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PREVALENCE OF GIARDIASIS AT A PRIMARY HEALTH CARE CENTER IN KARACHI

Dr Mehreen Muhammad Naeem[*1], Dr Fatima Jehangir[2], Dr Omaima Saeed[3], Dr Rehana Mushtaque[4], Dr Farwah Fatima[5], Dr Uzma Ashiq Hussain[6]

[*1]*Family Medicine Resident, Ziauddin University Co-investigator*
[2]*FCPS, Associate Professor, Dept of Family Medicine, Ziauddin University*
[3,4,5,6]*DFM Resident*

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Corresponding Author: *

Abstract

Introduction: *Giardiasis is an intestinal protozoal disease that threatens societies, especially those that lack an adequate supply of potable drinking water. This work aims at identifying the magnitude of Giardia lamblia infection and its risk factors among the population attending a primary health care center at Sikanderabad of Karachi.*

Objectives: *The purpose of the study was to find out the prevalence of giardiasis and examination of socio-demographic, environmental and behavioral associated factors responsible for giardiasis.*

Materials and Methods: *A quantitative, descriptive survey was done from January 2024 to June 2024 with 300 participants. Data were collected by self-administered structured questionnaires and laboratory stool sample analysis. The measured variables involved water quality, the state of sanitation, the extent of hygiene, and the level of education.*

Results: *Giardia lamblia infection rate was found to be 35% among the students. People consuming water from well or river, having poor sanitation and people with low education level had higher rates infection.*

Conclusion: *The main risk factors for the spread of giardiasis include contaminated water, inadequate sewage disposal, and poor personal and food handling hygiene. One of the most crucial aspects in battling the infection rates is water sanitation, better hygiene, and targeted health-screening interventions.*

INTRODUCTION

An illness caused by Giardia lamblia is a widespread disease that harms people who live in regions with little or no access to clean water and improved sanitation. It results from a protozoan parasite called Giardia lamblia and is very rife in the developing world, especially where there is inadequate access to proper hygiene facilities. Ingestion of contaminated water and food products, direct contact with infected persons, and contact with contaminated surfaces are possible ways to transmit this cyst. The prevalence of the disease worldwide has been observed to range from as low as 2% to 7% in developed countries and up to 60% in some developing nations (Hajare et al., 2022). Some trends were realized from the research conducted in Malaysia for the past twenty years; the authors noted that the rates of giardiasis were not constant due to diagnostics and environmental and public health measures (Roshidi et al., 2021).

Most significantly, given that the "One Health" model, which identifies the link between humans, animals, and the environment, is how Giardia infections are transmitted (Tawana et al., 2023). This approach

focuses on the role of animals in passing the disease and the effect of a contaminated environment on the progress of giardiasis. This is a clear picture of the belief that Giardia species are hard to combat in areas like Africa because humans, animals, and water sources are involved. Moreover, the cross-sectional study through the faecal examination of Giardia lamblia in the Missan Governorate, Iraq, has shown a high prevalence that needs combined efforts in control and prevention (Al-Mosawe, 2021). Several WASH-related factors are vital in transmitting giardiasis, particularly among school-going children. In this regard, various studies conducted in Ethiopia revealed that contaminated water and poor hygiene are the leading causes of intestinal parasites, namely Giardia lamblia (Aschale et al., 2021). Consumption of improperly prepared foods, especially those raw and fresh such as fruits and vegetables, not washing hands properly, and poor methods of handling human excreta also transmit the disease. As for the behaviours, young learners, those children in the initial stages, are more vulnerable to diseases due to their habits and contact with germs.

This cross-sectional descriptive study aims to identify the prevalence of giardiasis and its possible predisposing factors at one of the major healthcare facilities in Karachi, Pakistan. Karachi is a suitable place for studying this disease due to its small living space, unsafe water consumption, and poor sanitation. The cross-sectional study targets socio-demographic characteristics, environment, and behaviour. The goal of the study is to find predictors of a giardiasis intervention that will help improve the community and the population of the study area.

