PUBLIC HEALTH SIGNIFICANCE OF PARASITE EGGS AND CYSTS CONTAMINATION ON NAIRA NOTES FROM FOOD VENDORS IN THINKERS` CORNER ENUGU STATE

BY

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U14/NAS/MCB/081

A RESEARCH PROJECT SUBMITTED TO THE DEPARMENT OF MICROBIOLOGY,

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**CHAPTER ONE**

**INTRODUCTION**

**PUBLIC HEALTH**

Public health is the severe art of preventing disease, prolonginglife and promoting human health through organized efforts and informed choices of society, organizations, public and private communitiesand individuals. Analyzing the health of a population and the threats is the basis for public health. The public in question can be a small group of people, an entire village or it can be as large as several continents. Health is said to be the physical, mental and social well being and not merely the absence of disease. Public health aims to improve the quality of life through prevention and treatment of disease including mental health. It is done through surveillance of cases and health indicators, also through promotion of healthy behaviours.

**PUBLIC HEALTH PREVALENCE AND SIGNIFICANCE**

The focus of a public health intervention is to prevent and manage diseases, injuries and other health conditions through surveillance of cases and the promotion of healthy behaviours, communities and environments. Many diseases are preventable through simple non-medical methods for example; the simple act of hand washing with soap can prevent the spread of much contagious disease. In other cases, treating a disease or controlling a pathogen can be vital to preventing its spread to others either during an outbreak of infectious disease or through contamination of food or water supplies. Public health contamination programmes, vaccination programmes are common preventive health measures. Public health plays an important role in disease prevention efforts in both developing world and developed countries through local health systems and non-governmental organizations. The World Health organization (WHO) is the international agency that coordinates and acts on global public health issues.

**Parasites**

A parasite is an organism that lives on or in a host and gets its food from or at the expense of its host. Parasites can cause diseases in humans. Some parasitic diseases are easily treated and some are not. The burden of these diseases often rests on communities in the tropics and sub-tropics but parasitic infections also affect people in developed countries. Parasitic organisms get their food from or at the expense of their host. There are three main classes of parasites that can cause diseases in humans.

**Protozoa**

**T**hese are microscopic one celled organisms that can be free living or parasitic in nature. They are able to multiply in humans which contribute to their survival and also transmit serious infections. Transmission of protozoa that lives in a humans intestine to another humans intestine typically occurs through a fecal-oral route .Example is contaminated water or food or person to person contact. Virtually all humans have protozoa living in or on their body and many persons are infected with one or more species throughout their life. Some species are considered commensals i.e. they are not harmful whereas others are pathogens and normally transmits disease.

**Helminthes**

**T**hey are large multi-cellular that is generally visible to the naked eyes in their adult stage .Like protozoa, helminthes can either be free living or parasitic in nature. In their adult form, Helminthes cannot multiply in humans, There are three main pathogen groups of helminthes that are human parasites.

Flat worms (*platyhelminths*)

Thorny-headed worms (*acanthocephalins*)

Roundworms (*nematodes*)

**Ecto-parasites/Endo parasites**

Although this could broadly include blood sucking arthropods such as mosquitoes, it is generally used more narrowly to refer to organisms such as tick, fleas, lice, and mites that attach or borrow into skin and remain there for relatively long periods of time.

**Endo-parasites**

These are parasites that live inside their host. They are of two forms; the inter cellular and intra cellular parasites are those that inhabit the spaces of the body of the host, they live within the cell of the host the intra cellular parasites.

**Aim**

To determine the prevalence of parasitic eggs and cysts on Naira Notes from Food vendors in Thinkers ‘corner Enugu State.

