

AMOEBIASIS LEVELS IN RELATION TO SANITATION AND PERSONAL HYGIENE AMONG PATIENTS ATTENDING KAUWI AND MUTHALE HOSPITALS IN KITUI COUNTY, KENYA

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ABSTRACT

Background: *Entamoeba histolytica*, an intestinal protozoan parasite, is the causative agent of amoebiasis which is the third leading parasitic disease causing deaths in humans after malaria and schistosomiasis. Globally, it is responsible for 40,000 to 100,000 deaths annually. **Objective:** To determine the occurrence levels of *E. histolytica* infection among persons of various age groups attending Muthale mission and Kauwi sub-district hospitals in Kitui west district. **Materials and methods:** The study involved observation of clinical signs and symptoms as well as microscopic examination of *E. histolytica* trophozoites and cysts in stool samples from randomly selected individuals attending the two hospitals where 119 were males and 158 females. Formal-ether concentration technique was done for each sample that tested negative under direct smear and examined at low (20x) and high (40x) magnifications. The study collected data on personal hygiene and sanitation level as well as sources of water for domestic use and boiling habits of the residents by use of questionnaires. Data on level of sanitation and infection by *E. histolytica* in different sexes and age groups were analyzed using Mean square contingency coefficient, Cramer's V and Chi-square. **Results:** The study revealed that 81 (29.2%) of the patients suffered from amoebiasis of which 10.8% were males while females were nearly double at 18.4%. The most affected age group was the under five years at 58.8% and the least infected was 26 to 35 years at 20.6%. River water had significant relationship with infection by *Entamoeba histolytica*. Washing of hands, fruits and vegetables had no significance since the water used was from unsafe sources highly likely to be contaminated with *E. histolytica*. **Conclusion:** Although over 90% of patients practised hygiene habits such as hand washing with soap and latrine use, these practices did not seem to reduce the infection. This could be attributed to use of unsafe water or poor storage leading to contamination. It was apparent that the lack of properly treated water neutralizes any effort by the residents using other hygienic practices. This is in agreement with previous research that 94% of the population in Kitui west district had no access to safe drinking water.

KEYWORDS: *E. histolytica*, Amoebiasis, sanitation, personal hygiene practices.

INTRODUCTION

Amoebiasis is caused by the intestinal protozoan parasite *Entamoeba histolytica* and is the third leading parasitic disease causing death in humans after malaria and schistosomiasis. Globally, it is responsible for 40,000 to 100,000 deaths a year.^[1] The prevalence of *E. histolytica* infection differs with age, with highest prevalence in 1 day to 15 years.^[2] and is also affected by socioeconomic conditions of communities. In regions with poor sanitary conditions such as some areas of Central and South America, Africa and Asia, up to 50% of the population is affected.^[3,4] A study done in Kenya revealed that only 21% of patients attending Njoro district hospital tested positive for *E. histolytica*.^[5]

Intestinal infections occur through the ingestion of a mature quadrinucleate infective cyst in food and / or water contaminated with human fecal material and also by hand to mouth contact. Cysts survive the acidic pH of the stomach and pass into the intestine as the cyst wall is resistant to gastric juice.^[6] In the terminal ileum which is alkaline, excystation takes place. Trophozoites being actively motile invade the tissues and eventually implant in the sub mucous layer of the colon where they grow and multiply by binary fission. They are responsible for producing lesions in amoebiasis. Invasion of blood vessels leads to secondary extra intestinal lesions.^[7] A certain number of trophozoites come from tissues into the lumen of bowel and are first transformed into pre-cyst forms. Pre-cysts secrete a cyst wall and become a

uninucleate cyst. Eventually, the mature quadrinucleate cysts which are infective, forms.^[6]

The causative agent for amoebiasis was initially thought to be a single species, but isoenzyme and molecular studies led to the reclassification of *E. histolytica* into two morphologically identical species: the pathogenic *E. histolytica* and non-pathogenic *E. dispar*. Inaccessibility of elaborate diagnostic tools in developing countries such as Kenya, has led to increased deaths as the control and treatment rely on late clinical manifestation of the disease.

MATERIALS AND METHODS

Study site: The study was carried out in Kitui west district in Kitui County, Kenya. Muthale Mission Hospital and Kauwi Sub district Hospital laboratories were used for amoebiasis diagnosis.

Study design: This was a cross sectional study involving a combination of survey and laboratory investigation with collection of data from a cross-section of respondents randomly sampled during a three months period from April to June 2013.

