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Case Study

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EPIDEMIOlOGY OF WATER BORNE DISEASES AND THE KNOWLEDGE, ATTITUDES AND PRACTICES OF THE BASIC SCHOOL CHILDREN TOWARDS THEM IN El-OBEID, NORTH KORDOFAN STATE, SUDAN (2011 - 2014)

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ABSTRACT

Background: The problem of water borne diseases is especially prevalent where general hygiene and environmental sanitation are poor. This facility based cross-sectional study aimed to study the epidemiology of water borne diseases and the knowledge, attitudes and practices of the Basic school students towards them in El-Obied, North Kordofan State in the period of 2011-2014. **Methodology:** The study comprised of 428 students selected from 12 schools. Data were collected via questionnaire as well as the interviews, observation checklist and microbiological tests. The data were analyzed by SPSS software, version 11.5. **Results:** The study showed that the prevalence of diarrhoea 22.4%, giardiasis 40.4%, amoebiasis 1.2%, salmonellosis 7.2%, and shigellosis 3%. This study showed that 263 (61.4%) of respondents heard about water borne diseases and 281 (65.7%) of them do not have knowledge towards water borne diseases transmission. The students practicing open defecation in about two (17%) of schools due to unavailability of latrines. **Conclusion**: The study revealed that there is a problem of water borne diseases in basic schools in El-Obied specially Giardiasis, which is dominated as compared with amoebiasis, shigeliosis and salmonellosis and there was a poor knowledge of school children towards water borne diseases transmission routes, prevention and types.

KEYWORDS: Water Borne Diseases, School Children, El-Obeid, Sudan.

INTRODUCTION

Water-borne diseases are diseases caused by the ingestion of water contaminated by human or animal faeces or urine containing pathogens.[1]

Water borne diseases are viral, bacterial and parasitic diseases which use water as a common means of transmission.[2]

Water borne diseases remain a major cause of death and illness in developing countries. In the developing world 1.1 billion people do not have access to safe water, and 2.6 billion lack adequate sanitation. As a result, water-related diseases are easily spread, with debilitating effects that keep adults out of productive work and children out of school. The weakest members of communities are the most vulnerable, with water-related diseases claiming the lives of 5000 children a day. This makes them the second biggest killer of children worldwide, after acute respiratory infections like tuberculosis.[3]

Globally over one billion people have no access to safe drinking water and 2.6 billion lack adequate sanitation. This leads to 1.8 million people dying every year from water and sanitation related diarrhoeal diseases, 90% being children under 5 years, mostly in developing countries.[4]

The Sudan household health survey 2006 (SHHS) revealed that under five children with diarrhea in North Kordofan State was 24.8% , about 47% of household population uses improved drinking water sources, only 1.3% has access to water with appropriate treatment, and 28.3% uses of improved sanitary means of excreta disposal.[5]

Rationales: Water harvesting from heavy rain fall to hafir in El-Obied sometimes contaminated with dust, animal manure, human excreta and other contaminants.[6]

There are an estimated 1305 cases of dysentery and 1301 cases of giardia in the period 2003 to 2007 according to outpatient registration in El-Obied hospital. The number

of school age (5 to 14 year) cases are 215 (16%) for dysentery and 118 (9%) for giardia.[7]

Study about Environmental Health Impacts of water supply system in Elobeid Town –North Kordofan State (2009 – 2011) revealed a gross bacteriological contamination of the supplied water with *Coliform*, *Thermotolerant Coliform*, and *E.coli* in the three seasons of the year, with highest in summer season where 94% , 81%, 23.6% of the tested samples were positive for *Coliforms*, *Thermotolerant* and *E.coli* respectively also high turbidity and low chlorine residual were detected in samples of the treated surface water with worst conditions in the rainy season (Turbidity reached 370 NTU, Chlorine residual declined to non or less than 0.2 ppm.[8]

MATERIALS AND METHODS

Study design: Facility based descriptive cross sectional study.

Study area: El-Obeid is the capital of North Kordofan State. Its area have been estimated by 81 km^2 and the distance from Khartoum is about 560 km. El Obeid is connected to Khartoum by an asphalt motorway, a railway line and air-flights taking off its airport several times a week.

