilated notes had a higher eggs contamination (26.38%) and the dirty naira notes (9.7%).While the clean notes had no eggs contamination. There was a statistical significant difference between eggs contamination and physical condition of the currenc

**Table 2. Prevalence of Parasites in Relation to Condition of Currency**

| Currency Condition | No. Examined | No. Positive | Percentage positive (%) |
|---|---|---|---|
| Clean | 72 | 0 | (0) |
| Dirty | 72 | 7 | (9.7) |
| Very dirty | 72 | 19 | (26.38) |
| Total | 216 | 26 | (12.04) |

$X^2$cal=18.7035

$X^2_{(2)}$tab=5.991

$X^2$cal>$X^2$tab i.e 18.7035>5.991

Naira notes collected from butchers had the highest prevalence of parasitic eggs contamination (19.4%) followed by notes collected from food vendors (16.7%). Naira notes collected from commercial motorcycle riders had a parasitic eggs contamination of 11.1%, while that of students, beggars, bus conductors each has a parasitic eggs contamination of 8.3%. The observable difference in eggs parasitic eggs contamination with respect to the source was not statistically significant.

**Table 3. Prevalence of Parasites in Relation to Currency Sources**.

| Source of Currency | No. Examined | No. Positive (%) |
|---|---|---|
| Students | 36 | 3(8.3) |
| Commercial motorcycle riders | 36 | 4(11.1) |
| Food vendors | 36 | 6(16.7) |
| Butchers | 36 | 7(19.4) |
| Beggars | 36 | 3(8.3) |
| Bus conductors | 36 | 3(8.3) |
| Total | 216 | 26(12.03) |

$X^2cal=3.37$

$X^2_{(5)}=11.071$

$X^2cal<X^2tab$ i.e $3.37<11.071$

## Discussion

The results obtained from this study shows that some Nigerian currencies in circulation within the Dutsin-ma local government area are contaminated with different eggs as discovered in other parts of Nigeria (Matur *et al.,* 2010). An overall prevalence rate of 12.03% was recorded for the currencies examined in this study.The presence of these parasites on the naira notes posses health risk to the masses in Nigeria where people do not wash their hands after counting dirty naira notes. *Ascaris lumbricoides* and *Entamoeba histolytica* are transmitted orally. *Ascaris lumbricoides* causes ascariasis, a disease that is spread through oral contact with materials contaminated with the ova of *Ascaris*. Infection with the *Ascaris* may cause abdominal pains or intestinal obstruction. *Entamoeba histolytica* causes the diseases amoebiasis which is spread orally through ingestion of the eggs. The pathology on the invasive form amoebiasis is manifested with amoebic dysentery, liver abscess or possible death.

Only the paper naira notes (₦ 100,₦ 200,₦ 500,₦ 1000) were observed to be contaminated with parasitic eggs, with N100 notes having the highest prevalence of parasitic eggs contamination of (33.33%). The polymer notes (₦ 5,₦10,₦ 20 and ₦ 50) examined had no parasitic eggs contamination. The plausible explanation of this result might be that the surface of naira notes made of paper can enhance attachment of parasites and retain moisture for their survival. This result agrees with Dehghani *et al.,* (2011), that the degree of contamination and types of micro-organisms present on the currency notes is dependent on sanitary conditions of the area, micro-organism Endemocity and texture of the currency. The report of the absence of parasite on the polymer naira notes does not agree with Enemuor *et al.,* 2012 and Matur *et al*., (2010) who reported the contamination of naira notes circulationin FCT, Abuja and Abakaliki respectively. However the result was agrees with that of Uneke, (2007).

*Ascaris lumbricoides* eggs, occurred has the highest frequency in this study because of the resilience of the eggs that can withstand extremes of contaminated conditions. Significant differences were found between parasitic eggs contamination and the condition of the currency ($P \leq 0.05$) with higher rates of parasitic contamination on the dirty/mutilated notes. This could be as a result of the fact that the dirty and very dirty notes have been in circulation for a very long time and have changed hand so frequently that they were exposed to been contaminated. This is in accordance with the work of Ogo *et al.,* (2004), this finding has very important health and economic implications especially in underdeveloped and developing tropical nations of the world particularly Asia and Africa. The climatic and environmental conditions of the tropics favour the thriving of many pathogenic micro-organisms and in the face of underdevelopment, inadequate water and sanitation, crowded living condition, lack of education, a greater population of the populace, particularly the poor, become highly susceptible to infection and disease, (Awodi *et al*., 2001).

## Conclusion

The research has revealed that some paper notes in Dutsin-ma metropolis were contaminated with eggs of parasites. The contamination of the naira notes with eggs of parasites showed that naira notes can serve as vehicle for the parasites from an infected person to healthy individual. The parasites eggs found in this research are that of *Ascaris lumbricoides* , *Hookworm* , *Trichuris trichuira* and *Entamoeba histolytica*. The research showed that ₦100 and ₦200 denominations have the highest parasitic eggs count. Naira notes obtained from butchers showed the highest rate of parasitic eggs count.

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