**Objectives**

**1.** To swab Naira Notes and identify the parasite and cyst on Naira the notes.

**2.** To determine denomination that are carriers of parasitic eggs/cysts.

**CHAPTER TWO**

**LITERATURE REVIEW**

In ancient times, people did not need money. They practiced trade by barter. In the early 1800s and 1900s, scientists began to theorize that transmission of money was associated with the transmission of diseases (Alemu,2014). A paper currency note is widely exchanged for goods and services worldwide and was first developed in china (Prasai et al.,2008). Money is used as a medium for exchange of goods and services, settlement of debts and for deferred payments in economic activities(Beg and Fisher,1997).money is the most widely used and sought after service on planet earth with the potential of changing from one user to the other thus increases the spread of disease and a risk to public health(Neel,2012).An individual living in unhygienic condition will therefore contaminate the notes and these acts as a vehicle to the next user(ogba,2007). currency is handled by large number of people under a variety of personal and environmental vehicle for transmission of potential pathogenic organisms. Paper currencies provide a large surface area as breeding ground for pathogens(Micheal,20002).The contamination of notes could be from several sources that is the atmosphere, storage, usage, handling or production (Matur et al.,2008).Daily transactions has made money to pass through many hands .The Naira(N) is the legal tender in Nigeria. Lower denominations of currency are exchanged more than higher denominations because they are frequently handled in petty daily transactions, more widespread and exchangeable between lower economic classes. Higher denominations show lesser contamination(Matur et al.,2008,Awodi et al.,2000,Oyera and Enukpe,2007).Paper notes have been shown to be more contaminated than polymer notes (Oyero and Enukpe.,2007).The Nigerian note is a mixture of 75% cotton and 25% Linen(Brady and Kelly,2000).

A lot of studies have been carried out on microbial contamination of currency with viruses, bacteria and fungi (Alemu, 2014, Brady and Kelly, 2000, Umeh et al., 2017). Accumulated data over the last 20years on microbial status and survival of pathogens’ on currency notes indicated that they represent a potential cause of food borne diseases(Alemu.,2014).Microbes are ubiquitous and their ability to contaminate objects is more prevalent when compared to parasites(Jolaosho.,1991).Parasites with direct life cycles do not need an intermediate ingestion of eggs or cysts and this can be from contaminated surfaces like banknotes. Parasites have been observed to be able to contaminate naira notes are mainly of fecal origin(Awodi et al.,2000).Currency notes with parasites have been detected in Nigeria by several scientists. Parasites that have been isolated from currency in Nigeria are eggs of worms like *Ascaris* *lumbricoides*, *hookworms*, *trichuris* *trichiura*, *Enterobius* *vermicularis*, *Taenia*,*Toxocara*, *Hymenoplepsis* *nana* and *dimunta* (Ameh and Balalogun,1997).Parasites are organisms that are entirely dependent on other organism(Hosts) and are capable of causing harm to their host. When hands used in cleaning up the anus after passing out feces are not properly washed and are used in touching the naira notes, theres tendency that there will be contamination with the trophozoite of the developed parasites if the stool is infected. Other way by which the currency can be contaminated such as tongue-wets of fingers with saliva or use of contaminated water to lubricate the hand in counting leads to possible transfer of parasites to the notes(Amen and Balogun,1997).

2.1. PARASITES CLASSIFICATION

The word parasites originate from two Greek words Para which means beside and sitos which means food. A parasite is an organism that is entirely dependent on another organism, referred to as the host, for all or part of its life cycle and metabolic requirements. In a strict sense, the term parasite can simply be said to be referred to any infectious agent but mostly, it is generally restricted to infection caused by protozoa and helminthes. (Suleman, 2005).

They are two major types of parasites

1. The micro parasites are small and unicellular, occurs within its host cells. Protozoa are micro parasites.

2. The macro parasites are basically large and do not have direct reproduction within its vertebrate host. The helminthes are included in this category (Arora and Arora,2000).

