

Pattern of Intestinal Parasitic Infections at King Abdulaziz Medical City, Riyadh, Saudi Arabia and its Primary Health Clinics Across Saudi Arabia

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Abstract: *Background:* Intestinal parasites are considered one of the most common infections worldwide, 3.5 billion people are considered as affected and 450 million are considered ill as a result of these infections. *Objective:* This study aimed to undertake an epidemiological survey of intestinal parasitic infections in a tertiary care hospital King Abdulaziz Medical City, Riyadh, Saudi Arabia (KAMC) and its primary health clinics from January 2007 to December 2012. *Methods:* This is a retrospective cross sectional study from all patients' records and microbiology data from January 2007 until December 2012 regarding all intestinal parasites isolated at KAMC laboratory and its primary health clinics. The samples included pediatrics, adults and elderly from in and out-patient clinics. We evaluated the frequency of organisms involved and associated it with patient's nationality, gender and age. *Results:* All positive samples for intestinal parasites were included which was 688 samples. Giardia Lamblia (51%) was the most common encountered parasite followed by hookworms-Necator or Ancylostoma (13%) and Trichuris trichiura (8%) while Taenia species (0.1%) exhibited the minimum prevalence. Males were more affected by Giardia Lamblia than females (33% and 18%, respectively). Moreover, males were more affected by hookworms than females (11% and 1.5%, respectively). The mean age for infection was 23 years (± 15.53 SD) for both genders. Among positive cases, the infection rate was the highest in 25-34 years age group (29%) followed by 7-17 years age group (22%) while >65 years age group showed the least infection rate which accounted for 2%. Giardia Lamblia was the most common parasitic infection across all age groups. *Conclusion:* Giardia Lamblia was found to be the commonest etiologic agent of intestinal parasitic diseases among the study population. There is an extensive need for multi-institutional collaborative studies to get more valuable information on our population to identify risk factors and prevention strategies.

Keywords: Infection; Intestinal parasites; prevalence; Stool; Giardia Lamblia; Riyadh Saudi Arabia

1. Introduction/Background

In spite of the great development in healthcare system, the problem of parasitic infections continues to affect people. Intestinal parasites are considered one of the most common infections worldwide. These infections affect 3.5 billion people and 450 millions of them are considered medically ill as a result of these infections, mainly in children^(1, 2). It is estimated that more than 60% of the earth population are infected with at least one parasite and enormous part of these people have several different species⁽³⁾. Hence, it has a huge impact on the society and community as it causes mental illnesses in the form of delusions of parasitosis and physical health problems such as intestinal obstruction caused by Ascaris and in severe cases might lead to death^(4,5). Infections with intestinal parasites are predominately seen in tropical and subtropical regions of the developing world where clean water and sanitation facilities are almost absent. Many studies have reported that there is a relationship between the educational, environmental, sanitary and socioeconomic conditions of the people with the prevalence and spread of parasitic infections^(6,7). The centers for disease control and prevention have stated that poor personal hygiene is the third most common factor contributing to food-borne diseases⁽⁸⁾. For this reason, this factor is considered as major influencing factor for getting parasitic infections in Saudi Arabia⁽⁹⁾. Riyadh, the capital of Saudi Arabia, is located at the middle part of central region. The area has a hot, continental climate with low humidity

throughout the year. One study in 2010 showed that 8% of stool specimens were positive for intestinal parasites collected from children at primary and nursery schools⁽¹⁰⁾. Another study done by Zaglool *et al* in 2011, found that 6% of stool specimens from patients attending Al-Noor specialist hospital were positive for intestinal parasitic infections⁽¹¹⁾. In a large study by Al-Shammari in Saudi Arabia, discovered high prevalence of intestinal parasitic infections among specific populations including; food handlers (14%), Riyadh school children (14%), expatriates (56%) and patients attending hospitals (31%)⁽⁷⁾. Studies of infectious diseases, in general, and parasitic infections in particular in Saudi Arabia are insufficient. The present study of intestinal parasitic infections among patients was conducted in King Abdulaziz Medical City (KAMC) - Microbiology laboratory from January 2007 until December 2012. The main objective of the current study was to determine the type and prevalence of intestinal parasites among these patients, the impact of these parasites as risk factors among the residents in Saudi Arabia and discuss their public health importance.