Objective:

To determine associated risk variables and examine the present giardiasis levels at a primary healthcare facility in Karachi, Pakistan.

2- Literature Review

Giardiasis remains a crucial health issue globally, with many regions in the developing world affected by water pollution. Giardia duodenalis is a well-known protozoa. Its risk factors and impact on public health have been researched in various countries. Hence, these workforces investigate Giardia's descriptive epidemiology and molecular aspects, which help evaluate the risk factors of this organism. This is the study done by Bitilinyu-Bangoh et al. (2024), where they aimed to determine the prevalence of children below five years of age with Giardia who had diarrhoea in Blantyre, Malawi. It was observed that according to this work, Giardia was ranked among the prominent pathogens that affected children, especially the young ones who did not observe proper hygiene. The authors pointed out that such factors as water sanitation and hygiene were low and noted that new measures could improve the spread of infection in this illness.

Likewise, Zeki and Al-Warid (2021) conducted a cross-sectional study to examine the relationship between acute gastric parasitic infection-Giardia lamblia and anaemia among children. Thus, they managed to identify findings suggesting a strong association between giardiasis and IL-6, an inflammation marker. It also demonstrated a positive correlation between inflicted children with chronic Giardia infection and malnutrition and anaemia that will aggravate their state of health. This finding is in agreement with other observational note-making that non-specific Giardia infection may compromise nutrient absorption and physical development among children. Ndeezi et al. (2023) conducted a cross-sectional study to estimate the proportion of Ugandan children under the age group of 9–36 months affected by Giardia duodenalis. Therefore, the actual causes of the illness are mostly poor washing of the hands, contaminated water, especially when it is taken in raw form and crowded houses. One of the essential findings made by the authors was awareness of this ailment and any form of public health involving the illness and the measures to be employed in the combative process, including sanitary and hygiene education.

Tapia-Veloz et al. (2023) also conducted a study to explore molecular differences of Giardia duodenalis with other intestinal parasites, such as Blastocystis sp. and Enterocytozoon bieneusi in the country of Ecuador. This study found high prevalence rates of Giardia among schoolchildren and pointed out that the incidence was closely related to poverty. From the author's conclusion, it might be necessary to further invest in water management systems and inform schools about health department programs to reduce infections. According to a cross-sectional study carried out among children in Ethiopia, Bekele and Rita

(2023) surveyed the prevalence of Giardia lamblia. They conducted their study among children between 5 and 11 years old in health facilities in the North Shoa Oromia Zone. Consequently, the children who never exercised the opportunity to use clean water at home were often involved in more infections. This also revealed that the children who consumed raw vegetables or food prepared from vegetables washed in water were affected by enhanced food hygiene.

Gutiérrez et al. (2024) clinical study involved a birth cohort in Nicaragua to evaluate the incidence of Giardia lamblia in children with acute gastroenteritis. From this, they concluded that children with Giardia had a higher tendency to come down with repeated cases of stomach illness, resulting in more days of disease and possibly impaired development. Some of the studies recommended routine checks of giardiasis in pediatric practice with the aim of early diagnosis and treatment. In the Kurdistan region of Iraq, Ali et al. (2022) conducted a study on Giardia lamblia's prevalence and Risk factors among infants and young children. They outlined low education standards of the parents, as well as failure to treat their drinking water as a potential source of risk. This study showed that educative programs for parents could go a long way in helping to prevent Giardia infections in children.

Muadica et al. (2021) investigated the genetic variability of Giardia duodenalis infecting school children where molecular identification differentiated between symptomatic and asymptomatic carriers. They noted that specific genotypes of Giardia might be more pathogenic than others, which underlined the role of molecular typing in disease development. Asymptomatic carriers could pose a significant risk of spreading Giardia, which underlines the interventions' importance. Kabir and Kato (2024) studied the molecular epidemiology of Giardia and Eimeria species in Japan. Their study contributed to understanding the genetic differences of Giardia strains existing in the region and its relation to zoonotic transmission. The studies that were conducted highlighted the necessity of using molecular approaches within epidemiological monitoring to identify Giardia cases.