Sampling technique: Medical out-patients residing in Kitui west district and attending the two hospitals were sampled using simple random sampling method.

Stool examination: Laboratory investigation was conducted through examination of stool samples for trophozoites and cysts by use of microscopy as per World Health Organization (1994) bench aid for the diagnosis of *Entamoeba histolytica*.^[8] Questionnaires were used for the survey on sanitation and personal hygiene. After filling the questionnaire, each subject was orally interviewed on clinical symptoms of amoebiasis before being requested to provide fresh fecal sample for laboratory analysis.

Data analysis: Quantitative data was coded and processed using SPSS version 17.0. The difference in amoebiasis level in different age groups from <1 to above 50 years was analyzed by Chi square test. The relationship between level of sanitation and personal hygiene and *E. histolytica* infection levels was determined using mean square contingency coefficient and Cramer's V. Relationship between latrine use and *E. histolytica* infection was analyzed using Fisher's exact test.

RESULTS

Among the 277 individuals sampled, it was found that 18.4% were females infected by *E. histolytica* compared to 30 (10.8%) males. This gave an overall infection rate of 29.2% (Figure 1).

The under five years age set was the most affected with 58.8% of them testing positive followed by the 16-25 years old (33.3% infected) and 27.7% infected amongst

age ≥ 50 years. The least infected age group was 26 to 35 years at 20.6%. The chi square test revealed a significant relationship between age group and the occurrence of *E. histolytica*, $\chi^2 (5, N=277) = 16.68 P= 0.005$ Cramer's V = 0.25. The level of infection in the under 5 years age group was significantly higher than 16-25 age group while the infection rates in the other age groups were statistically similar (Figure 2).

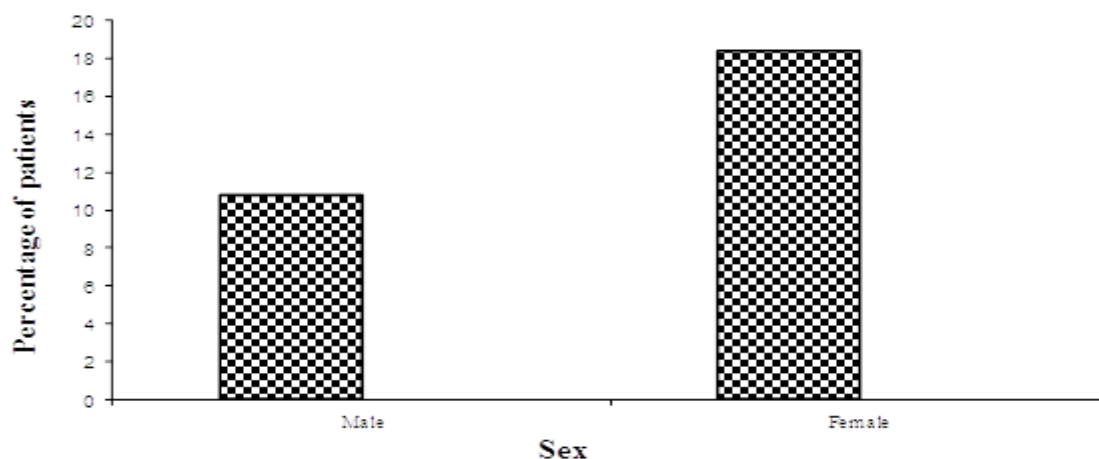
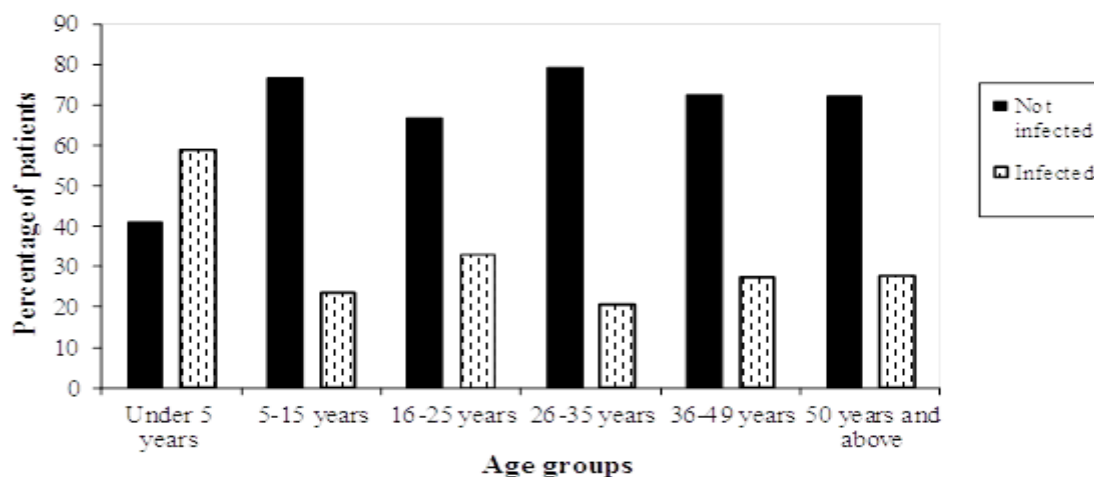
Hand washing behavior of the respondents was observed as one of the critical parameters in personal hygiene. It was found that almost all the interviewees washed their hands after using toilet and before eating. However, 39 of the 277 respondents did not use soap while 86% of the patients washed their hands with soap and water. Among those who washed their hands with soap, only 28.6% tested positive for the disease as opposed to 33.3% among those who did not use soap. A chi square test revealed that washing hands with soap and water had no significant effect on the risk of getting infected compared with washing without soap ($\chi^2 (1, n=277) = 1.73 P= 0.677$ Phi = 0.036).