2. Methodology

This was a retrospective cross sectional study from all patients' records and microbiology data from January 2007 until December 2012 regarding all intestinal parasites isolated at King Abdul-Aziz Medical City (KAMC) laboratory and its primary health clinics across different

regions of Saudi Arabia. The samples included pediatrics, adults and elderly from in and out-patient clinics. We evaluated the frequency of organisms involved and associated it with patient's nationality, gender and age.

Thus, the study was conducted at King Abdul-Aziz Medical City (KAMC), Riyadh, Saudi Arabia. KAMC, a tertiary care center has a central laboratory department in Riyadh that is internationally accredited by Joint Commission International (JCI). It provides complete medical services through its laboratories which cover wide spectrum of clinical diagnostic tests that help predict, diagnose and monitor diseases. Microbiology lab is one of the sections in the laboratory department. It has bacteriology, virology, TB, parasitology, mycology service as well as water and environmental testing. The microbiology lab receives around 1000 stool samples per year. Stool samples from KAMC primary health clinics (PHC) across different regions of Saudi Arabia were included in this study. These primary health clinics include, but not limited to: Hail region PHC, Qassim region PHC, Northern Borders region PHC (Arar city and Rafha city) and Nejran region PHC. All specimens were examined grossly by qualified laboratory technologists for consistency and presence of blood or mucus. Direct fecal smears were prepared and intestinal parasites were identified by direct microscopy using a wet mount of stool specimen with normal saline and iodine looking for the presence of trophozoites and cysts. Trichrome stained/fixed smear and permanent stain was used to confirm the presence of intestinal parasites. Diagnosis of intestinal parasites is confirmed by the recovery of protozoan trophozoites and cysts, helminthes eggs and larvae in the clinical parasitology laboratory. Also, samples were investigated for the presence of some enteropathogens. After statistical calculation, the number of stool samples needed for our study was 357 samples when confidence level is 95% and when margin of error is .05. Stool samples were selected randomly to avoid sampling bias. The data was analyzed using SPSS statistical software version 20.0 and Microsoft Excel 2010. The subgroups were tested for significance using chi-square test and p-value less than 0.05 was considered significant. Categorical data was presented as frequency and percentage while numerical data as means and standard deviations.

3. Results

All positive samples for intestinal parasites from January 2007 to December 2012 were included which is 688 samples. *Giardia Lamblia* ($n = 351, 51\%$) was the most common parasite that was encountered followed by hookworms-*Necator or Ancylostoma* ($n = 86, 12.5\%$) then *Trichuristrichiura* ($n = 57, 8.3\%$), after that *Ascaris Lumbricoides* ($n = 39, 5.7\%$) followed by *Entamoeba coli* ($n = 37, 5.3\%$) while *Taenia species* ($n = 1, 0.1\%$) exhibited the minimum prevalence. (Appendix 1)

Males ($n = 494, 71.8\%$) were more affected when compared to females ($n = 194, 28.2\%$) regardless of the intestinal parasitic organism and there was statistically significant association (p -value=0.02). Specifically, males ($n = 226, 32.8\%$) were more affected by *Giardia Lamblia* than females ($n = 125, 18.2\%$) with a positive association between male sex and infection with *Giardia Lamblia* (p -value=0.03).

Also, males were more affected by hookworms-*Necator or Ancylostoma* ($n = 76, 11\%$) than females ($n = 10, 1.5\%$) without a statistical significance ($p = 0.10$). The mean age for infection was 23 years (± 15.53 SD). (Appendix 2)

Among positive cases, The infection rate was the highest in 25-34 years age group ($n = 197, 28.6\%$) followed by 7-17 years age group ($n = 148, 21.5\%$) then 18-24 years age group ($n = 104, 15.1\%$) while >65 years age group ($n = 12$) showed the least infection rate which accounted for 1.7%. There were three male cases below the age of one year, one is four months old and the others were three months old, all of them were infected by *Giardia Lamblia*. The other age groups combined accounted for 33% of positive cases ($n = 227$) and their break up was as follows: 35-44 years age group ($n = 76, 11\%$), 3-6 years age group ($n = 72, 10.5\%$), 1-2 years age group ($n = 35, 5.1\%$), 45-54 age group ($n = 30, 4.4\%$) and 55-64 years age group ($n = 14, 2\%$). *Giardia Lamblia* was the most common parasite across all age groups. (Appendix 3)

For nationality, Saudis accounted for 52% ($n = 358$) of positive cases for intestinal parasites while Non-Saudis accounted for 48% ($n = 330$) without a statistically significant association (p -value=0.20).

