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Research Article

Cross-sectional study of parasitic causes of diarrhea in patients visiting a university hospital in Jeddah, Saudi Arabia

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Abstract: Diarrhea is considered a global health problem and a major mortality cause in children less than 5 years of age. Infectious diarrhea is usually associated with morbidity in the form of intestinal dysfunction and malnutrition. One of the major causes of diarrhea is intestinal parasitic infections. In this study, we investigate the parasitic causes of diarrhea in patients visiting King Abdulaziz University Hospital (KAUH) in Jeddah, Saudi Arabia during 2014. A total of 627 stool samples was received during 2014 at the Parasitology lab for stool analysis. Samples were analyzed using the formalin ethyl acetate concentration technique and a direct smear was performed for all diarrheic samples. A thick smear was prepared from all diarrheic specimens and permanently stained with a modified Zeihl-Neelsen staining procedure to look for the presence of *Cryptosporidium.* Four hundred and eighty (76.6%) specimens were negative for intestinal parasites and 88 (14%) non-diarrheic specimens were positive for intestinal parasites. Fifty nine (9.4%) specimens were diarrheic and 30 of them had intestinal parasites. The most frequent parasites seen in diarrheic samples were *Giardia lamblia* (28.8%) and *Entamoeba histolytica* (10.2%). *Cryptosporidium* was found in only 2 (3.4%) diarrheic specimens. The Results of this work recommend the establishment of a high standard sewage system to provide a better quality of life.

1. Introduction

Diarrhea is defined as a reduction in the consistency of stool or an increase in its fluidity. It is considered a complex illness with several causes. Acute diarrhea usually lasts for 2-3 weeks or less. Any diarrheal illness over 3 weeks is considered chronic diarrhea [1-3]. Diarrhea is considered a global health problem and a major mortality cause in children less than 5 years of age. Infectious diarrhea is usually associated with morbidity in the form of intestinal dysfunction and malnutrition [4-9]. Around half of hospitalized patients may develop diarrhea due to hospital acquired infections which will add to the morbidity of these patients and the total cost for their health care [3].

Diarrheal diseases are a major cause of death and are marked second to cardiovascular disorders as a cause of mortality [1, 10-11]. In the early 1980s, diarrheal disorders were the biggest child killers, responsible for an estimated 4.6 million deaths worldwide every year. Two and a half million children still die from these illnesses every year, almost all of them in developing countries [2, 10, 12].

One of the major causes of diarrhea is intestinal parasitic infections [2, 13-14]. Several intestinal parasites have been incriminated as a common cause of diarrhea, including *Giardia lamblia, Entamoeba histolytica, Cyclospora, Cryptosporedium, Isospora, Microsporidia, Strongyloides, Ascaris,* Hookworm, *Trichiura,* and tapeworms [2, 7, 9, 14-28].

In this study, we investigate the parasitic causes of diarrhea in patients visiting the King Abdulaziz University Hospital (KAUH) in Jeddah, Saudi Arabia during 2014.

2. Materials and Method

This study was a cross sectional study through the laboratory data of the King Abdulaziz University Hospital during the year 2014. Data were collected by IT data retrieval system and included all stool samples

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received in the Parasitology laboratory. A total of 627 stool samples was received during 2014 at the Parasitology lab for stool analysis. Of these, 59 (9.4%) samples were diarrheic. Samples were analyzed using the formalin ethyl acetate concentration technique as described by Cheesbrought [29]. A direct smear was performed for all diarrheic samples. A thick smear was prepared from all diarrheic specimens and permanently stained with a modified Zeihl-Neelsen staining procedure to look for the presence of *Cryptosporidium* [30]. Results were analyzed by SPSS (Ver. 16).

3. Results

During 2014, 627 stool specimens were received at the Parasitology laboratory at KAUH for stool analysis. Four hundred and eighty (76.6%) specimens were negative for intestinal parasites and 88 (14%) non-diarrheic specimens were positive for intestinal parasites. Fifty nine (9.4%) specimens were diarrheic and 30 of them had intestinal parasites. The most frequent parasites seen in diarrheic samples were *Giardia lamblia* (28.8%) and *Entamoeba histolytica* (10.2%). *Cryptosporidium* was found in only 2 (3.4%) diarrheic specimens. Other parasites detected in diarrheic specimens were *Ascaris lumbricoides* (5.1%), *Hymenolepis nana* (1.7%), and hookworm (1.7%).