2.1.1 THE PROTOZOA

Protozoa are small organisms that multiply within their vertebrae host. Among the protozoa that can infect and cause disease in man are those associated with excreta and found in intestinal tract(WHO, 1994, Suulaiman,2005).Protozoa which are eukaryotic and unicellular belong to the kingdom protista and Helminths which are eukaryotes and multicellular belong to the kingdom animalia,it makes up approximately 70percent of all invading organisms. Certain protozoa, through intensensly rapid reproductive ability, can take over the intestinal tract of their host and from there go on to the other organs and tissues, some feed on red blood cells, some protozoa produce cysts-closed sacs in which they may be safely transported through food and water from one person to another. In the cyst state, protozoa are safe from destruction by human digestive tissuses.These one celled parasites can actually destroy the tissues of their hosts. Common protozoa includes *enndolimax*, giadia *lambia ,entamoeba histolytica, cryptosporidium nana parvum, blastocytis* *hominus, trichiomonas vagiunalis ,toxoplasma gondii, cryptosporidium* *muris*, *leishmanania* *donovanii* (WHO,1994; Suleiman 2005)

2.1.2 THE HELMINTHS

Helminths or parasitic worms are multicellular, bilaterally symmetrical, elongated, flat or round animals. They are usually transmitted to humans during the consumption of raw mammal meat and through fecal route (Pozio, 2001).

Helminthes which occur as parasites in humans belongs to two phyla;

1*. Phylum Plathyhelminths*

2*. phylum Nematoda*

*Phylum* *plathyhelminths* are also known as flat worms, are dorsal ventrally flattened leaf like. Their alimentary canal is incomplete and body cavity is absent, are mostly hermaphrodites.

Human pathogenic helminthes of this phylum belong to two classes; The *cestoidean* and The *trematodea* (Arora and Arora,2008).

*Phylum* *nematodea* are unsegmented worms with complete alimentary canal, no circulatory system with a simple excretory organ/system and have a body cavity with hydrostatic pressure (WHO,1994).

**2.1.3 SOME COMMON PROTOZOA**

***Amoeba***

A genus of protozoan parasites belonging to the phylum *sacromastigophora*.There are three species infecting man namely, *Entamoeba* *coli*(non pathogen) infects the intestinal tract, *entamoeba* *gingivitis* inhabits the mouth and *entamoeba* *histolytica*(pathogen) is the cause of amebiasis or amoebic dysentery which is a worldwide infection affecting approximately 500 million people in tropic. The protozoa alternate between a trophozoite and a cyst. Amoeba passes its life cycle only in one host. Man acquires infection by injection of mature quadrinucleate cysts in feacally contaminated with food. Within the small intestine the cyst wall is lysed to form trophozoites (Kathleen and Arthur.2002).

***Girdia Lamblia***

The parasites cause giardiasis infection. The flagellates *Girdia* intestinals was first observed by Antoine Van Leuwenhoek (Arora and Arora, 2000).it is the most common flagellate and is indicated by its trophozoite having a unique, symmetrical heart shape organelle positioned in a way that makes it look like a face. The cysts are small, compact and multinucleate and can survive for two months in the environment. Infection is acquired by ingestion of cysts in contaminated food and water.

***Cryptosporidium parvum***

A protozoan pathogen of the phylum picomplexa. It causes a diarrheal illness called cryptosporidiosis. At first, cryptosporidium was considered as an intestinal aliment mainly to calves, pigs, chicken and other poultry but infection is initiated when cysts are ingested from focally contaminated food and water. The cysts give rise to sporozoites threat penetrate the intestinal cells and live intracellular in them (Kathleen and Arthur,2002). In other cases, cryptosporidium causes gastro intestinal illness and is characterized by watery stool with mucus. People who are immune-compromised are threatened by this parasites because diarrhea one of its symptoms of the becomes more severe with time and results in a prolonged life threatening cholera like illness (Arora and Arora,2000).