4. Discussion

Intestinal parasites with simple life cycle like *Giardia lamblia* usually have the same distribution across the world. This has been shown not only in this study, but also in those reported in the literature^(11,12). We found that *Giardia lamblia* to be predominant in this study and this is comparable to many reports from Saudi Arabia^{(11),(7),(13)}. Our results are in full agreement with the earlier reports where overall high intestinal parasitic infections rate of 32% was reported in Riyadh, depending on socio-demographic and environmental factors⁽¹¹⁾. On the other hand, the presence of certain parasites like *Enterobius vermicularis*, even though it was found in low rate, is alarming. Autoinfection is common with this parasite by scratching the anus region and lack of personal hygiene⁽¹⁴⁾. The rate of monoparasitism in this study was much higher than the rate of polyparasitism. A study by Okyay et al. reported that there is low prevalence of mixed infection⁽¹⁵⁾. Our study was a laboratory based and as a result we did not have clinical data on exposures to water collections or food-borne parasitic diseases. Also, some socio-demographic data could not be collected which is important to reflect information on intestinal parasites at the community level. Finally, there is a possibility that the samples included in this study might have been from the patients already taking treatment and in recovery phase which may not reflect the real infection rate.

5. Conclusion

Giardia Lamblia was found to be the common etiologic agent of intestinal parasitic diseases among the study population. Despite the advances in healthcare systems, the problem of intestinal parasites continues to affect people. Hence, there is an extensive need for multi-institutional collaborative studies to get more valuable information on our population to identify risk factors and prevention strategies.

