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Factors associated with Intestinal Parasitic Infection among patients attending Jericho Governmental Primary Health Care Clinics

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Dedication

I dedicate this thesis to the unwavering support and encouragement of all my family and friends who have been my pillars of strength throughout this journey. Your belief in me has been my constant motivation, and I am profoundly grateful for your love and guidance.

I also dedicate this work to the memory of my beloved mother & Father, my supportive wife & my extraordinary brothers and my cute sister, whose wisdom and inspiration continue to guide me, even in their absence.

To my dedicated thesis advisor, Dr. Asad Ramlawi, your expertise, patience, and mentorship have been invaluable, and I am sincerely appreciative of the knowledge I have gained under your guidance.

This thesis is a testament to the collective efforts of everyone who has touched my life, and I offer it as a token of my gratitude.

Subhi M. Alshaer

Declaration

I hereby declare that this thesis submitted for the degree of Master is the result of my original work, except where otherwise acknowledged and that this thesis (or any part of the same) has not been submitted for a higher degree to any other university or institution. All data, figures, tables, and other information presented in this thesis are accurate and have been collected and analyzed with rigor and integrity.

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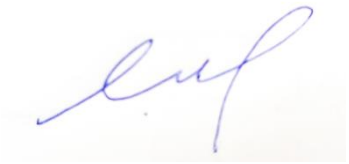
Signed: 

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Abstract

Background: Intestinal parasitic infections are a global issue, affecting millions of people, especially those in impoverished regions, with helminth diseases, particularly among schoolchildren. The Palestinian Ministry of Health (PMOH) has annually reported several cases of intestinal parasitic infestations, including giardiasis, ascariasis, and enterobiasis, strongyloidiasis, and amebiasis. The most significant risk factors for intestinal helminthic infections are low socioeconomic status, limited awareness of personal hygiene, and environmental contamination. Due to parasitic infection, anemia is considered multifactorial, which is associated primarily with iron deficiency and undernourishment in children.

Aim: The aim of the study is to assess the risk factors associated with Intestinal Parasitic Infection among patients attending Jericho Governmental Primary Health Care Clinics.

Study Methodology: A cross-sectional study was conducted using a simple random sampling method to select patients from governmental health care clinics in Jericho Governorate. Face-to-face interviews of patients were accompanied using a structured questionnaire asking for risk factors of infection with Parasitic diseases. Fresh feces specimens were examined macroscopically for the presence of adult worms and microscopically for parasites ova, cysts, oocysts, and/or larvae to determine intestinal parasitic infection. The statistical package for social science (SPSS) program, version 22 for windows, was used for data entry and data analysis Appropriate statistical tests (parametric or nonparametric) were selected based on the nature of the data, whether qualitative or quantitative. A P-value equal to or below 0.05 was considered significant.

Results/Discussion: The results of the study provide insight into the demographic characteristics of the 495 patients who participated from the Governmental Primary Health Care Clinics in Jericho. The study included 234 male patients (47.3%) and 261 female patients (52.7%). The patients' residences were distributed as follows: 352 (71.1%) living in the city, 115 (23.2%) in a village, and 28 (5.7%) in a camp. By analyzing the participants' responses to various risk factors and hygiene practices, these possible factors might contribute to the spread of gastroenteritis. There is a significant positive correlation between the incidence of parasitic infections and the presence of family complaints related to abdominal pain, diarrhea, or medication intake. Moreover, a significant negative correlation was observed between the incidence of parasitic infections and the habit of washing hands after meals. The occurrence of bloody diarrhea was found to be significantly correlated with parasitic infections. Some factors do not exhibit a significant impact on parasitic infection prevalence, like wearing shoes and working with animals. The correlation between parasitic infections and clinical symptoms emphasizes the need for early detection and prompt medical treatment to prevent complications.

Keywords: *Intestinal parasitic infections (IPI), helminths disease, socioeconomic status, schoolchildren, risk factors, anemia, undernourishment, Primary Health Care Clinics, cross-sectional study, prevalence, correlation, symptoms, population*

العوامل المرتبطة بالعدوى الطفيلية المعوية بين المرضى الذين حضروا الى عيادات الرعاية الصحية الأولية في أريحا

إعداد الباحث: صبحي محمد صبحي الشاعر

إشراف: الدكتور أسعد رملاوي

ملخص:

الخلفية: تنتشر العدوى الطفيلية المعوية (IPI) على مستوى العالم، وخاصة ملايين الأشخاص في المناطق الفقيرة مصابون بمرض الديدان الطفيلية وخاصة أطفال المدارس. وزارة الصحة الفلسطينية تقوم سنويا بالإبلاغ عن عدة حالات من الإصابة بالطفيليات المعوية، بما في ذلك داء الجيارديا، وداء الصفر، وداء المعوية، وداء الأندويدات، وداء الزخار. العوامل المرتبطة بالوضع الاجتماعي والاقتصادي المنخفض، ونقص الوعي بالنظافة الشخصية، والتلوث البيئي هي أكبر عوامل الخطر المثيرة للعدوى المعوية بالديدان المعوية. بسبب العدوى الطفيلية، يعتبر فقر الدم متعدد العوامل، والذي يرتبط في المقام الأول بنقص الحديد ونقص التغذية عند الأطفال.

الهدف: الهدف من الدراسة هو تقييم عوامل الخطر المرتبطة بالعدوى الطفيلية المعوية بين المرضى الذين يترددون على العيادات الحكومية للرعاية الصحية الأولية في اريحا.