4. Discussion

Diarrheal diseases are a major cause of death and are marked second to cardiovascular disorders as a cause of mortality [1, 8, 28]. Intestinal parasitic infections are considered as one of the major causes of diarrhea [2, 13-14]. In this study, we found that 9.4% of stool specimens received for stool analysis were diarrheic specimens. *Giardia lamblia* and *Entamoeba histolytica* are most frequently seen parasites in diarrheic specimens. Two specimens (3.4%) contained *Cryptosporidium* oocysts. Other parasites detected in diarrheic specimens were *Ascaris lumbricoides*, *Hymenolepis nana* and hookworm. The estimated prevalence rate of parasitic diarrhea among these collected samples was 50.8%. In a previous study among school children in Jeddah, the prevalence of intestinal parasites was 9.5% and *Giardia lamblia* had been the most frequently reported parasite [31]. In this study, we found that 14% of non-diarrheic stool specimens received were positive for intestinal parasites. The percentage increase in the past 10 years can be explained by the sample selectivity in this work where all samples were collected from patients visiting the hospital. Other studies have reported a lower rate of parasitic diarrhea [9]. However, the specimen collection selectivity may explain the higher estimated prevalence rate in this study.

High estimated prevalence of diarrhea caused by intestinal parasitic infection may be contributed solely to water contamination in the area. Previous studies have reported the presence of *Giardia lamblia* cysts in water samples from Jeddah [32]. Other studies have reported the presence of intestinal parasites in swage treated water [33-34]. Since, it is known that less than 20% of Jeddah city is covered by appropriate sewage system, contamination of drinking water is of high probability and, hence, a major drawback in hygiene. The Results of this work recommend the establishment of a high standard sewage system to provide a better quality of life.

References

1) Thillainayagam, A. (2003). Diarrhoea. *Medicine*, 1: 45-51.
2) Thapar, N. and Sanderson, I.R. (2004). Diarrhoea in children: an interface between developing and developed countries. *Lancet*, 363: 641-653.
3) Hamilton, A.C. and Auron, M. (2013). Diarrhea. *Hospital Medicine Clinics*, 2(2): e277-e246.
4) Tinuade, O., John, O., Saheed, O., Oyeku, O., Fidelis, N. and Olabisi, D. (2006). Parasitic etiology of childhood diarrhea. *Indian Journal of Pediatrics*, 73(12): 1081-1084.
5) Mukhopadhyay, C., Wilson, G., Pradhan, D. and Shivananda, P.G. (2007). Intestinal protozoal infestation profile in persistent diarrhea in children below age 5 years in western Nepal. *Southeast Asian Journal of Tropical Medicine and Public Health*, 38(1):13-19.
6) Platts-Mills, J.A., Liu, J. and Houpt, E.R. (2013). New concepts in diagnostics for infectious diarrhea. *Mucosal immunology*, 6(5): 876-885.
7) Swierczewskia, B.E., Odundoa, E.A., Koecha, M.C., Ndonyea, J.N., Kireraa, R.K., Odhiamboa, C.P., Cheruiyota, E.K., Wub, M.T., Leeb, J.E., Zhangb, C. and Oaksb, E.V. (2013). Surveillance for enteric pathogens in a case-control study of acute diarrhea in Western Kenya. *Transaction of the Royal Society of Tropical Medicine and Hygiene*, 107: 83-90.
8) Fagundes-Neto, U. (2013). Persistent diarrhea: still a serious public health problem in developing countries. *Current Gastroenterology Reports*, 15 (9): 345.
9) AL-Kubaisy, W., AL-Talib, H., Al-khateeb, A. and Shanshal, M. (2014). Intestinal Parasitic Diarrhea among Children in Baghdad Iraq. *Tropical Biomedicine*, 31(3): 499–506.
10) Dinesen, L. and Harbord, M. (2013) Acute diarrhea. *Medicine*, 41: 104-107.
11) Fagundes-Neto, U. (2013). Persistent diarrhea: still a serious public health problem in developing countries. *Current Gastroenterology Reports*, 15 (9): 345.
12) Qadri, S.M. (1990). Infectious diarrhea: Managing a misery that is still worldwide. *Postgraduate Medicine*, 88 (5): 169-175.
13) Klein, E., Boster, D., Stapp, J., Wells, J., Qin, X., Clausen, C., Swerdlow, D., Braden, C., and Phillip I. Tarr, P. (2006). Diarrhea Etiology in a Children's