***Isospora belli***

It is an uncommon human intestinal parasite with a distinctive oocyst stage transmitted through feces contamination that causes coccidiosis. Man acquires the infection by ingestion of food or water contaminated with sporrulated oocysts from contaminated soil. The infection is usually asymptomatic or self limited. The most prominent symptoms are malaise, nausea and vomiting, diarrhea, fatty stool, abdominal coli and weight loss (Krupp and Mutton, 1973).

SOME COMMON HELMINTHS

***Ascaris Lumbricoides***

It’s a giant intestinal roundworms that probably account for the greatest number of worm infections. The eggs hatch in the small intestine releasing motile larvae which penetrate the wall (Krupp and Milton., 1973). The females are 20-30mm long and 5-6mm in diameter while the males are smaller.

***Trichuris trichura***

The common name for *trichuris* *trichura* is called whipworm which is reffered to its likeness to a miniature buggy whips (Kathleen and Arthur, 2002).The worms are white in colour with the females longer. The eggs are barrel shaped with a mucus plug at each pole. Infection is acquired by ingesting embryonated egg with contaminated food or water. It is common parasite to man (Krupp and Milton, 1973). Embryonic eggs deposited in the soil are not immediately infective until two to four weeks in a favourable soil (Hoeprich, 1975).

***Enterobius Vermicularis***

The worm is also pinworm (Krupp and Milton, 1973) with a round white coloured 12-13mm long that usually infect the area around the anus and parts of the intestine. The worm is the most commonly seen intestinal parasite in a primary care practice (Franchot and Nicky, 2000). The embryonated pinworm egg has hyaline shell and is asymmetric with one flattened side (Hoeprich, 1975). The worm results to itchiness around the anus and between the legs. Girls may have vaginal itching if the worms crawled forward (Franchot and Nicky, 2000)

***Taenia Species***

A number of species of adult tape worm have recorded as human parasite, although both *taenia* *saginata* and *taenia* *solium* are cosmopolitan in distribution. Infections in man are limited to the area in which ingestion of raw or inadequately cooked beef or pork. Tapeworm often exceed 10feet in length. The gravid segment of the worm detach themselves from the chain and exapes from the host intact or ruptures within the host releasing eggs in feces(Krupp and Milton,1973).

**2.2 SIGNIFICANCE, PREVALENCE AND DISTRIBUTION OF** **PARASITE EGGS/CYSTS**

Parasitic infections are a global problem worldwide more than a billion people who are estimated to be infected with just one species of parasite *Ascaria* *lumbricoides*, mostly in developing countries (Harlay et al.,2001).Human association with enteric parasites extends into human history(Alum et al.,2010; Stephenson et al.,2000).

Some of these enteric parasitic agents also called neglected intestinal parasites are responsible for causing not only chronic infection predisposing to malnutrition in children thereby lowering their resistance to infectious diseases but further leads to malabsorption of nutrients critically required for child`s growth and cognitive development(Jasti et al.,2007; Bradley and Jackson;2004). This leads to the development of a vicious cycle of malnutrition. For example, *A*.*lumbricoides*, a soil transmitted helminthes sheds up to 200,000 ova per day in the faeces of infected person. With effective collection and treatment of human waste particularly in developing countries *A*. *lumbricoides* ova widely contaminate the environment essentially maintaining a vicious cycle of malnutrition-enteric parasite malnutrition synergy in human population living under unhygienic conditions as seen in most developing countries today (Cancrrinic;2006).