منهجية الدراسة: تم إجراء دراسة مقطعية باستخدام عينات عشوائية، حيث تم اختيار المرضى من المراكز الصحية الحكومية في محافظة أريحا. وتم عمل مقابلات وجها لوجه مع المرضى ووالديهم حيث انهم قاموا بتعبئة استبانة منظمة تسأل عن عوامل خطر الإصابة بالأمراض الطفيلية للفئة العمرية من سنة الى الخامسة عشرة. وبعد ذلك تم اخذ عينات للبراز من المرضى مجهريا لفحص اما وجود ديدان بالغة، او طفيليات سواء بويضات، او خراجات، أو يرقات لتحديد نوع الطفيليات المعوية.

النتائج/المناقشة: توفر الدراسة نتائج على الخصائص الديموغرافية ل 495 مريضا شاركوا من عيادات الصحة الأولية الحكومية في أريحا. شملت الدراسة 234 مريضا من الذكور (47.3٪) و 261 مريضا من الإناث (52.7٪). وتوزعت مساكن المرضى على النحو التالي 352 (71.1٪) يعيشون في المدينة، و 115 (23.2٪) في قرية، و 28 (5.7٪) في مخيم. من خلال تحليل استجابات المشاركين لمختلف عوامل الخطر وممارسات النظافة، قد تساهم هذه العوامل المحتملة في انتشار التهاب المعدة والأمعاء. هناك علاقة إيجابية كبيرة بين حدوث الالتهابات الطفيلية ووجود شكاوى عائلية تتعلق بآلام البطن أو الإسهال أو تناول الدواء. علاوة على ذلك، لوحظ وجود علاقة سلبية كبيرة بين حدوث الالتهابات الطفيلية وعادة غسل اليدين بعد الوجبات. تم العثور على حدوث الإسهال الدموي ليكون مرتبطا بشكل كبير مع الالتهابات الطفيلية.

الكلمات المفتاحية
مرض الديدان الطفيلية، الحالة الاجتماعية والاقتصادية، تلاميذ المدارس، (IPI) الالتهابات الطفيلية المعوية عوامل الخطر، فقر الدم، نقص التغذية، عيادات الصحة الأولية، دراسة مقطعية، الانتشار، الارتباط، الأعراض، السكان

List of abbreviations

WHO	**World Health Organization**
PMOH	**Palestinian Ministry of Health**
MOH	**Ministry of Health**
IPI	**Intestinal Parasitic Infection**
STH	**Soil transmitted helminth**
SPSS	**Statistic Package for Social Science**
UNICEF	**United Nations International Children's Emergency Fund**
PHC	**Primary Health Care**
PNIPH	**Palestinian National Institute of Public Health**

Chapter One: Introduction

1.1 Background

Intestinal parasitic infections have been a vast worry for developing countries as well as the leading cause of increased morbidity and mortality. Most of the helminthic infectious diseases have been considered neglected tropical diseases and are highly affecting low-income countries (Sitotaw & Shiferaw, 2020). Intestinal parasitic infections are a global issue, affecting millions of people, especially those in impoverished regions, with helminth diseases, particularly among schoolchildren. The most significant risk factors for intestinal helminthic infections are low socioeconomic status, limited awareness of personal hygiene, and environmental contamination. (Alemu et al., 2019).

Intestinal parasitic infections constitute a challenging global health burden, particularly among children in developing countries, and remain a significant contributor to morbidity and mortality worldwide (Sitotaw B & et al, 2019). These infections, caused by various helminths and protozoa, have garnered attention as neglected tropical diseases due to their impact on vulnerable populations, particularly children. Despite advances in healthcare and improved living conditions in many parts of the world, these infections continue to thrive in resource-limited settings, preserving a cycle of ill health and hindering socio-economic progress (Weatherhead JE, & et al 2017). Among the population, children are disproportionately impacted by intestinal parasitic infections (Dessie A, & et al, 2019). Their heightened susceptibility arises from a combination of biological, behavioral, and environmental factors that create a favorable environment for transmission (Fauziah N, & et al ,2022). The consequences of these infections in children are profound, ranging from impaired growth and cognitive development to an increased risk of anemia and malnutrition. Additionally,

these infections can contribute to a compromised immune response, rendering children more susceptible to other infectious diseases (Walson JL & Berkley JA.,2018).

The prevalence of intestinal parasitic infections among children was influenced by several correlated factors. Socioeconomic status plays a central role, with children from low-income households facing greater exposure due to inadequate sanitation facilities and limited access to clean water (Shrestha, A., & *et al.* ,2020). Poor hygiene practices, common in settings with limited health education, further worsen the risk. Environmental contamination, often linked to open defecation and improper waste disposal, creates a fertile ground for the transmission of parasitic pathogens (Penakalapati G, & et al, 2017).

The consequences of intestinal parasitic infections in children extend beyond individual health implications to broader social impacts. Infected children are more likely to miss school days due to illness, leading to educational setbacks (Zenu, S. & et al, 2019). Reduced school attendance and impaired cognitive development can affect the cycle of poverty by limiting children's future opportunities and potential contributions to their communities (Woldehanna T, & et al, 2017).

Addressing these infections necessitates a comprehensive approach that integrates health interventions with socio-economic development strategies. (Haque M, & et al, 2020). Mass deworming programs, which involve administering anthelmintic drugs to at-risk populations, have been implemented to reduce the prevalence and intensity of infections. Improved sanitation facilities, access to clean water, and health education campaigns aimed at promoting proper hygiene practices are equally vital components of comprehensive interventions (Taylor-Robinson DC & et al, 2019).

1.2 Study Justification

School-aged children were infected by intestinal parasitic diseases particularly more than adults and elderly due to their immature immune systems and higher metabolic

requirements. In schoolchildren, intestinal helminths infections disturb growth rate, iron absorption, and eventually a reduction in cognitive abilities (Marques et al., 2020). Worldwide, millions of schoolchildren are susceptible to infections by helminths worms, and they need preventive, control intervention and urgent management (Maru, 2017).