Most of the patients obtained their drinking water from the river (220 or 79.4%), 14 (5%) from earth dams and only 43 (15.6%) patients had access to tap water. The source of drinking water significantly influenced the risk of infection ($\chi^2 (2, n=277) = 8.02 P= 0.018$ Phi = 0.17) according to a chi square test of independence. Among the sources of drinking water, river water was the most used, and was potentially more likely to be contaminated and unsafe hence predisposing the residents to the risk of contracting the disease.

The percentage of patients with *E. histolytica* cysts and trophozoites was higher in Muthale hospital at 50% compared to 14.3% at Kauwi hospital. This was despite the fact that Kauwi hospital received more patients than Muthale hospital. The difference in infection levels at the two hospitals was found to be statistically significant ($\chi^2 (1, n=277) = 39.85; p= < 0.001; Phi = 0.38$). About 90.5% of out-patients who attended Muthale hospital obtained water from either earth dam or river. Out of these, 28.9% did not always boil or treat water. At Kauwi hospital, 19.9% of patients used tap water while those using river water at the same hospital, 3.3% boiled or treated it sometimes (Table 1).

Table 1: Rate of *E. histolytica* infection among out-patients attending Kauwi and Muthale hospitals and their water source.

| Hospital | Laboratory test results | | Source of drinking water | | |
|--------------|-------------------------|---------------------------|--------------------------|----------------|----------------------|
| | No. of out-patients | Positive cases No. (%) | River No. (%) | Tap No. (%) | Earth dam No. (%) |
| Kauwi | 161 | 23 (14.3) | 123 (76.4) | 32 (19.9) | 6 (3.7) |
| Muthale | 116 | 58 (50.0) | 97 (83.6) | 11 (9.5) | 8 (6.9) |
| Total | 277 | 81 | 220 | 43 | 14 |

**Figure 1: The overall percentage of *E. histolytica* infected individuals by sex in Kitui west district.****Figure 2: Occurrence levels of *E. histolytica* in different age groups among out-patients attending Kauwi and Muthale hospitals in Kitui West district (n=277).**

DISCUSSION

The current study found that 29.2% of the patients attending Kauwi and Muthale hospitals in Kitui west district were infected with *Entamoeba histolytica*. This is slightly higher compared to 2012 study done at Njoro District Hospital in Kenya.^[5] but lower than the 50% reported in Africa by Harthi and Jamjoom.^[3] This may be attributed to recent developments geared towards providing safe drinking water to Kitui residents although much of treated piped water was at the Kauwi urban centre where 19.9% of the sampled population had access to treated piped water (Table 1).

This study observed that females had significantly more infections with *E. histolytica* at 32% compared to males at 25%. In developing countries, both sexes are equally exposed to infection with *E. histolytica*.^[6] but the risk is reportedly higher for females working in farms and homosexual men.^[9] Kitui west is a rural farming area and women are more likely to be working in farms than men. This brings them into constant contact with contaminated soil and water which potentially promote oral transmission of the disease through contaminated hands, similar to previous study done on children in Bangladesh.^[9]

