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Research Article

Studies of Parasitic and related health risk associated with Waste Scavengers OR Rag Pickers in Port Harcourt Nigeria

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Abstract:
This study is on investigating the health risk of waste scavengers (rag pickers), and the microbial burden of the waste. Samples were collected from 8 dumpsites (7 dumpsites and 1 control) from different parts of Port Harcourt, analyzed for total heterotrophic count. A total of 100 subjects (80 ragpickers and 20 students as control) were examined for microbiological parameters. A well-structured questionnaire and oral interview were administered to the rag pickers. Ascaris was seen in 12 (35.29%) of the rag pickers and 2 (40%) of the control subjects. Also, Entamoeba histolytica was seen in 10 (29.41%) of the rag pickers, 2 (40%) of the control. Hookworm was seen in 8 (23.53%) of rag pickers, zero in control subjects, then Trichuris trichiura was seen in 4 (11.76%) of the rag pickers and 1 (20%) of the control. Widal test results which correlates with the stool culture indicates that they are prone to typhoid infection. The HIV and hepatitis tests were not significant. Malaria parasites was seen in 30 (57.68%) of the rag pickers. Despite the fact that rag pickers make money from their business, they may serve as vehicle for infections and the health implication is of great concern.

Keywords: Parasite, Isolates, rag-pickers, microorganisms, waste.

1. Introduction

Waste scavenging **is** the informal recovery of materials from waste represents an important survival strategy for disadvantaged populations throughout the developing world [1].

Scavengers are perceived as the poorest of the poor and marginal to mainstream economy and society. They may not be able to enter formal sector employment because of poor education or physical disability [2]. This inability to enter more conventional occupations and the resulting absence of real choice

needs to be recognized by interventions that attempts to change the role and working practices associated with informal recycling.

According to [3] if waste pickers do find alternative employment in the formal sector, other individuals are highly likely to replace them as long as poverty continues and waste remains accessible. The picture of scavenging that emerges from reviewing literature is that of an occupation that provides a livelihood for the poor [4].

Microbial activity on waste is a natural biological process (Degradation of waste is carried out under controlled conditions which hastens the breakdown of organic waste and reduces its volume, creating a stable soil enriching humus [5].

According to [6] the microorganisms that function in degradation of waste have basic requirements to achieve an acceptable product. The requirements are adequate amounts of air, water, and nutrients. Proper control of surface area, temperature and acidity is also necessary. Microorganisms involved in organic waste degradation also need carbon as an energy source and nitrogen for protein synthesis [7]. Waste contains parasites and pathogens as well as aerobic thermophilic digestion bacteria [8]. These aerobic thermophilic digestion bacteria proliferate due to the presence of oxygen. Phototrophic bacteria present in waste convert organic waste into liquid fertilizers [9].

This process of digestion occurs when aerobic thermophilic digestion bacteria stably flourishes at about 60°C thus produces heat (exothermic reaction). Decomposition of perishable waste is continued by phototrophic bacteria for a long term at a high temperature giving rise to liquid fertilizer without generating any foul smell [10].

Other organisms involved are worms, insects and fungi. They decomposed waste and decomposition is made up of a number of sub processes. During decomposition, these wastes are broken in small bits called fragments, a process known as fragmentation.

These small fragments have a large surface area and as such support the growth of fungi and bacteria. At the end of decomposition, the fragments become fine black particles and their original shape no longer exist. The rate of decomposition depends on the temperature, carbon/nitrogen ratio, pH, moisture, oxygen and chemical composition of the waste.

If the temperature is too low, or too high, fungi and bacteria cannot grow and the rate of decomposition will be slow. When the oxygen available below ground is used up by fungi and bacteria, their decomposing activity stops. Anaerobic bacteria can continue the decomposition activity. Methane gas is its end product. The anaerobic bacteria can live where no oxygen exist. According to [11], when refuse is placed in a dump or landfill, it undergoes a number of biological, physical and chemical charges.