Parasitic disease have existed since ancient times but are still major public health problems today which are influenced by many factors including rapid travel, immigration and the increase in the number of immune compromised patients(Kathleen and Arthur;2002). The distribution of disease worldwide is striped by the difference between developed and developing countries (Gerald and Larry, 2006). In southern and eastern United States, it’s estimated that up to 10% of the total population in endemic areas is infected with whipworms (Hpeprich, 1975). Comparison in Latin America reported that parasitic infection is serious threat to child survival among the children under the age of five worldwide. In Nigeria, high prevalence of intestinal parasites ranging between 14% and 42% especially in the communities without has been reported (Nwosu, 1979). Nock and Geneva (2002) reported on the prevalence of cysts and eggs on the handle of water closets in the toilets used by staff and students. Similar result was obtained in Zaria in which oocysts and coccidan was reported with the highest prevalence of 64%; cysts of Entamoeba 16% and eggs of *Ascaris* 45% and hookworm 35% respectively (Nwosu 1979). Dyek,(2001) 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 *schistosome* *mansoni* (1.3%) *Tania* *spp*(11.4%), *Ascaris* *spp*(19%), *hookworm*(18%) mite and adult louse of 13%(ecta parasite), mite eggs38% were observed. Counting 24 bunches of Naira notes resulted in recovery of oocysts of isopera species and eggs of *Teania* *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). In Nigeria, poor currency handling culture is widespread and there is indiscriminate abuse of currency notes with a great majority of the populace not carry money in wallets. The squeezing of currency notes is a major occurrence. Women especially among the unenlightened often place their brassier while men place theirs under socks. These activities not only enhance currency contamination but also may increase the risk of infection from conminated notes. The situation is further compounded by the inability of the Nigerian government to consistently withdraw old, wornout, and multilated notes from circulation. The presence of damaged currency or terribly multilated notes from circulation is common phenomena in many parts of Africa and Asia (Gatsby 1998, Podhajory 2004). The persistence of damaged or terribly mutilated notes in active circulation elevates their contributory role in transmission of parasite egg thereby constituting potential public health hazard. Also the practice of applying saliva to fingers while counting paper currencies is an important and potential route of exposure of parasite cysts.

In another study, parasite cysts from naira notes were isolated in Zaria by the study of Ameh and Balungun in (1997). The study was aimed at isolating, identifying and determining the level of contamination of parasitic cysts of mutilated naira notes in circulation in Benin city, Nigeria.

Another study carried to determine the parasite contamination of currency counting machines and counting room environment in selected four commercial banks operating in Anyigba, Kogi state Nigeria. Results revealed that samples analyzed were contaminated by parasite cysts/eggs. (Enemuor et al; 2012).

Study conducted in Australia showed that the lower the index values of the money, the higher the typical parasite content of the currency. They further showed that the age of the notes and the materials that was used to produce the notes influence the number of parasitic contamination (Vriese koop et al.,2010).

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 R., 2012).

2.3 ECONOMC IMPORTANCE

Parasites live externally or internally in the human body where it interfers with the normal working of the body (Taylor, 1997). The most common disease caused by parasites is diarrhea. One of the principal factors contributing to child morbidity and child mortality in tropical countries is the high frequency of diarrheal episodes due to intestinal infections which contribute to childhood growth retardation (Guerrant, 1986). Hookworm, roundworm, and whipworm are the main nematode infections implicated in growth retardation of children in tropical countries (Stephenson et al., 1989). Hookworm causes systemic secondary effect related to iron deficiency, anemia and possibly malnutrition and malabsorption(Roche and Benito,1999; Hotez et al.,2004). Hookworm infection in children reduces school attendance and subsequent effect on the productivity and wage earning potential in adulthood. Approximately 80years ago, an inverse correlation was observed between the hookworm burden and a child`s intelligence quotient. *Ascaris* *lumbricoides* ova,widely contaminate the environment essentially maintaining a vicious cycle of malnutrition, enteric parasite malnutrition synergy in human population living unhygienic conditions as seen in most developing countries today(cancrini,2006; cox,2002).

The diarrhea prevalence rate in Nigeria is 18.8% and is one of the worst in sub-Sahara Africa and above the average of 16%. Diarrhea prevalence rate in Nigeria and an estimated 150,000 deaths mainly among children under five annually which is a result of poor sanitation and hygiene practices (Matur et al., 2009). Diarrhea is also closely linked to malnutrition, a condition that is associated with more than half of all under-five deaths. Undernourished children in turn have compromised immune systems and at higher risk of developing pneumonia which also contribute to high children mortality in the country. This chain reaction illustrates that good hygiene practices such as hand washing are critical for child survival and development(Matur et al.,2009).