In 2020, the World Health Organization (WHO) estimated that 267 million preschool-aged children and more than 568 million school-aged children lived in endemic areas where intestinal helminths are highly transmitted, and therefore quick treatment and interventions are needed. The highest prevalence of infection with soil-transmitted protozoa is commonly detected in school- aged children (WHO, 2020).

Moreover, the United Nations International Children's Emergency Fund (UNICEF) estimated that 47.0% of schoolchildren are ominously enduring intestinal helminths and iron deficiency anemia. Globally, almost 400 million school-age children were contaminated with roundworm (44.9%), whipworm (12.6%), and hookworm (5.4%) (Essa et al., 2019). the World Health Organization (WHO) reported that the most common intestinal helminths are Giardia lamblia, Entamoeba histolytica, and Cryptosporidium spp. The average numbers of intestinal parasitic cases of giardiasis, amoebiasis, and cryptosporidiosis were 184 million, 104 million, and 64 million, respectively (Mustafa et al., 2020).

The Palestinian Ministry of Health (PMOH) has annually reported several cases of intestinal parasitic infestations, including giardiasis, ascariasis, and enterobiasis, strongyloidiasis, and amebiasis. Conversely, the Israeli Health Authority has identified giardiasis and cryptosporidiosis as prevalent intestinal helminthic diseases in Israel. Additionally, in Jordan, like our area from socio- demographics point of view, helminthic diseases with amebiasis are commonly observed (Al- Jawabreh et al.,

2019).

In the investigation into intestinal infection rates, the Palestinian National Institute of Public Health (PNIPH) found that 9.6% (n=145) of children reported an infection in the 2016. Additionally, among the children in the sample, 8.9% (n=133) tested positive for Giardia cyst, which represented the highest percentage of parasitic infections. Furthermore, 16.5% (n=248) of the children tested positive for either a parasite or a worm in their stool. None of the children in the study sample tested positive for the Taenia worm, while a small number, specifically 0.4% (6 children), tested positive for Shigella, and 1.8% (27 children) tested positive for H. nana (PNIPH, 2016).

1.3 Problem Statement

In rural and tropical regions, intestinal helminths infections are still a major burden on the health sector (Damtie et al., 2021). Soil-transmitted helminths (STHs) infection is known internationally as one of the most common helminthic infections. There are four main causes of this infection: roundworms, whipworms, tapeworms, and hookworms. The World Health Organization (WHO) has classified STH infections as one of the neglected diseases in rural areas (Alaribi et al., 2020). Intestinal parasitic infestations are the most prevalent infections among school-aged children, affecting them in large numbers (Chandrashekhar et al., 2009).

Due to parasitic infection, anemia is considered multifactorial, which is associated primarily with iron deficiency and undernourishment in children. It might be the effect of blood loss which is affected by STHs infection through the feeding by helminths on blood and tissue or caused by adherence of worms to the mucosa (Alaribi et al., 2020).

This problem has not been stated before among school children because in this way

children can lead to malnourishment and eventually iron deficiency anemia. A possible cause of this problem is not having the awareness of the importance of washing hands at their schools and homes, in addition to the environmental contamination, and low level of education (Marques et al., 2020). This research will emphasize the prevalence of parasitic diseases among children, explore associated risk factors, and investigate resulting consequences such as anemia.

1.4 Study Expected Outcome

We expect that the study can provide evidence and recommendations to health policy makers for setting polices for controlling and preventing intestinal parasitic infections among Jericho population and its complications such as anemia.

1.5 Aim of Research

To assess the risk factors associated with Intestinal Parasitic Infection among patients attending Jericho Governmental Primary Health Care Clinics.

1.6 Study Objectives

1- To identify the incidence of intestinal parasitic infection among patients attending primary health care (PHC) directorate in Jericho during the period of June and August 2022, a comprehensive epidemiological study will be conducted.

2- To correlate the clinical picture with parasitic infection throughout several risk factors.

3- To identify the risk factors (personal hygiene, nutrition hygiene practices, lack of pure water supply, level of education, environmental contamination, socioeconomic status, geographic location, family history of intestinal helminthic infection or anemia) of parasitic helminths

infection among patients.

Chapter Two: Literature review

2.1 Introduction

Intestinal parasitic infections remain a significant public health challenge, particularly in low-resource settings, where they are a leading cause of morbidity and mortality. The prevalence and transmission of these infections were influenced by a complex interplay of risk factors that encompass socio-economic, environmental, behavioral, and biological dimensions (Eyayu T & et al, 2021). This literature review explores the diverse range of risk factors associated with intestinal parasitic infections, drawing insights from various studies to elucidate the multifaceted nature of these infections.

2.2 Risk Factors associated with Intestinal Parasitic Infections:

Intestinal parasitic infections are the result of a complex interplay of risk factors that transcend socio-economic, environmental, and individual dimensions (Fuhrimann S & et al, 2016). To effectively address these risk factors, it is essential to adopt a comprehensive approach that encompasses not only medical interventions but also initiatives to enhance sanitation, provide hygiene education, and promote socio-economic development (Mara D & et al, 2010). By understanding and targeting the array of risk factors associated with these infections, public health efforts can make significant strides in reducing their prevalence and alleviating the burden they impose on vulnerable populations (Mackey TK & et al,2014).

2.2.1 Socio-Economic Factors:

Socio-economic status is a central determinant of intestinal parasitic infections. Individuals from low-income households often lack access to proper sanitation facilities and clean water sources, leading to increased exposure to contaminated environments cc. Poverty limits the ability to access healthcare, hygiene education, and sanitation infrastructure, thus

exacerbating the risk of infection (Gyorkos et al., 2021).