The biological decomposition of organic materials results in the generation of gases and liquids. The percolation of water through a dumpsite result in a solution with high concentration of both organic and inorganic compounds referred to as leachate, the composition of which is variable and depends on the type of refuse [12]. [13] observed that a large proportion of the materials which are found in ordinary domestic refuse decompose to form highly undesirable waste substances which may be removed from a waste dumpsite by migrating waters.

Degradation of organic waste is a biological process in which organic matter is reduced to humus involving bacteria, fungi and *Actinomycetes,* all of which are widely distributed in nature or maybe contained in the waste.

According to [14], most of these microbes are potential human pathogens and may cause severe health hazard. Among the common pathogens found in these waste materials are bacterial pathogens such as *Salmonella spp, Mycobacterium spp, Vibrocholerae, Escherichia coli,* viral such as *Hepatitis virus, Enteroviruses and Adenoviruses and* Fungal such as *Microsporum spp, Candida tropicalis* and white rot fungi. Protozoan such as *Entamoeba histolytica, Gardia spp* could be present [12] remarked that the composition of the refuse determines the extent of the biological activities within the dump as - wood, paper will not be decomposed very easily.

2. Material and Method

2.1. Study area

The study was carried out in the city of Port Harcourt, which is the head quarter of oil and gas in Nigeria. Due to the importance of the city in Nigeria, there is in flow of people with accompanied commercial activity, thus giving rise to all forms of waste generation. Samples were collected from eighty waste scavengers from the following dump sites; Elikpokoodu, Mile 3 motor park dump site, Mile 1 dump site, Eagle Island dump site, Rumuokoro dump site,Town market dump site, Ogbunabali/ Nzimiro dump site and Ada George dump site, (ten per dump site). In course of the work, a structured questionnaire was prepared for the waste workers to analyze and ascertain the economic benefit and the health implication. Samples collected from scavengers include; stool, blood and urine. Samples were also collected from twenty students as control. The waste scavengers signed informed consent form before samples were collected from them. Protective materials used include; safety boots, nose and face mask and hand gloves.

2.2. Examination of samples from waste scavengers & students as control

Stool

Stool was collected for macroscopic and microscopic examination for intestinal worms and parasites using formol ether method.

Wet preparation

A drop of normal saline and Lugol's iodine were placed on each side of a grease free slide. Using an applicator's stick the stool is taken and emulsified on the slide. A cover slip is placed on the preparation and examined using x10 and x40 objective lens.

Formol ether sedimentation technique Reagents: 10%

Formalin and diethylether

Procedure: About 1gram of faeces was emulsified in 5ml of 10% formol saline in a test tube. The preparation was sieved through a guaze to remove coarse particles and collecting sieved suspension in a beaker.

The suspension was transferred to a centrifuge tube, about 3-4ml of diethylether was added and mixed for 1 minute. It was centrifuged immediately for 1 minute at 3000 revolutions per minutes (rpm).

Using a stick, the layer of the faecal debris was loosened from the side of the tube and inverted to discard the ether, faecal debris and formol water and the sediment remained. The bottom of the tube was tapped to resuspend the mixed sediment. The sediment was transferred to a slide and covered with a cover slip. The preparation was examined microscopically using x10 objective. The deposits were recorded.

Urine

Three basic types of analyses were done on the freshly voided urine samples.

Macroscopic examination

The general appearance of the urine sample was noted, that is whether the sample will be clear, slightly cloudy and amber in colour.

The odour of the urine was also noted. Commercially available medi-test combi 9 strip was used to check the biochemical reaction of each urine sample. Reactions like pH, Glucose, Ascorbic acid, ketones, Nitrite, Protein, bilirubin, urobilinogen, and blood were recorded.

Microscopic examination

About 5ml of urine was put into a centrifuge tube and centrifuged at 3000rpm for 5minutes. The supernatant was discarded and a drop of the deposit placed on a grease free slide, covered with coverslip and examined using x10 and x40 objective.

The following components were examined: white blood cells, Red blood cells, casts, epithelial cells and organisms.

Urinalysis

The urinalysis test strip was checked for it's expiry date, the urine sample was gently inverted 4 times for a homogeneous mixture, the lid of the sample container was removed and a strip from the urinalysis test kit was taken, it was held at the white end of the test strip, and Immersed in the urine sample, so that all test pads are covered for 1 second. The test strip was drawn across the rim of the sample container to remove any excess urine. The strip was compared with the ranges provided on the urinalysis kit container. The results were record, and the process repeated for all urine samples.