**2.4 FACTORS CONTRIBUTING TO THE SPREAD OF PARASITES**

Basic factors responsible for the spread of parasitic infection are environmental insanitation, poor personal and hand hygiene practices, socio-economic factor, age range of host and occupation.

**2.4.1 ENVIROMENTAL INSANITATION**

The quality of the environment plays an important role in the spread of parasites, insanitary environmental conditions greatly facilitates the spread of parasites through fecal, oral and person to person routes (FEPA,2004). Statistics have shown that about two third of diseases affecting our population has been identified as due to poor water and sanitary conditions. The environment is a complete ware of physical, chemical and biotic factors that interact with each other and impact upon all living things and their surroundings (UNICEF, 2009).

The lack of portable water and poor environmental sanitation are the reasons why diseases associated with unhygienic disposal of human feces and refuse are so common in developing countries most especially in Nigeria (OECD, 2005).

Even in public areas such as schools, sanitation is not a priority because people do not realize the need for a safe and clean environment (Awoyemu, 2008).

**2.4.2 POOR PERSONAL AND HAND HYGIENE PRACTICES**

Parasites are easily transmitted through fecal-oral route. This is more common today with the advent of technology and exchanged without washing hands. Currency exchange has become an effective means in Nigeria and worldwide (Ajenifrya and Ajibade, 2012).

The significance of hand washing at critical moments leads to reduction in diarrhea which is the second leading cause of deaths among Nigeria children(after malaria).

Hand washing can reduce diarrhea by about 30% and up to 47% reduction has been achieved in some cases (Ademola, 2012). Several studies has also indicated that hand washing with soap may have as much as 40% reduction in Acute Respiratory infections(ARI) among children (UNICEF,20090.

An estimated 85% of the populations in developing countries do not have adequate disposal system for human waste (Faechem et al., 1983).

2.4.3 AGE OF HOST

Age is the most important dominant. Mortality and morbidity rate often show a relationship to age (Henman, 1980). School children belong to the highest prevalence of parasitic infection in most communities or low economic grounds (hoeprrich, 1975). As widely reported in Nigeria show 18% and 10% infants and under five respectively (Ademola, 2012) also *E.histolytica* infection increase with age from 2-14years old children (Roche and Benito, 1999).

2.4.4 OCCUPATION

Several studies have indicated that people who handle dirty objects or those whose occupation are related to regular contact with public materials such as money are easily predisposed to parasite infections. A prevalence rate of 32% was recorded for cysts and ova of parasites on dirty naira notes (Matur et al., 2009). Dirty currencies are a potential source of contacting diseases 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 has dirt on it, there was a high chance that it could harbor cysts or eggs of parasites on it. Studies have revealed that parasite cysts and eggs are most prevalent on dirty objects and mutilated notes (Matur et al., 2009).

**2.5 CONTROL MEASURES**

Parasitic diseases can be managed or controlled by treatment, proper disposal of faeces, good hygiene practices and sanitation(Kathleen and Arthur,2002).

Control measures are aimed at minimizing human contact with the parasite or interrupting its life cycle through improved public health condition(Franchot and Nicky,2000) with a view to control soil transmitted helminthiasis (*Ascarisis* *trichursis* and hookworm infection) (Hotez et al.,2004). This could be achieved by regular deforming of school age children along with adults, provision of safe water, sanitation and health education. Most deaths caused by parasites are preventable by hand washing with soap combined with adequate sanitation (Awoyemi, 2008). Hands are the main vehicles of diarrheal and parasitic infections transferring them from person to person through direct contact or indirectly via surfaces and foods (Curtis et al., 2000). The connection between hand washing and diarrhea is well established, previous research shows that children living in household exposed to hand washing with soap has half the diarrhea rate of children living in control neighborhood. Increasing the frequency of hand washing with soap has half the diarrhea rate than of children living in control neighbourhood. Increasing the frequency of hand washing substantially decreases the occurrence of diarrheal in young children. In Nigeria, over 150,000 deaths occur annually among children due to diarrheal (UNICEF, 2009). UNICEF country representative Dr. Linlim Roberts stated that hand washing is very essential in order to combat the high mortality rate caused by parasites. In Abuja, Nigeria; the national hand washing campaign towards breaking the transmission cycle of communicable diseases was launched in the year 2008(Ademola,2012).