2.2.2 Poor Sanitation and Hygiene Practices:

Inadequate sanitation and hygiene practices are critical contributors to the transmission of intestinal parasites (Gebru H &et al, 2023). Open defecation and improper waste disposal contaminate the environment, allowing parasites to thrive. A lack of awareness about proper handwashing and personal hygiene further amplifies the risk of infection (Abossie & Seid, 2021).

2.2.3 Contaminated Water Sources:

Consumption of contaminated water is a significant mode of transmission for many intestinal parasites (Atabati H & et al, 2020). Communities relying on unsafe water sources are at a heightened risk of infection. Giardia and Cryptosporidium, for instance, are waterborne parasites that can lead to outbreaks of gastroenteritis (Liu et al., 2020).

2.2.4 Overcrowded Living Conditions:

Overcrowding, especially in urban slums and refugee camps, fosters the spread of intestinal parasites due to close interpersonal contact (Hamarsheh, O, 2021). Crowded living conditions facilitate the transmission of parasites that thrive in close human-to-human contact settings, such as pinworms and lice (Hotez et al., 2019).

2.2.5 Geographical Location:

Geographical factors influence the prevalence of specific parasitic infections. Tropical and subtropical climates often harbor parasites due to favorable conditions for their survival. For instance, hookworm infections are more prevalent in warm and humid regions (Hotez et al., 2014).

2.2.6 Poor Nutritional Status:

Malnutrition compromises the immune system, making individuals more susceptible to parasitic infections. Conversely, parasitic infections can exacerbate malnutrition by impairing nutrient absorption in the gut, leading to a vicious cycle of poor health (Keusch et

al., 2013).

2.2.7 Occupational Exposure:

Some occupations, like agriculture and mining, require frequent contact with soil and exposure to environmental contaminants. This increases the risk of acquiring soil-transmitted helminth infections, which are transmitted through contact with contaminated soil (Strunz et al., 2014).

2.2.8 Lack of Health Education:

A lack of knowledge about parasitic infections and preventive measures contributes to their persistence. Health education campaigns that promote proper sanitation, hygiene practices, and the importance of treating infected individuals can significantly reduce transmission (Gyorkos et al., 2021).

2.3 Prevalence of Intestinal Parasitic Infections in Palestine:

Intestinal parasitic infections remain a significant public health concern worldwide, including in Palestine (Hamarsheh, O, 2021). The prevalence of these infections was influenced by a complex interplay of socio-economic, environmental, and behavioral factors. It is essential to grasp the specific circumstances surrounding intestinal parasitic infections and their related risk factors within the local context. This understanding is fundamental to develop effective strategies for prevention and control (Elmonir W & et al, 2021).

Studies conducted in various regions of Palestine reveal a notable prevalence of intestinal parasitic infections among different age groups. A study by Amr et al. (2017) conducted in the West Bank reported an overall prevalence of 32.8% among schoolchildren. Similarly, a study by Al-Hindi and Elmanama (2018) identified an overall prevalence of 26.9% among primary school students in the Gaza Strip.

2.4 Associated Risk Factors in Palestine:

Intestinal parasitic infections remain a pressing public health issue in Palestine, with

the prevalence of these infections influenced by a range of interconnected risk factors (Mezeid N & et al, 2014). Poor sanitation, contaminated water sources, socio-economic disparities, crowded living conditions, and lack of health education collectively contribute to the persistence of these infections (Adelodun B & et al, 2021). Addressing these risk factors through targeted interventions, including improved sanitation infrastructure, access to clean water, health education initiatives, and socio-economic development, is crucial for reducing the burden of intestinal parasitic infections and improving the overall health and well-being of the Palestinian population (Erismann, S & et al, 2016).

2.4.1 Poor Sanitation and Hygiene Practices:

Inadequate sanitation facilities and poor hygiene practices contribute significantly to the transmission of intestinal parasites (Gupta R &et al, 2020). Lack of proper sewage systems and improper waste disposal are common issues in Palestine, particularly in densely populated areas like refugee camps. These conditions create an environment conducive to the spread of parasitic infections (Al-Hindi & Elmanama, 2018).

2.4.2 Contaminated Water Sources:

Contaminated water sources, whether used for drinking, cooking, or irrigation, pose a substantial risk for intestinal parasitic infections (Ribas A & et al, 2017). In areas where water quality is compromised, individuals are at a heightened risk of ingesting waterborne parasites. A study by Amr et al. (2017) highlighted the connection between poor water quality and increased prevalence of infections.

2.4.3 Socio-Economic Factors:

Socio-economic status plays a significant role in the prevalence of intestinal parasitic infections. Families with limited resources may lack access to adequate healthcare, sanitation facilities, and health education (Gaffan, N & et al, 2022). These factors collectively contribute to higher infection rates. A study by Al-Hindi and Elmanama (2018) found a correlation between low family income and increased infection rates among schoolchildren.

2.4.4 Crowded Living Conditions:

Overcrowded living conditions, often observed in refugee camps and densely populated urban areas, facilitate the spread of parasitic infections (Shetty AK & et al, 2019). Proximity increases the likelihood of person-to-person transmission of parasitic pathogens. Al-Hindi and Elmanama (2018) identified overcrowding as a significant risk factor for intestinal parasitic infections among children in the Gaza Strip.

2.4.5 Lack of Health Education:

Awareness of proper hygiene practices and the modes of transmission of parasitic infections is crucial for their prevention (Alqarni AS & et al, 2023). Insufficient health education and limited knowledge about personal hygiene contribute to the persistence of these infections. Amr et al. (2017) emphasized the importance of health education programs in reducing infection rates among Palestinian schoolchildren.