North Kordofan state located in central Sudan latitude 13˚ 20 N longitude 30˚ 15 E, 570 m above sea level, the semi arid area of north kordofan receive an annual precipitation of about 280 – 450 mm in the months from July to September, temperature is generally high averaging 37˚c in summer and 18˚c in winter, the most important soil types according to the FAO – classification are cambisols and regosols.[9]

Figure (1): Elobeid City – 2010.[9]

The population of the City estimated by 440483 person. There are 38000 houses, 40000 families.

Drinking water supply in El-Obied has two main sources

1. Water collected from heavy rainfall in hafir through large area and then passed to the water treatment plant in El-Obied.

2. Ground water from wells.[9]

Sanitation provision in El-Obied is deficient, most people do not have access to hygienic toilets, and the large amounts of feacal waste discharged to the environment without treatment because there is no sewerage system in El-Obied this may assist in spread of infectious diseases.

Study population: Basic School Children

Sample size: A total of 428 school children were participated as a study subject. The sample size calculated with the formula; $n= z^2.pq/d^2$ [10] mutiplied by design effect.

Sampling technique: El-Obied, City was divided into four equal quarters (Clusters). The different types of schools (boys – girls - boys and girls) were considered as strata where three schools (boys, girls, and mixture) was selected from each quarter of El-Obeid City following a process of simple random sample using the table of random numbers, so the total number of schools selected was **twelve** schools.

The sample was divided over the schools following a process of stratified sampling combined with systematic sampling with probability proportional to size to distribute the sample over the selected schools where selection was at random in each stage.

Data collection methods and tools

- An interview with headmasters of schools
- A structured pre coded and close-ended questionnaire of school children
- An observation checklist to collect data on water supply and sanitation within the basic schools in El-Obied.
- Laboratory tests: parasitological and bacteriological examination of faeces.

Parasitological tests: A suitable amount of fresh stool specimen was collected into a suitable size, clean, dry, leak proof container, for detection of *G. lamblia* and *E. histolytica* Stool specimens were examined macroscopically & microscopically.

The fresh stool specimens were examined macroscopically for properties include; consistency, Colour, Mucus and blood. Most specimens were collected in sodium acetate-acetic acid-formalin (SAF) preservative and the specimens handled properly to examine microscopically when the specimen reaches the laboratory by direct wet smear, and concentration procedures were performed on the same preserved sample.

Bacteriological tests

Fresh stool specimens were collected for culture using stool containers to identify salmonella and shigella.

When the specimen is formed or semiformed, a suspension of it is made in about 4 ml of Selenite F Broth in plain container, and incubated overnight at 37 °C. After that Xylose lysine deoxycholate (XLD) agar is used as a selective medium culture, this process was implemented through suspend of 56.68 grams in 1000 ml distilled water, heated frequent agitation until the medium boiled after that transferred immediately to water bath at 50 °C then the medium was cool and poured into sterile petri plate by Inoculated a loopful of fresh emulsified faeces or a fluid specimen on XLD agar and Incubate the XLD agar plate aerobically at 35–37 °C overnight if the color is red or red and black Gram stain was done to facilitating in identification of salmonella and shigella.

Confirmation and identification of salmonella and shigella was done using biochemical tests such as Indole test, Simmons Citrate Agar, Urea agar Base, Kligler Iron Agar (KIA) and Semisolid agar.

Data processing & analysis: Data were analyzed using Statistical Package for Social Sciences (SPSS) version (11.5).

Ethical consideration: Ethical permission for the study was obtained prior to collect data, by contacting and receiving approval from the appropriate management authority (North Kordofan State Ministry of Education). Participants were assured of the confidentiality of their responses and provided informed verbal consent.

RESULTS AND DISCUSSION

The study showed that the prevalence of diarrhea among study group 22.4% (**Fig. 2**) which is lower than the prevalence of diarrhea (34. 84%) in similar study conducted in Thanga Village, Manipur- India.[11] The present study revealed that the dominant disease was giardiasis with prevalence of 40.4% (**Fig. 3**) which considered high as compared with 33% in similar study about prevalence of intestinal parasite infection in primary school children in Elengaz area, Khartoum, Sudan.[12] The prevalence of giardiasis in this study also high as compared with 10.72% in similar study conducted in AL-Shulaa and AL-khadimya –Baghdad-Iraq.[13] In this study the prevalence of amoebiasis 1.2% (**Fig. 3**) and this is considered low when compared with 2.92% in similar study conducted in AL-Shulaa and AL-khadimya – Baghdad-Iraq.[13] The present study showed that the prevalence of salmonellosis 7.2% (**Fig. 3**), it considered high when compared with 6.2% in similar study conducted in Jimma southwest Ethiopia.[14]