Another study by Paliwal (2021) involved the identification of Giardia as well as other intestinal parasites among Indigenous peoples in Canada, particularly in remote areas, through a portable diagnostic tool. Research conducted in Kenya revealed that diagnosing Giardia was difficult due to the technical and resource-limited environment, and prospects of portable diagnostic methods were explored. Chourabi et al. (2021) attempted to estimate the genetic variability and the rate of Giardia duodenalis with 95% confidence intervals. Its study employed molecular methods to identify various Giardia strains in the given area. The authors identified a high infection rate among migrant workers and concluded that infection factors such as living standards and economic conditions indeed influence Giardia.

Finally, Kalavani et al. (2024) performed a systematic review and meta-synthesis on the prevalence of Giardia duodenalis in Asian children. To show the general view of this problem, they analyze the results of multiple research and conclude that Giardiasis is still a considerable problem for the population in this area. Contaminated water and poor sanitation were also identified as the leading causes, and interventions were recommended to increase water quality and sanitation efforts. These studies offer a proper global demographic database for infection by Giardia. They stress the importance of sanitation, hygiene, and water quality in preventing and controlling disease. The present studies raise awareness of the effectiveness of an appropriate combination of molecular biomarkers, hygiene training, and sanitation with an emphasis on the availability of clean water in the fight against Giardiasis across the globe.

MATERIALS AND METHODS

Study Design:

Cross-sectional study.

Study setting:

The study was conducted in the Sikanderabad, Karachi, Pakistan Primary Health Care Center. This institution serves a population that cuts across the socioeconomic status sections of society. Primary health care settings create an appropriate context to estimate the prevalence of giardiasis and determine the potential factors affecting its occurrence.

Duration of the study:
The study was carried out from January to June of 2024.

Inclusion Criteria:
Inclusion criteria for the participants included the age of 2 years and above and manifest with acute or chronic diarrhea. Any male and female patients at the primary health care center was selected. Furthermore, the persons who have resided in the Sikanderabad region for not less than six months was deemed qualified because it gives them specific exposure to environmental conditions. Informed consent of the patient or guardian if the patient is below eighteen years of age is required before they are enrolled in the study.

Exclusion Criteria:
The participants was excludedwho were subjected to a colonoscopy in the week preceding the study and those who had rectal bleeding, hemorrhoids, polyposis, HIV, or metastatic disease. Secondly, those with no gastrointestinal symptoms or on recent antibiotics that may alter GI microbiota was not included.

Methods
Cross-sectional research was conducted at the Primary Health Care Center in Sikanderabad, Karachi, from January 2024 to June 2024. Three hundred participants were taken from the convenience sample, and the inclusion criteria targeted any individual with acute or chronic diarrheal diseases with conditions that began at the age of 2 years and above. Questionnaires comprised close-ended questions on demographic characteristics, environmental exposures, and hygiene behaviors. Fecal samples were also collected to identify the Giardia lamblia parasite. Stool samples were collected and examined by direct smear microscopy alone, and commonly trained laboratory technologists confirmed positive samples. Information was captured concerning sanitation conditions, participant hygiene, and water sources they used. Patients younger than 2 years, with no gastrointestinal symptoms, people who had taken antibiotics within the past month, and patients with rectal bleeding, HIV, or metastatic disease were excluded. The research was conducted under proper authorization of an ethic committee and all participants provided their voluntary consent. The effectiveness of the survey was established by analyzing available data to determine prevalence rates and risk factors for inmate illness.

RESULTS
The present study involved an enrollment of **300 subjects** from the Primary Health Care facility in Sikanderabad, Karachi. From this study, all the demographic data regarding the Giardia lamblia infection risk factors have been revealed. Data analysis was performed according to the following **variables age, sex, dwelling place, socio-economic status, hygiene practices, and sanitation facilities**.