Chapter Three: Theoretical & Conceptual Framework

3.1 Introduction

The conceptual framework of this study centers around the independent variable, Intestinal Parasitic Infection (IPI), and its complex interplay with several dependent variables to determine the prevalence of these infections among clients of Jericho Governmental Primary Health Care Clinics. Intestinal parasitic infections are a major public health concern worldwide, especially in areas with limited resources and healthcare infrastructure. To comprehensively investigate the factors influencing their prevalence, this framework encompasses demographic variables, hygiene practices, socioeconomic status, healthcare access, geographic location, immune status, behavioral factors, and sanitation infrastructure (Omar M, & et al, 2022).

By exploring these interconnected variables, this study aims to uncover the complicated

nature of intestinal parasitic infections and contribute to the development of targeted interventions and public health strategies to alleviate their impact on the community's health and well-being.

Here's the conceptual framework for the study on the prevalence of intestinal parasitic infections among clients of Jericho Governmental Primary Health Care Clinics, with intestinal parasitic infection as the independent variable and several dependent variables.

3.2 Independent Variable:

- **Intestinal Parasitic Infection (IPI)**: This variable represents the presence or absence of various types of intestinal parasites, such as helminths and protozoa, in Children visiting Jericho Governmental Primary Health Care Clinics.

3.3 Dependent Variables:

- **Demographic Factors:**
    - **Age:** Age may influence the susceptibility to intestinal parasitic infections, with children and the elderly potentially being more vulnerable (Fauziah N, & et al ,2022).
    - **Gender**: Gender-based differences in exposure and susceptibility may affect infection rates (Chiara Bertoncello, 2021).
- **Hygiene Practices:**
    - **Personal Hygiene**: Practices like handwashing, proper sanitation, and hygiene education can influence the transmission of intestinal parasites (Feleke DG & et al, 2021).
    - **Environmental Hygiene**: The cleanliness of the living environment and access to safe drinking water and sanitation facilities can impact infection rates (Ribas A & et al, 2017).
- **Socioeconomic Status:**

- **Income Level**: Individuals with lower income levels may face challenges in accessing clean water and sanitation, potentially increasing their risk of infection (Feleke DG & et al, 2021).
- **Educational Achievement**: Higher levels of education may lead to better knowledge of hygiene practices and healthier behaviors (Emmanuel T & et al, 2023).

- **Healthcare Access:**
  - **Utilization of Health Services**: Frequency of health center visits and access to medical care may affect the detection and treatment of intestinal parasites (Eyayu T & et al, 2021).
  - **Health Education**: Availability of health education programs and awareness campaigns within health centers can influence client knowledge and behavior (Lastrucci and others, 2020).
- **Geographic Location:**
  - **Rural vs. Urban:** Geographic location can impact exposure to parasitic infections, with rural areas potentially having higher transmission rates due to environmental factors (Camacho-Alvarez I, & et al, 2021).
- **Immune Status:**
  - **Immunocompromised Conditions**: Individuals with compromised immune systems, such as those with HIV/AIDS, may be at a higher risk of severe parasitic infections (Fauziah N, & et al, 2022).
- **Behavioral Factors:**
  - **Dietary Habits**: Eating habits and the consumption of contaminated food or water sources may contribute to infection (Yoseph, A.& et al, 2020).
  - **Travel History:** Travel to areas with a high prevalence of intestinal parasites may increase the risk (MacPherson DW,1991)

- **Sanitation Infrastructure**:
    - **Availability of Sanitation Facilities**: The presence or absence of proper sanitation facilities can significantly impact the transmission of parasites (Gebru H &et al, 2023).

The study aims to establish associations and identify key factors contributing to the prevalence of intestinal parasitic infections among clients of Jericho Governmental Primary Health Care Clinics by analyzing these dependent variables in relation to the independent variable, Intestinal Parasitic Infection. This conceptual framework provides a structured approach to understanding the complex interplay of factors involved in the transmission of these infections.

3.4 Definition of variable:

Table (3.1): Definition of variables

Variables	Definition
Intestinal Parasitic Infection	A condition in which a parasite infects the gastro-intestinal tract of humans and other animals.
Demographic Factors	are factors that are used to define the characteristics of a person or a population, such as race, age, income, marital status, etc.
Hygiene Practices	Practices that promote cleanliness and contribute to good health, such as regular handwashing, maintaining facial cleanliness, and bathing using soap and water.
Socioeconomic Status	is a measure of an individual's or group's standing in the community, determined by factors such as wealth, occupation, and social class
Healthcare Access	he ability to obtain healthcare services such as prevention, diagnosis, treatment, and management of diseases, illness, disorders, and other health-impacting conditions
Geographic Location	The identification of a specific place on the planet
Immune Status	refers to the body's capacity to exhibit an immune response or protect itself against diseases and foreign substances
Behavioral Factors	factors arise from human conduct and can be attributed to personality traits, situational influences, or responses to the environment.

Sanitation Infrastructure	This includes all systems for drinking water and wastewater management, regardless of their configuration (onsite or piped) or their ownership (private, communal, or municipal).