**CHAPTER THREE**

**3.0 MATERIALS AND METHODS**

Study population/Naira notes collection

The study will be conducted in Enugu State, Godfrey Okoye University Thinkers corner, Nigeria. A total of 65samples of Nigeria currency notes consisting of 10pieces of lower denomination from 10naira to 100naira and 5 pieces of higher denomination from 200naira to 1000naira each will be collected from food vendors around thinkers Corner.

The Naira notes were collected aseptically with hand gloves into a sterile polythene bag and conveyed to the microbiology laboratory of Godfrey Okoye University for parasitological examination and analysis.

**LABORATORY EXAMINATION**

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 10ml of 0.85% sterile normal saline was dropped on each of the currency notes using a 10ml syringe. Each bottle was covered and shaken vigorously and left standing for 30minutes and shaken all over again. The notes were removed using a pair of forceps and transferred 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 examined microscopically at \*40 and \*10 for the presence of parasite cysts under a compound binocular microscope.

CHAPTER FOUR

RESULTS

Table 1 shows the physical condition of the Naira Notes.

Of the 70 samples examined for parasite contamination ,it is shown that (35) pieces out of the samples were contaminated on their surface with parasite cysts and eggs. No cysts and eggs were found on mint and clean notes. The multilated notes had the highest parasite contamination(19 pieces), followed by the dirty notes (16 pieces). It was also observed that the lower denominations were more contaminated with parasite cysts while the higher denomination had the least contamination with parasite cysts.

Parasite eggs and cysts discovered in the currency were about four of them.

*Ascaris* *lumbricoides*

*Hook worm*

*Entamoeba histolytica*

*Flagellates*

These were observed on multilated and dirty notes respectively

TABLE ONE

PHYSICAL CONDITION OF THE NAIRA NOTES COLLECTED AND NUMBER CONTAMINATED

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Denomination | Number Examined | Dirty Notes | Number Contaminated | Multilated Notes | Number Contaminated | Total Number Contaminated | Total percentage |
| 5 Naira | 10 | 9 | 4 | 2 | 2 | 6 | 17.1% |
| 10 Naira | 15 | 7 | 3 | 7 | 5 | 8 | 22.8% |
| 20 Naira | 10 | 5 | 3 | 8 | 4 | 7 | 20% |
| 50 Naira | 10 | 5 | 1 | 2 | 1 | 2 | 5.7% |
| 100 Naira | 10 | 4 | 3 | 7 | 5 | 8 | 22.8% |
| 200 Naira | 5 | 2 | 1 | 2 | 2 | 3 | 8.6% |
| 500 Naira | 5 | 1 | 1 | 1 | 0 | 1 | 2.9% |
| 1000 Naira | 5 | 0 | 0 | 0 | 0 | 0 | 0% |
| Total Number  | 70 | 30 | 16 | 30 | 19 | 35 | 50% |