Hospital Emergency Department: A Prospective Cohort Study. *Clinical Infectious Diseases*, 43:807–813.
14) Kaiser, L. and Surawicz, C. (2012). Infectious causes of chronic diarrhea. *Best Practice & Research Clinical Gastroenterology*, 26: 563–571.
15) Rim, H., Chai, S., Min, D., Cho, S., Eom, K., Hong, S., Sohn, W., Yong, T., Deodato, G., Standgaard, H., Phommasack, B., Yun, C. and Hoang, E. (2003). Prevalence of intestinal parasite infections on a national scale among primary school children in Laos. *Parasitology Research*, 91: 267-272.
16) Mahdi, N.K. and Ali, N.H. (2004). Cryptosporidiosis and other intestinal parasitic infections in patients with chronic diarrhea. *Saudi Medical Journal*, 25 (9): 1204-1207.
17) Tinuade, O., John, O., Saheed, O., Oyeku, O., Fidelis, N. and Olabisi, D. (2006). Parasitic etiology of childhood diarrhea. *Indian Journal of Pediatric*, 73 (12): 1081-1084.
18) Dib, H., Lu, S. and Wen, S. (2008). Prevalence of *Giardia lamblia* with or without diarrhea in South East, South East Asia and the Far East. *Parasitology Research*, 103: 239-251.
19) Haque, R., Mondal, D., Karim, A., Molla, I., Rahim, A., Faruque, A., Ahmad, N., Kirkpatrick, B., Houpt, E., Snider, C. and Petri, W. (2009). Prospective Case-Control Study of the Association between Common Enteric Protozoal Parasites and Diarrhea in Bangladesh. *Clinical Infectious Diseases*, 48:1191–1197.
20) Mousa, K.M., Abdel-Tawab, A.H., Khalil, H.H. and El-Hussieny, N.A. (2010). Diarrhea due to parasites particularly *Cryptosporidium parvum* in great Cairo, Egypt. *Journal of the Egyptian Society of Parasitology*, 40 (2): 439-450.
21) Shah, M., Tan, C.B., Rajan, D., Ahmed, S., Subramani, K., Rizvon, K. and Mustacchia, P. (2012). *Blastocystis hominis* and *Endolimax nana* Co-Infection Resulting in Chronic Diarrhea in an Immunocompetent Male. *Case Reports in Gastroenterology*, 6 (2): 358-364.
22) Kurniawan, A., Dwintasari, S.W., Connelly, L., Nichols, R.A., Yunihastuti, E., Karyadi, T. and Djauzi, S. (2013). *Cryptosporidium* species from human immunodeficiency-infected patients with chronic diarrhea in Jakarta, Indonesia. *Annals of Epidemiology*, 23 (11): 720-723.
23) Dash, M., Padhi, S., Panda, P. and Parida, B. (2013). Intestinal protozoans in adults with diarrhea. *National American Journal of Medical Sciences*, 5 (12): 707-712.
24) Hegazia, M., Patel, T. and El-Deek, B. (2013). Prevalence and characters of *Entamoeba histolytica* infection in Saudi infants and children admitted with diarrhea at 2 main hospitals at south Jeddah: a re-emerging serious infection with unusual presentation. *The Brazilian Journal of Infectious Diseases*, 17 (1): 32-40
25) Hawash, Y., Dorgham, L., Al-Hazmi, A. and Al-Ghamdi, M. (2014). Prevalence of *Cryptosporidium*-Associated Diarrhea in a High Altitude–Community of Saudi Arabia Detected by Conventional and Molecular Methods. *Korean Journal of Parasitology*. 52 (5): 479-485.
26) Rostami, M., Nikmanesh, B., Haghi-Ashtiani, M. T., Monajemzadeh M., Nazeer, J., Khalifa, K., Thien, H., El-Sibaei, M., Abdel-Hamid, M., Tawfik, R. and Tannich, E. (2013). Use of multiplex real-time PCR for detection of common diarrhea causing protozoan parasites in Egypt. *Parasitology Research*, 112:595–601.
27) Mukherjee, A.K., Chowdhury, P., Rajendran, K., Nozaki, T. and Ganguly, S. (2014). Association between *Giardia duodenalis* and coinfection with other diarrhea-causing pathogens in India. *Biomedical Research International*, in press.
28) Dinesen, L. and Harbord, M. (2013). Acute diarrhea. *Medicine*, 41: 104-107.
29) Cheesbrought, M. (1995). Medical Laboratory Manual for Tropical Countries. 3rd ed. Vol, 1.
30) Casemore, D.P., Armstrong, M. and Sands, R.L. (1985). Laboratory diagnosis of cryptosporidiosis. *Journal of Clinical Pathology*, 38: 1337-1341.
31) Zakai, H.A. (2004). Intestinal parasitic infections among primary school children in Jeddah, Saudi Arabia. *Journal of the Egyptian Society of Parasitology*, 34(3): 783-790.
32) Zakai, H.A. and Barnawi, H.I. (2014). Prevalence of *Cryptosporidium* and *Giardia lamblia* in water samples from Jeddah and Makkah cities. *Journal of Advanced Laboratory Research in Biology*, 5(1): 12-17.
33) Norman, G., Pedley, S. and Takkouche, B. (2010). Effects of sewerage on diarrhoea and enteric infections: a systematic review and meta-analysis. *Lancet Infectious Diseases*, 10: 536–544.
34) Ben Ayed, L., Schijven, J., Alouini, Z., Jemli, M. and Sabbahi, S. (2009). Presence of parasitic protozoa and helminth in sewage and efficiency of sewage treatment in Tunisia. *Parasitology Research*, 105: 393-406.