The current study revealed that under five years age group was the most affected with 58.8% infected while 26 to 35 years age group was the least affected at 20.6%. Age is an important risk factor for many infectious diseases especially those that are transmitted orally such as *E. histolytica*.^[2] Previous studies have pointed out that infection with *E. histolytica* is most common among young children who are likely to come into contact with infected material as they crawl on the ground or play games outdoors.^[2,8] In addition, children are likely to put play items in their mouths and eat with unwashed hands. Children are also less acquainted with hygienic habits such as washing hands before eating or after using the latrines which also makes them more vulnerable to infection.^[6] Although this study found that people of all age groups were infected with the disease, the levels of infection differed among the age groups. This finding is consistent with the assertion by Zahida *et al.*^[2] that although young children are more susceptible to infection; people of all ages in developing countries are exposed to the disease particularly where there is inadequate provision of safe water for domestic use. The nearly uniform infection rates can be attributed to poor socioeconomic standards and poor sanitation which are risk factors in developing countries.^[3]

Most of the patients (84.5%) obtained water from the river or earth dams both of which are potentially contaminated with the *E. histolytica* cysts. Since they used the same water to wash hands, fruits and vegetables and other domestic uses, they ended up contaminating rather than cleaning. The source of drinking water had a statistically significant relationship with *E. histolytica* infection similar to previous report on water and food borne diseases.^[4]

CONCLUSION

The current study found that 29.2% of the patients attending Kauwi and Muthale hospitals in Kitui west district were infected with *Entamoeba histolytica*. Most infected at 58.8% were children aged five years or below compared to all other ages. The least infected were 26-35 years old at 20.6%. There was higher proportion of females infected with *E. histolytica* than males. Among the 29.2% infected patients, 10.8% were males while females were nearly double at 18.4%. The use of river water was associated with higher levels of *E. histolytica* infection compared with earth dam and tap water.

Recommendations

To curb the relatively high levels of amoebiasis in the district there is need for surveillance systems and health education targeting parents and guardians of children under five years aimed at early and proper treatment of the disease. The Ministry of Health should intensify health campaign especially in children less than five years of age and their parents / guardians, particularly females, on ways to improve hygiene practices at home to avoid infection. There is need for residents in Kitui west district to emphasize use of safe water for all

domestic chores if the benefit of personal hygiene is to be realized. Consequently, supplying all residents in Kitui west district and other rural areas in Kenya with treated piped water will go a long way in helping Kenya realize MDG 4 and vision 2030.

There is need for evaluation of water used by residents in Kitui west district to determine the contaminating pathogens and potential health risks. Studies should be carried out on other causes of diarrhea in the population targeting the 45.7% patients who had apparent symptoms of amoebiasis but tested negative.

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Conflict of interest

The authors declare that no conflict of interest

REFERENCES

1. Sebastiaan, J., Van Hal, J.V., Stark, D.J., Fotedar, R., Marriott, D., John, T., Ellis, J.T. and Harkness, J.L. Amoebiasis: Current status in Australia. *Medical Journal of Australia*, 2007; 186: 412-416.
2. Zahida, T., Shabana, K. and Lashari, M.H. Prevalence of *Entamoeba histolytica* in humans, Pakistan. *Pakistan Journal of Pharmaceutical Sciences*, 2010; 23: 344-348.
3. Al-Harhi, S.A. and Jamjoom, M.B. Diagnosis and Differentiation of *Entamoeba* infection in Makkah Al Mukarramah using microscopy and stool Antigen Detection Kits. *World Journal of Medical Sciences*, 2007; 2: 15-20.
4. Ryan, K.J. and Ray, C.G. Sherris Medical Microbiology, 4th ed. McGraw Hill, 2004; 733-738. ISBN 0-8385-8529-9.
5. Kinuthia, G.K., Afoloyan, F.I.D., Ngure, V. and Anjili, C.O. Selected practices among rural residents versus the prevalence of Amoebiasis and Giardiasis in Njoro district, Kenya. *Africa Journal of Health Sciences* 20: 11-20.
6. Stanley, S.L. (2003). Amoebiasis. *The Lancet*, 2012; 361: 1025-1034.
7. Devinder, S., Alok, B. and Sudha, B. Pathogenesis of infection by *Entamoeba histolytica*. New Delhi India. Jawaharlal Nehru University. World Health Organization. (1994). Bench aid for the diagnosis of intestinal parasites. WHO ISBN-92 4 1544767, 1996.
8. Haque, R., Mondal, D., Duggal, P., Kabir, M., Roy, S., Farr, B.M., Sack, R.B. and Petri, W.A. *Entamoeba histolytica* infection in children and protection from subsequent amoebiasis. *Infectious diseases and Immunology*, 2006; 74: 904-909.