 TABLE TWO

PREVALENCE OF PARASITE CONTAMINATION OF NIGERIAN CURRENCY NOTES

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Status of Naira Notes | N5X Y (%) | N10X Y | N20X Y | N50X Y | N100X Y | N200X Y | N500X Y | N1000 X Y | Total number of Notes |
| Mint | 2 0 | 4 0 | 3 0 | 3 0 | 0 0 | 0 0 | 1 0 | 1 0 | 14 0 (0%) |
| Clean | 1 0 | 2 1 | 1 0 | 1 0 | 0 0 | 3 1 | 3 0 | 4 0 | 15 2 (13.3%) |
| Dirty | 4 3 | 5 3 | 3 2 | 1 0 | 4 3 | 1 1 | 0 0 | 0 0 | 18 12 (66.7%) |
| Multilated | 3 3 | 4 4 | 3 5 | 5 2  | 6 5 | 1 1 | 1 1 | 0 0 | 23 21 (91.3%) |
| Total | 10 6 (0.6%) | 15 8 (0.53%) | 10 7 (0.7%) | 10 2 (0.2%) | 10 8 (0.8%) | 5 3 (0.2%) | 5 1 (0.2%) | 5 0 (0%) | 70 35 (50%) |

X====NUMBER OF SAMPLES EXAMINED

Y====NUMBER OF SAMPLES CONTAMINATED WITH PARASITE EGGS AND CYSTS

N====NAIRA

In the result of the studies on prevalence of parasite contamination on naira notes (Table 2) showed that dirty and multilated notes had high prevalence rate of parasite cysts than clean and mint notes.

Of the 35 samples that were contaminated with parasite cysts, a total of 14 samples were mint and none was contaminated (0%), 15 samples were clean notes and 2 (0.13%) contaminated with parasite cyst, 18 samples were dirty notes and had 21 (0.67%) contamination of parasite cyst , 23 samples were multilated notes and 21(0.92%) was contaminated.

A total of 0.5% prevalence of parasite contamination of Nigerian Currency were observed. Was observed that paper notes were more dirty and multilated than polymer notes, mint and clean notes harbor less parasite cysts.

The result also showed 10 Naira and 100 Naira notes as the most multilated and contaminated, 200 Naira, 500 Naira and 1000 Naira had less contamination, it does not mean that it is free from microbial contamination.

CHAPTER FIVE

DISCUSSION

The isolation of parasitic contaminants from the currency notes confirmed the fact that currency acts as an agent and plays an important role in the transmission of pathogenic micro organisms (ogo et al., 2004). A prevalence rate of 0.5% was recorded for cysts and eggs of parasites on the currency notes analyzed. This is in agreement with the finding of Dada and Bellino (1979) and Edungbola and Obi (1992) where they found that dirty naira notes served as a potential source of contacting infection. Studies have reavealed that parasite cysts and eggs are most prevalent on dirty objects, multilated materials and currency notes, while mint and clean notes harbours no parasite (Fashiyi, 1983).

The results from the study showed that denominations of notes did influence the level of contamination as seen in the lower denominations according to table one. However, it is not connected to the methods of handling the currency notes, rather it is a reflection of the present poor economic sanitation in our country and environments were the naira notes are highly of low value to the point at which higher denominations have readily become available for daily transactions. Parasite cysts and eggs observed and identified from the currency notes are those of high socio-economic importance that pose danger and great health implication to man. Seventy percent(70%) of parasites isolated can be transmitted through oral route. This becomes more of a problem when a good number of people tongue-wet their fingers when counting money, thereby, contaminating the naira notes. Practices including spraying money during ceremonies and dirty hands contaminated with human and animal feacal particles (Adelowo, 1990). Other potential risks that also lead to contamination of notes include improper hand washing after using the toilet and ATM machines, coughing and sneezing on hands when exchanging money, placement or storage of notes on dirty surfaces as socks, shoes, and the act of biting off corners of notes.

CONCLUSION

In conclusion, handling money is like shaking hands with somebody, these activities not only enhance currency contamination but increases the risk of infections from contaminated notes. Awareness campaign and seminars should be created both in rural and urban areas of the Federation because it is our identity in terms of transaction. Similar studies on both parasitic and microbical contaminants of currency notes should be undertaken in other countries to enrich the global information on the subject, because the issue is a major public health concern.