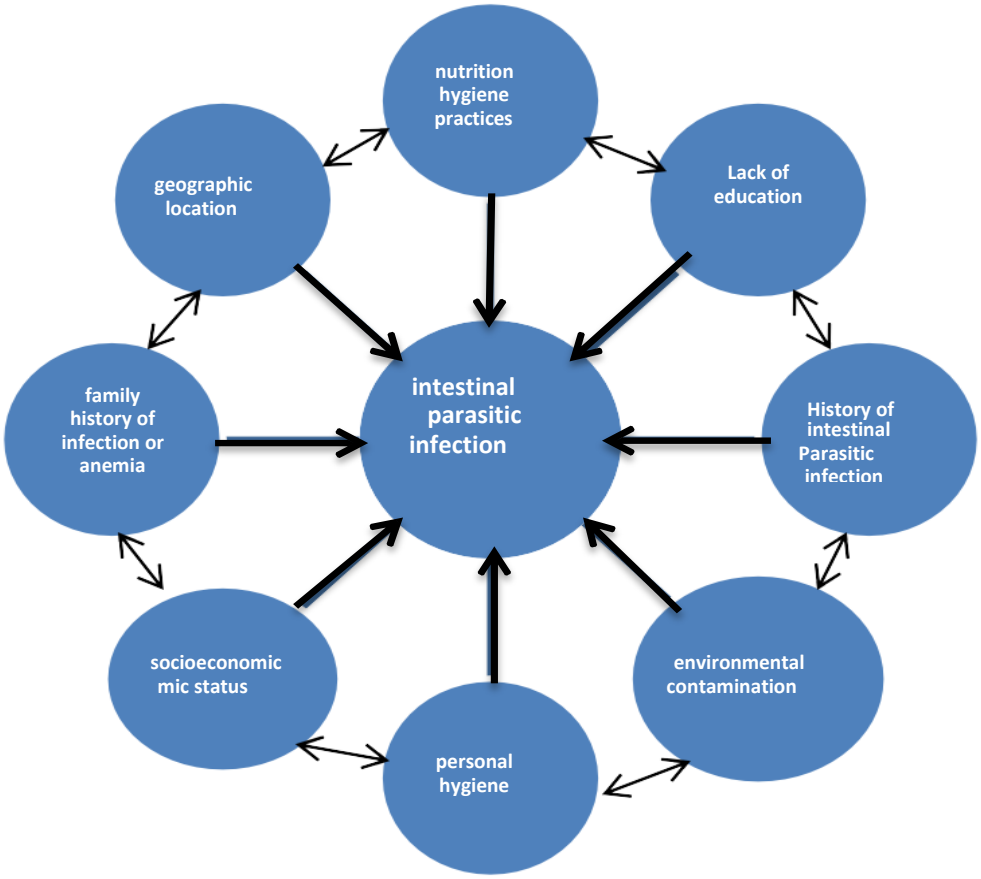

Figure (1) shows the conceptual framework of the study. The intestinal parasitic infection is the independent variable while there are several dependent variables which may determine the prevalence of intestinal parasite infection among clients of Jericho.

Chapter Four: Materials & Methods

4.1 Study Setting and Population

The study was conducted in Jericho Governorate, which is situated in the West Bank and is located at an elevation ranging from 240 to 400 meters below sea level. Despite Jericho being an ancient city, has more relation with a large rural village than a well-established city (Kool J. 2016). This study utilizes a cross-sectional approach to select patients from the Jericho Governmental Primary Health Care Clinics for the purpose of conducting stool analysis. A cross-sectional study involves collecting data from a specific population at a single point in time or over a short period to gather information about the prevalence of a condition, exposure to a risk factor, or other variables of interest. In this case, the researchers are focusing on stool analysis, which could be related to investigating gastrointestinal health, infections, or other relevant factors within the selected patient group from Jericho.

4.2 Study Design and Sample Frame

A cross-sectional study was conducted for all the patients of Jericho Governmental Primary Health Care Clinics for stool analysis during the study period.

4.3 Sample Size and Sampling Technique

Sample size was calculated using single population proportion formula, The following assumptions were considered (Dhand et al. 2014). Previous studies have reported that family size, age, education level, dietary diversity, and meat consumption are significant risk factors associated with iron deficiency anemia in individuals (Phyllis Atta Parbey 2019). Between those risk factors associated with anemia, assuming any particular outcome to be within a 5% marginal error, with 95% confidence level. Therefore, the total sample size calculated was 495 (Dhand et al. 2014). We will use a convenient sampling technique to identify study participants.

4.4 Inclusion- exclusion criteria

Inclusion criteria:

- Clients from Jericho Governmental Primary Health Care Clinics agree to provide Verbal consent for participation and to do stool examination.

Exclusion criteria:

- Clients who were on antiparasitic medication will be excluded.
- Clients who consent to participate but didn't do a stool Analysis.

4.5 Data Collection and processing

After the participants were accepted into the study, face-to-face interviews were conducted using a structured questionnaire developed in Arabic to collect demographic data such as age, gender, education, occupation, family size, place of residence, as well as fingernails hygiene. Factors to consider include the living condition, hygiene habits before and after meals, habits related to handwashing after defecation, and the source of water used for bathing.

Also included were questions about the general health status of the participant, sources of drinking water such as pipes, cistern and well, history of previous parasitic infection and/or anemia, feeding habits and personal hygiene, economic status, and environmental pollution.

Furthermore, clinical data related to the following factors were collected: the number of daily stool movements, the presence of mucus or blood in the stool, abdominal pain, bloating, general fatigue, loss of appetite, and weight loss.

The target study group was selected based on a predetermined sample size. A pre-tested questionnaire in Arabic was applied to ensure the clarity and accuracy of the questions. To evaluate the validity and reliability of the questionnaire, a pilot test involving a subset of participants (20 subjects) was conducted one week prior to the

actual data collection.

Fecal samples were composed and collected between June and August 2022. Fresh stool samples will be obtained in clean containers with screw caps and an adequate volume of 2g is brought. The stool samples will be examined in the microbiology laboratory at the Jericho Governmental Primary Health Clinics, within 2-3 hours for analysis. Fecal samples were properly labeled and coded and collected for parasitological examination.