The present study illustrated that the prevalence of shigellosis only 3% **(Fig. 3)**, this prevalence was consistence with similar study conducted in Jimma southwest Ethiopia with prevalence 2.3%.[14] However, it considered very low when compared with 21% in similar study conducted in China.[15]

This study showed that 61.4% of respondents heard by water borne diseases (**Fig.4**), this knowledge is considered low as compared to study conducted in Vhembe District, Limpopo, South Africa where 76.80 % of the respondents knew that there are waterborne diseases.[16]

The study illustrated that most of respondents 65.7% do not have knowledge towards water borne diseases transmission **(Fig. 5)**, this level of knowledge consistence with 65% did not know about the route of transmission of waterborne diseases in similar study conducted in Vhembe District, Limpopo, South Africa.[16]

Most of respondents 80.6% washed their hand with soap after defecation at homes (**Fig. 6**) this is considered good practice as compared with only 14.8% washed their hand after defecation in study carried out in Angolela, Ethiopia.[17] Whereas in this study the girls was compliance with hand washing with soap more than boys which proved by study herself using chi-square test (X^2 = 14.007, df=1, p=0.000) (**Table. 1**).

The study showed that all schools latrines were dirty, improper design and contains insects of medical important such as flies and cockroachs. The study showed that in about two (17%) of schools the students practice open defecation in the peripherals inside the schools. This negative practice is due to unavailability of latrines in schools or insufficient in numbers and lack of health education.

In all schools under study, we found road vendors of food (females) inside and outside the schools and their food usually open to flies and dust that may carry germs and all of them did not have health cards and medical examinations, and none of them practiced proper hand washing.

The present study showed that a toilet was not available in about 25% of schools under study (**Table 2**), this result corresponding with the result of similar study carried out in Haitian Schools in the Time of Emergency, which revealed that 14 (33%) schools have no sanitation at all.[18]

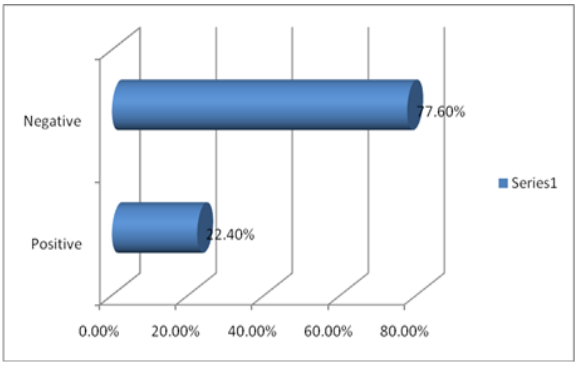

Figure (2): The prevalence of diarrhea among study group - El-Obied 2014
n=428

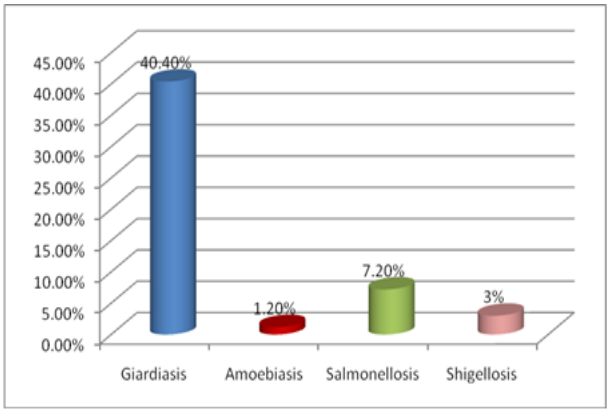

Figure (3): The prevalence of water borne diseases among study group - El-Obied 2014
n=428