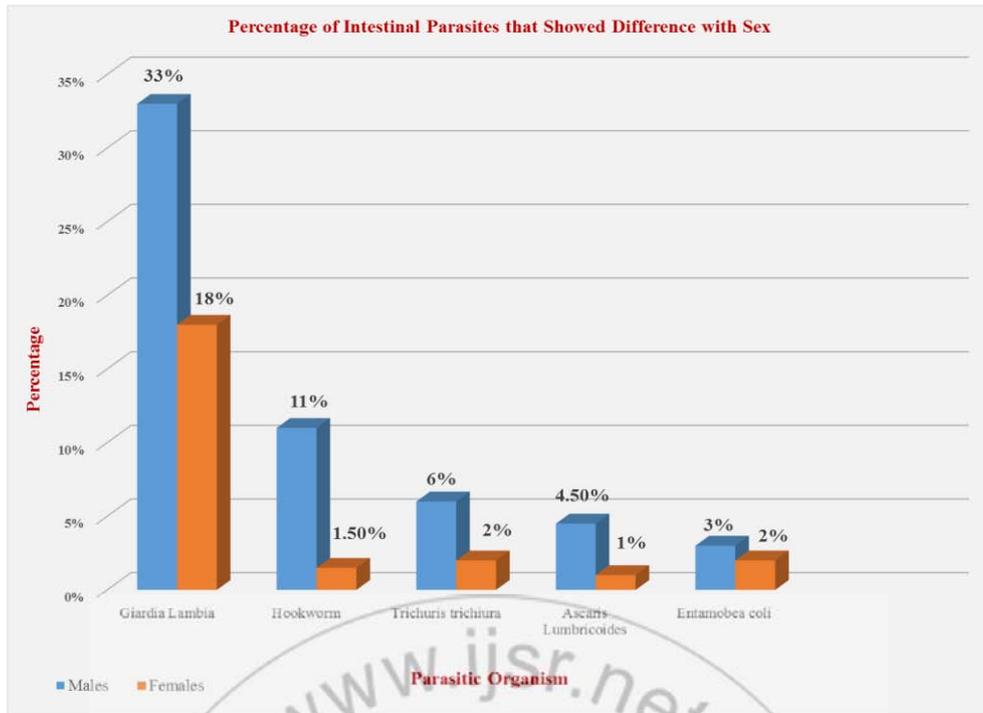
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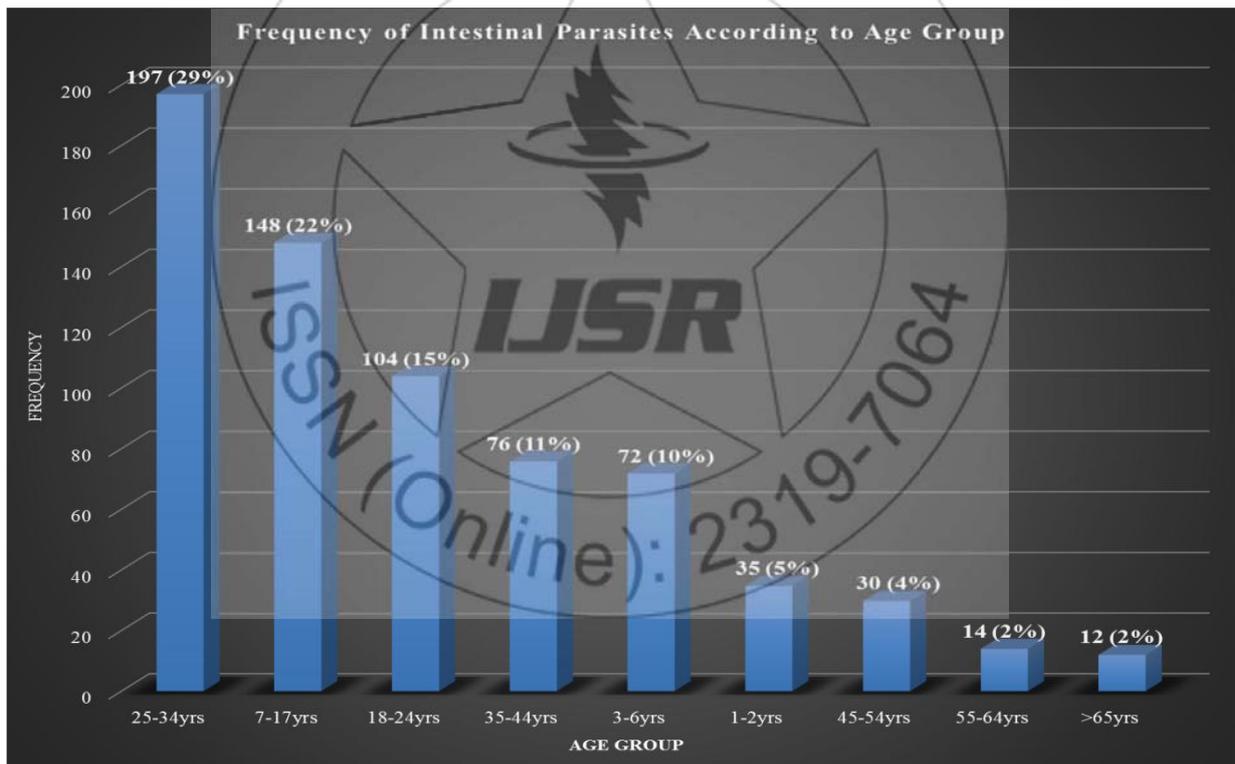
Appendix

Intestinal Parasitic Organism	Frequency (n = 688)	Percentage (100%)
<i>Giardia Lamblia</i>	351	51.0%
<i>Hookworms</i>	86	12.5%
<i>Trichuristrichiura</i>	57	8.3%
<i>Ascarislumbricoides</i>	39	5.7%
<i>Entamoeba coli</i>	37	5.4%
<i>Hymenolepis nana</i>	29	4.2%
<i>Trichuristrichiura</i> and <i>Hookworms</i>	17	2.5%
<i>Endolimax nana</i>	12	1.7%
<i>Strongyloidesstercoralis</i>	11	1.6%
Others	46	6.3%

Appendix 1: Frequency and percentage of Intestinal Parasites



Appendix 2: percentage of intestinal parasites that showed difference with sex



Appendix 3: Frequency of intestinal parasite according to age group