4.6 Parasitological Examination

Fresh feces specimens were examined macroscopically for the presence of adult worms or segments and consistency and presence of mucous or blood. Direct saline/wet mount smears were microscopically examined for parasites ova, cysts, oocysts, and/or larvae to determine intestinal parasitic infection (Vinay Khanna et al 2014). Staining and examination techniques were accomplished according to Garcia, 2009 (Lynne S. Garcia et al 2017).

4.7 Statistical Methods

The statistical package for social science (SPSS) program, version 22 for windows, was used for data entry and data analysis. Summaries with descriptive statistics were produced and the data were further statistically analyzed according to the objectives of the study. Suitable statistical tests (parametric or nonparametric tests) were used according to the type of data whether qualitative or quantitative. Additional tests were conducted to examine potential associations between the prevalence of intestinal parasitic infections and variables including age, sex, educational status, and potential risk factors. P-value equal or below 0.05 were considered significant.

To achieve the objectives of the study by addressing the Questionnaire answers, the data were analyzed using statistical methods that were appropriate for the nature of the study. The following set of statistical methods were employed in the data analysis:

- **Means, Standard Deviations, and Percentages**: These methods were used to summarize and analyze quantitative variables (such as age or weight) and present statistical summaries, including means, standard deviations, and percentages, to understand the distribution of the data.

- **One-way Analysis of Variance (ANOVA):** This method was utilized to compare means among three or more independent groups. It can be helpful in examining statistical differences between different groups.

- **Chi-Square Test:** The Chi-Square test was used to analyze the relationship between two categorical variables by estimating expected values against observed values in a contingency table.

- **Pearson Correlation Coefficient:** This coefficient was employed to measure the linear relationship between two quantitative variables. Values range between -1 and +1, where values close to +1 indicate a strong positive correlation, values close to -1 indicate a strong negative correlation, and a value of 0 suggests no linear relationship.

- **Linear Regression:** Linear regression was used to determine the relationship between two quantitative variables by fitting the best-fitting line that represents their relationship. Linear regression can be used for predicting one variable based on another variable.

These statistical methods were applied to analyze the data in the study. The selection of these methods is based on the nature of the data and the study's objectives.

4.8 Ethical Consideration

To conduct this study, this proposal was submitted to ethical committee approvals of Al-Quds university and the ministry of health.

While all participants were under the age of 18, consent was taken directly from their parents about our study's goal of consenting to their voluntary contribution. Verbal or written consent was handed in because certain numbers of parents had no formal education. The confidentiality of the information was guaranteed, and the privacy of the participants was preserved. Children who were found to have anemia and/or intestinal parasites were referred to doctors for further diagnosis, treatment, and follow-up.

Chapter Five: Results

5.1 Study Approach

Considering the inherent characteristics of the research and the specific information sought, the researcher chose to utilize an analytical descriptive approach. This decision was made to effectively attain the study's goals and address its inquiries. The choice was grounded in the approach's compatibility with the research's essence.

The analytical descriptive approach, a fundamental research methodology, involves an in-depth examination of a specific issue within a particular community. The primary aim is to gather empirical information and draw meaningful conclusions, thereby contributing to problem-solving.

This approach not only defines the research process but also enhances the comprehension and interpretation of the collected data.

5.2 Study Results

This chapter highlights the presentation of data analysis which addresses the research questions. It also involved a review of the key survey results, which have been derived from the analysis of its sections. Furthermore, an exploration of the dimensions of the independent variable has been conducted. Consequently, statistical procedures were applied to the aggregated data from the research questionnaire. The Statistical Package for the Social Sciences (SPSS) software was utilized to obtain research results, which were both presented and analyzed.

The study concentrated on patients who visited government-run primary health care clinics in the city of Jericho. The study sample comprised 495 randomly selected patients. Table (5.1) and Figure (1) show the distribution of the study sample according to its demographic variables.

Table (5.1): Demographical data

		Frequency	Percent
Gender	Male	234	47.3%
	Female	261	52.7%
Mother education	Primary	12	2.4%
	Secondary	28	5.7%
	Tertiary	27	5.5%
	Collage	428	86.5%
Place living	City	352	71.1%
	Village	115	23.2%
	Camp	28	5.7%
Family members	1 to 4	277	56%
	4 and more	218	44%
No of child living in same house	1 to 4	421	85.1%
	4 and more	74	14.9%

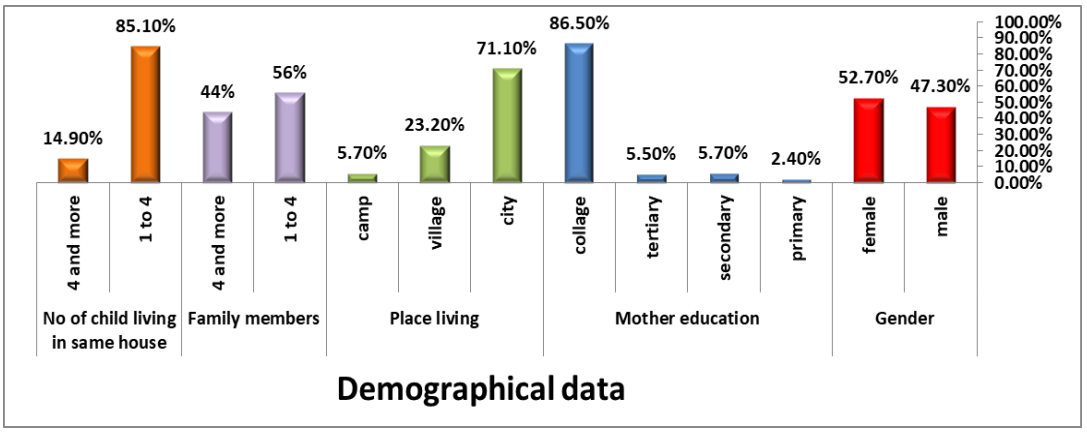

Figure (2): Distribution of the study sample according to its independent variables (n = 495)

The results of the study are summarized in Figure (2). Table (5.1) provides a brief overview of the results of the study and provides insight into the demographic characteristics of the 495 patients who participated from the governmental primary health care clinics in Jericho. Data were presented using both frequency, which indicates the number of individuals within each category, and percentage, which indicates the proportion of each category within the total sample. This comprehensive summary offers a clear insight into the distribution of study participants according to their demographic variables.