Serotyping of Salmonellae using specific antisera.

A loopful of growth of Salmonellae was made on a grease free slide and physiological saline added to it. This was mixed by tilting the slide backwards and forward for about

30seconds. A loopful of the specific antisera 0,H,VI was added and mixed. This was examined for agglutination. A positive test showed strong clear agglutination within 1 minute according to the antigen possessed by the organism

3. Result

The distribution of intestinal parasite amongst rag pickers and control subjects is represented in figure 1 From the result *Ascaris* was found in 12 (35.29%) of rag pickers and 2 (40%) of control subjects. Hookworm was found in 8 (23.53%) rag pickers and 0(0%) of control subjects. *Trichuris trichiura* was seen in 4(11.7%) of rag pickers as against 1 (20%) of control subject. *Entamoeba histolytica* was seen in 10 (29.41%) of rag pickers and 2 (40%) of control subjects.

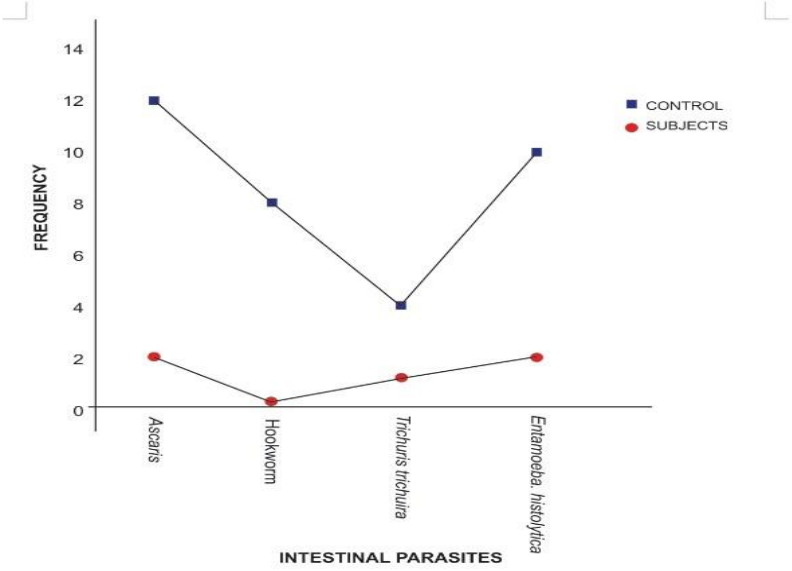

Figure 1. Distribution of Intestinal Parasites Amongst Rag Pickers And Control

Figure 2 illustrates Bar Chart showing the classification of Disease according to ailment from Questionnaire completed by Respondents (rag pickers). From the Bar Chart: 10 of the rag pickers had cough/sore throat, 12 were hospitalized, 12 had typhoid, 20 had malaria, 8 suffered from stooling/vomiting, 14 had wound skin infection, 4 went for routine medical consultation and non-had Tuberculosis.