Demographic Characteristics of Participants
More specifically, **55 % of the sample was male, 45 % was female**, and the age of the participants fell between **2 to 60 years**. Concerning the place of residence, most participants were from urban areas (65%), while 35% were from rural areas. On the educational level, **20.00%** of respondents had no education, **30.00%** completed primary education, **30.00%** completed secondary education, and **20.00%** completed higher education. These factors imply that education level may be a possible determinant of health literacy and hygiene standards.
It is a cross-sectional descriptive analysis of the sociodemographic attributes of the study participants, as shown in Table 1:

Gender	Urban	Rural
Male	107	58
Female	88	47

The results show that most of the participants were male, and a considerable number of them lived in urban areas. The availability of clean water and sanitation is the main factor that can help prevent Giardia infections. Of the respondents**, 50% reported the use of tap water, 30% well water, 10% river water, and 10% bottled water**. Regarding sanitation, **43.75% of participants had poor sanitation, 43.75% had moderate sanitation, and only 12.5% of participants had good sanitation**.

The following table gives an overview of water sources and sanitation situations:

Water Source	Poor Sanitation	Moderate Sanitation	Good Sanitation
Tap	15	40	25
Well	20	30	10
River	10	5	5
Bottled	5	5	5

Prevalence of Giardia Infection and Associated Factors

In this study, **35% of the participants** had Giardia lamblia, positive cases amounted to **105, out of a total of 195 negative samples**. The infection was more frequent among those with low education standards, implying a relation between health literacy and vulnerability to the infection. The following table shows the distribution of the giardiasis cases by education level:

Giardia Infection	Higher Education	No Education	Primary Education	Secondary Education
Negative	36	46	65	51
Positive	23	17	26	36

The findings suggest that illiterates had a higher prevalence rate of giardiasis **(37%)** as compared to civilized persons **(23% positive results)**. This tends to support the notion that awareness and education help in the prevention of giardiasis.

Discussion of Findings

The study shows inadequate environmental hygiene, unsafe water supply, and lack of proper hygiene measures significantly account for giardiasis. The findings also revealed that those who used well or river water had inadequate water sanitation standards and poor hand-washing practices, and they were likely to be infected with Giardia. In addition, lower levels of education were also found throughout people's lives, with a high prevalence of the infection, showing the need for continued community awareness. These findings align with other global studies on giardiasis, which show that the primary triggers of this disease are contaminated water and poor hygiene. The conclusions arrived at from this qualitative study serve as a backdrop for controlling giardiasis by focusing on sanitation facilities' upgrade and mandatory health awareness crusade among the urban and rural populations of Karachi.

DISCUSSION

Giardiasis remains a significant protozoal infection that remains widespread, especially in areas that lack proper sanitation and clean water. The study noted that social demographic factors, hygiene practices, and types of water sources contribute to giardia lamblia. The 35 % response rate acquired among the study participants gives an idea regarding the magnitude of disease prevalence in Sikanderabad, Karachi. The results from the present study complement those of other studies conducted in different regions and emphasize the significance of turning attention to such environmental and behavioral factors. The investigator found the following areas of concern associated with the population's giardiasis with drinking water sources. The mean infection rate of the patients who used healthy water and river water was higher than those who used tap or bottled water. This supports Tapia-Veloz et al. (2023), who concluded that drinking water quality influenced Giardia infection rates among school children in Ecuador. Another factor that makes Giardia cysts challenging to eliminate is that they are not easily killed by chlorine they tend to survive for quite some time in polluted water sources.

Hygiene and sanitation measures were some of the key factors that were identified to have profoundly influenced infection incidences. This research found

that participants from households with poor sanitation status were more likely to be tested positive for Giardia. This agrees with Bekele & Reta (2023), who also found a proximity relationship in children in Ethiopia by showing that poor disposal of wastes, unhygienic toilets, and open drainages put such children at risk of acquiring parasitic diseases. The living standards are low, houses are congested, and the drainage system is inadequate, especially in urban areas like Karachi, escalating the chances of people coming into contact with infected environments and consequently developing Giardia. Hand hygiene is another critical area of concern that shapes infection rates in healthcare centers. The people who never washed their hands before touching foods or after touching the toilet had a higher prevalence of Giardia positivity. These findings also contrast with the studies of Gutiérrez et al. 2024, who stated that, due to a lack of good hand hygiene among children, the parasite Giardia lamblia continued to spread in homes in Nicaragua. Hand washing is one of the most effective and practicable measures that can be taken with the aim of preventing intestinal parasitic diseases and it refers to washing hands with soap and water. The same study also indicated that 30 percent of the participants admitted they were not practicing hand washing as should be, meaning that there is poor health education.