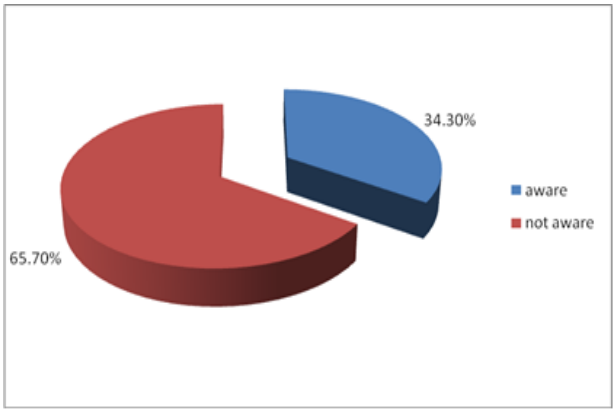

Figure (5) Knowledge about transmission of water borne diseases among study group- El-Obied 2014
n=428

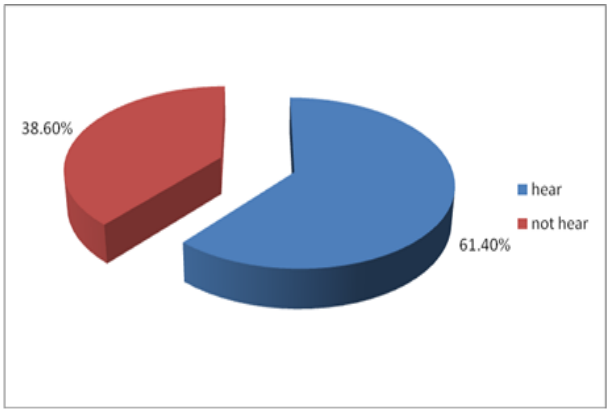

Figure (4): Hearing of study group by water borne diseases-El-Obied 2014
n=428

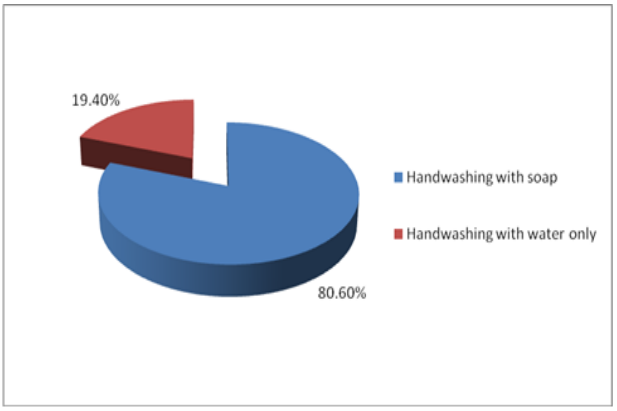

Figure (6): The hand washing after defecation among study group at home - El-Obied 2014
n=428

Table (1) shows the association between the gender of students and their practice of hand washing with water and soap after defecation - El-Obied 2014
n=428

Hand washing	Gender				Total	
	Male		Female			
Yes	158	37%	187	44%	345	81%
No	57	13%	26	6%	83	19%
Total	215	50%	213	50%	428	100%

(X^2 = 14.007, df=1, p=0.000)

Table (2): The situation of sanitation facilities among schools under study- El-Obied 2014
n=12

Availability of Toilets	Frequency	Percent
Available	9	75%
Not available	3	25%
Adequacy of toilets		
Adequate *	0	0.00%
Not adequate	9	100%

***** *One toilet per 25 girls and one for female staff; one toilet plus one urinal per 50 boys, and one for male staff* [19]

CONCLUSION

The study revealed that there is a problem of water borne diseasesin basic schools in El-Obied specially Giardiasis, which is dominated as compared with amoebiasis, shigeliosis and salmonellosis and there was a poor knowledge of school children towards water borne diseases transmission routes, prevention and types. The study showed that latrines in all schools surveyed were dirty and students was defecating surround the seat,

while in schools without toilets the student practicing open defecation inside schools in El-Obied.

RECOMMENDATIONS

Based on the findings of this study we recommend that

To the State Ministry of Education

– Build new toilets in enough numbers in schools and should be of a proper design to eliminate infiltration to water ground tank through soil layers.

– Rehabilitate existing toilets and avoid open defecation in schools.

– Construction of cafeterias in all schools and should be in proper design according to health authority standards to protect food contamination.

– Sending a short verbal messages, regards water borne diseases, sanitation and hygiene, through morning assembly and other daily activities at school.

To the State Ministry of Health

– All food handlers should have valid medical certificates.

– Early treatment of school children those infected with any waterborne diseases to avoid diseases transmission within the schools.

– Health education to school children, for how to protect and conserve water within schools from contamination

– Encourage good behavior of school children for water utilization and personal hygiene.

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