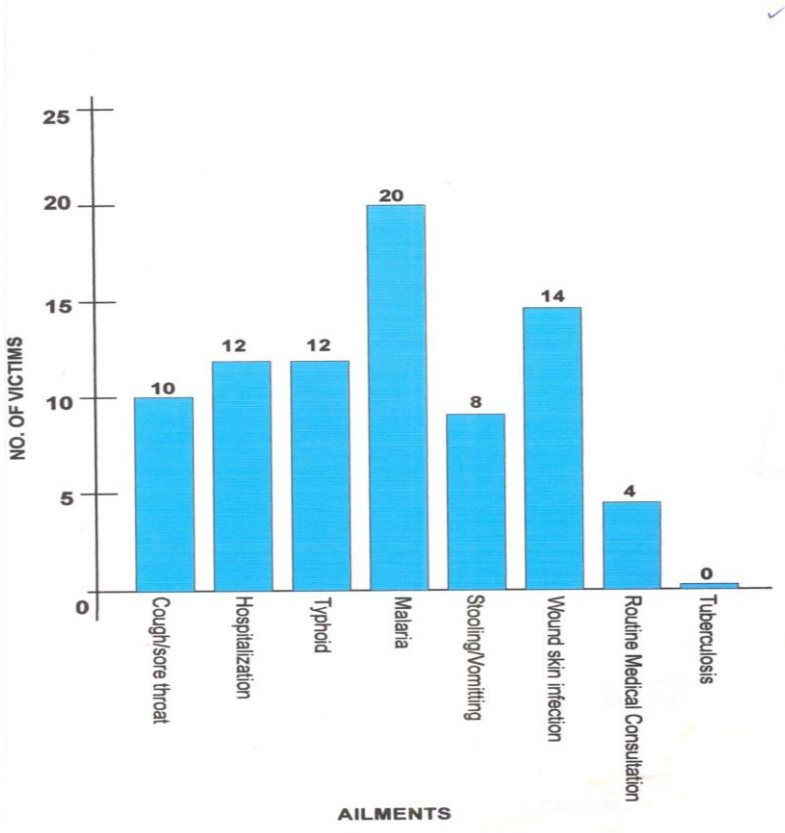

Figure 2. Classification Of Diseases From Respondents

Table 1 represents the result of urinalysis. From the result 4(5%) of the rag pickers had nitrite in their urine sample, 8(10%) had bilirubin and blood respectively, 10 (20%) had urobilinogen present in their urine while 16 (2%) had protein present in their urine.

In the control subject, no blood, nitrite and protein were present in significant quantities. The microscopy of the urine reveals that 16(20%) of the rag pickers had significant amount of white blood cells in their urine, 14 (17.5%) had crystals while 6 (7.5%) had red blood cells and hyaline casts respectively. The control subjects showed insignificant amount of all these.

Table 1. Urinalysis On Subjects

PARAMETERS	RAG PICKERS (%)	CONTROL (%)
Nitrite	4(5)	-
Bilirubin (>2mgIdl)	8(10)	-
Blood (>5-10Ery/ul)	8(10)	-
Protein (>30mgIdl)	16(10)	2(10)
Urobilinogen (>2mgIdl)	10(2.5)	-
White Blood Cell (>10phf)	16(20)	2(10)

Red Blood Cell (>1phf)	6(7.5)	-
Crystals	14(17.5)	2(10)
Casts (Hyaline)	6(7.5)	-

4. Discussion

From the research carried out stool samples of both the rag pickers and control subjects. *Ascaris* was seen in 12 (35.29%) of the rag pickers and 2 (40%) of the control subjects. Also *Entamoeba histolytica* was seen in 10 (29.41%) of the rag pickers and 2 (40%) of the control.

Generally, most intestinal parasites are prevalent in moist, warm climates (as provided by wastes dumps) and in areas with poor sanitation. The two infections are acquired by ingestion of embryonated egg and cyst from faecally polluted soil. *Ascaris* causes abdominal pains, nausea, vomiting and diarrhea. The infection is facilitated by maintenance of improper hygiene and eating with unwashed hands while at work. Hookworm was seen in 8 (23.53%) of rag pickers and none of the control subjects, then *Trichuris trichiura* was seen in 4 (11.76%) of the rag pickers and 1 (20%) of the control.

Hookworm and *Trichuris* infection are acquired through the penetration of the skin by filariform larva from the soil. It is observed that the rag pickers work with little or no protection for their foot and this is why they are infected with hookworm.

Widal test results which correlates with the stool culture indicates that they are prone to typhoid infection, 18 (64.62%) of the rag pickers tested positive while 4 (26.67%) of the control tested positive. This fairly high rate may be due to poor sanitary living and dirty habits as they purchase and eat food with unwashed hands while at work. The HIV and hepatitis tests are however not significant 2 (3.85%) of the rag pickers and 1 (6.67) of the control and for Hepatitis B 2(3.5%) of the rag pickers and none of the control. This may be due to the fact that they sustain less injury and even when they do they treat immediately. Though the income per month (N10,000 – 15,000) is above the minimum wage, it may not be used for promiscuous way of living and as such they cannot be exposed to HIV. Malaria parasites was seen in 30 (57.68%) of the rag pickers and 10 (66.66%) of the control subject. This fairly high malaria parasitemia amongst the rag pickers and control subject, are due to the nature of our environment generally. However, the waste dumps offer an excellent breeding ground for mosquitoes and as such they are bitten by mosquitoes which in turn give them malaria.