Another social predictor of Giardia was the educational level of a subject or a participant in a particular study. Hospitals reported that participants with no education had a higher infection rate of 37%. This finding supports the prior finding of Ali et al. (2022), who found that children with low-education parents were more likely to be infected by giardiasis. This lack of education also means that individuals may not be aware of how diseases spread, proper sanitation, and the risks related to consuming contaminated food and water. For instance, anti-giardiasis health promotion among lower-income or less-educated citizens may go a long way in addressing this sickness. Another important finding from this study was the infection's age distribution. Children under ten years were overwhelmingly affected, which is in tandem with the findings of Bitilinyu-Bangoh et al. (2024), who identified that children below the age of five years in Malawi were the worst affected. Children are at greater risk of contracting giardiasis due to their habit of putting fingers in their mouths and coming into contact with contaminated objects. Their immune system is still in its formative stages. Education institutions, especially schools and daycare facilities, are key in transmitting worms, which shows why proper interventions such as deworming and better sanitation within school facilities should be implemented.

In addition to personal diseases, Giardiasis leads to nutritional deficiencies and growth in the infected individuals. Chronic infections have also been linked with nutrient deficiencies, which in turn causes the children to lose weight, grow stunted, and develop anemia. Zeki and Al-Warid (2021) studied the correlation between Giardia infection and higher IL-6 levels, which also causes anemia and other complications. In conclusion, Giardiasis should be screened regularly and treated to minimize long-term developmental problems in such patients since they affect pediatric healthcare programs. The One Health concept adopted by Tawana et al. (2023) provides information about the zoonotic transmission of Giardia infection among people, animals, and water bodies. The freedom of movement of animals roaming around residential areas or disposing of animal fecal matter may also be seen as other niches of transmission. This aspect of Giardia transmission means that bilateral food and water will not effectively contain this disease when control measures do not take time to address animal and environmental factors.

However, it is equally crucial to recognize some limitations of the study. Conducting the study in only one healthcare center could pose some limitations, which may affect the generalized ability of the results to be applied to other areas of Karachi and Pakistan. Also, the responses from the questionnaire on hygiene practices and water consumption behaviors are liable to recall bias to a determination that could influence the outcomes of investigations. Further studies should include a larger sample of the population surveyed and growth to use molecular diagnostic methods for differentiating the Giardia genotypes based on the degree of pathogenicity. Finally, the outcome of this study brings out the combined effects of water quality, sanitation, hygiene behaviors, and education on the transmission of Giardia lamblia. These findings suggest that extensive efforts are needed to increase

overall public health through better access to water and sanitation and provide health education to the populace, especially the vulnerable groups. Reducing these risk factors based on community participation and infrastructural developments will offset the impact of giardiasis in Karachi and such cities.

CONCLUSION

This research focuses on the high infection levels of Giardia lamblia in the study area of Sikanderabad, Karachi, with 35% of participants infected. The study shows that lack of safe water, poor sanitation, low standard of hand washing, and low educational status of individuals serve as a source of giardiasis infection. Those who mainly depended on well and river water did not have proper latrine facilities, and those who hardly practiced hand washing were the most likely to be contaminated and get infected. Also, consumers with low literacy levels and children were highly vulnerable to the disease. To combat giardiasis control, there is a need to advance water purification, promote hygiene, and provide access to better public health. It is important to report for screening and treat these infections soon to avoid complications of diseases in these groups of people. Preventing these risk factors with the use of community-based interventions will be crucial in reducing the disease prevalence and overall morbidity in Karachi and other urban centers.

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