The urinalysis and microscopy result showed that there was a slight pyuria with proteinuria and hematuria among some of the rag pickers. Pyuria and hematuria are both indicative of urinary tract infection. Even though the income generated by the rag pickers is low some of them may be involve in illicit sexual activities since they fall within the sexually active group and as such can be predisposed to urinary tract infections. Hyaline casts were also seen in their urine. This may be due to the

strenuous nature of their jobs and fever associated with malaria parasite. This further agrees with the report of [15] that hyaline casts are present in urine following strenuous exercises and fever. The pigments (bilirubin & urobilinogen) present in their urine samples are indicative of hepatocellular jaundice. The increase AST as observed in the study further suggest hepatocellular damage which if not controlled and monitored might increase with time.

From the structured questionnaire completed by the rag pickers there is a strong indication that they suffer mostly from malaria, wound infections, typhoid fever and all these could make them to be hospitalized. The reason for this illness is obvious, that is the nature of their work and the environment under which they operate.

An assessment of the extent to which the income they generate has satisfied the economic well-being of their household show that 33 (41.25%) of rag picker especially the married ones said to a low extent while 29 (36.25%) said to a very low extent. From this assessment, it is clear that the money they make do not in any way satisfy their need. Though the economy is harsh, they do not have any choice.

Similarly, an assessment of the extent to which rag picking cause malaria, typhoid, hookworm and other diseases showed that 31(28.75%) of the rag pickers said to a very large extent, 26(32.50) said to a large extent. From the foregoing, it can be seen that though money is made out of the job, the health implication is devastating and as such a way of making it less infection free should be sought.

In summary, the statistical analysis to test the significant relationship in degradation between the organisms from the waste dumpsite and the one in the laboratory showed that there is no significant relationship in degradation between the organisms from the dumpsite and the one in the laboratory for 1 week ($P < 0.05$) (appendix II), the reason being due to the change in nutritional and environmental factors.

5. Conclusion

Bacteria, fungi and helminths are basically present in waste dumps and they are responsible for decay of waste and they cause diseases with people that come in contact with them from the study. The diseases caused by these bacteria, helminths and fungi can cause the death of persons, more especially the rag pickers who do not protect themselves or observe good personal hygiene during and after handling these wastes and therefore their health presently and in the near future is at risk.

Scavenging represents an important survival strategy for the poor. Scavengers recover materials from waste in order to satisfy their needs. Scavengers respond to market demand and not to environmental and health considerations. The underlying factors that cause people to become scavengers are poverty resulting from under development, inability or unwillingness of individuals to obtain other forms of employment, existence by waste dumps, income earned and recyclable industrial demand for inexpensive raw materials. Scavenging has led to the production of sub – standard, fake and adulterated consumables in Nigeria as a whole as bottles are picked and sold to companies to repackage.

Scavengers despite the monthly income they make have faced problems of informality and vulnerability to diseases, hence they need government assistance. Women are scared of getting involved in scavenging because of fear of being raped.

Recommendations

In reality rag picking has posed a great threat to the society at large, I therefore make the following recommendations:

Indiscriminate dumping of waste around residential areas should be avoided. There should be adequate policies in this regard.

Waste could also be converted to wealth by use of separating machines as done in advance countries

Burning of wood, coal should be avoided in order not to aid the productions of greenhouse gases which could lead to Global warming.

They should receive immunization against tetanus, and hepatitis and other diseases.

They should receive adequate basic health training (first aid) to learn how to take care of themselves in case of accidental injury and ensure good sanitary conditions at home.

All the recommendations are made based on the premise that health is wealth, the health of the rag pickers or waste scavengers is important to us as a nation and it does appear that things that affect them may at the long run affect the environment, the populace and the society at large.

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