The following is an illustration of the demographic information:

- **Gender:** The study included 234 male patients (47.3%) and 261 female patients (52.7%).
- **Mother's education**: The educational background of the patients' mothers was detailed as follows: 12 (2.4%) had primary education, 28 (5.7%) had secondary education, 27 (5.5%) had tertiary education, and the majority 428 (86.5%), obtained a university education.
- **Place of residence:** The patients' residences were distributed as follows: 352 (71.1%) living in the city, 115 (23.2%) in a village, and 28 (5.7%) in a camp.
- **Family members:** 277 patients (56.0%) belonged to families of 1 to 4 members, while 218 patients (44.0%) belonged to families of 4 or more members.

The study found that 421 patients (85.1%) resided in families with 1 to 4 children, whereas 74 patients (14.9%) lived in families with 4 or more children.

These demographic variables provided insight into the composition of the study sample and were useful in analyzing the study results and drawing conclusions regarding health care and other relevant factors.

Table (5.2): Distribution of the study sample according to risk factors

		Frequency	Percent
Do you have contact with pets?	daily	30	6.1
	sometimes	**342**	**69.1**
	never	123	24.8
Do you working with animals or poultry, sheep, gout, cows, chicken, and turkey?	yes	48	9.7
	no	447	90.3
Did any other member of family suffer from gastroenteritis during the last two weeks?	yes	25	5.1
	no	470	94.9
Did you use antiparasitic in the last 2 weeks?	yes	19	3.8
	no	476	96.2
Do you have latrine?	yes	17	3.4
	no	478	96.6
Where do you defecate the fasces?	away from the well	495	100
Do you bring water for cooking and drinking from Water Well?	no	495	100
If yes to question No 3, how many times a day do you fetch water for household?	none	495	100
Do you swim in Water Well?	no	495	100
If yes to question No 3, how many times a day do you fetch water for household?	none	495	100
Do you wash cloths in well?	no	495	100
Do you wear shoes?	yes	490	99
	no	4	0.8
Do you eat raw meat/vegetable?	yes	2	0.4

	no	493	99.6
Do you wash your hand before meal?	yes	160	32.3
	no	**335**	**67.7**
Do you wash your hand after meal?	yes	393	79.4
	no	101	20.4
Do you have access to Health facilities?	yes	447	90.3
	no	48	9.7
Do you take medications for intestinal parasitoids or diarrhea?	yes	17	3.4
	no	478	96.6
Did any member of the family complain from abdominal pain or diarrhea or take medication?	yes	171	34.5
	no	324	65.5
Do you have habit of walking on barefoot?	yes	29	5.9
	no	466	94.1
	Total	495	100

A summary of the study results shown in Table (5.2) indicates or focused on exploring various risk factors related to gastroenteritis among the study participants. The information is presented in the form of questions and corresponding responses, which are then tabulated to provide insights into the distribution of these risk factors within the sample population. Let's go through and explain the different risk factors and their associated responses:

- **Contact with Pets:**

The participants were asked about their contact with pets.

30 participants (6.1%) reported having daily contact with pets, 342 (69.1%) reported having contact sometimes, and 123 (24.8%) reported never having contact with pets.

- **Working with Animals:**

Participants were asked if they work with animals such as poultry, sheep, cows, etc.

48 participants (9.7%) responded yes, while 447 (90.3%) responded no.

- **Family Members with Gastroenteritis:**

Participants were asked if any other family member suffered from gastroenteritis in the last two weeks.

25 participants (5.1%) answered yes, while 470 (94.9%) answered no.

- **Antiparasitic Use:**

Participants were asked if they used antiphrastic medications in the last 2 weeks.

19 participants (3.8%) responded yes, and 476 (96.2%) responded no.

- **Latrine and Defecation:**

Participants were asked if they have a latrine.

17 participants (3.4%) answered yes, and 478 (96.6%) answered no.

All participants (100%) reported defecating away from the well.

- **Water Source and Usage:**

Participants were asked about fetching water for cooking and drinking from a water well.

All participants (100%) responded no.

Similarly, participants were asked about swimming in the water well and fetching water for household use, to which all participants (100%) responded none.

- **Hygiene Practices:**

Various questions were posed related to hygiene practices.

Most participants wear shoes (99%).

Most participants did not eat raw meat/vegetables (99.6%).

About one-third washed their hands before meals (32.3%).

The majority washed their hands after meals (79.4%).

- **Access to Health Facilities:**

Participants were asked if they have access to health facilities.

447 participants (90.3%) responded yes, and 48 (9.7%) responded no.

- **Medication Use:**

Participants were asked about taking medications for intestinal parasitosis or diarrhea.

17 participants (3.4%) responded yes, and 478 (96.6%) responded no.

- **Family Complaints:**

Participants were asked if any family member complained of abdominal pain, diarrhea, or took medication.

171 participants (34.5%) responded yes, and 324 (65.5%) responded no.

- **Barefoot Walking:**

Participants were asked about walking barefoot.

29 participants (5.9%) responded yes, and 466 (94.1%) responded no.

In summary, this research section investigates various variables that might influence the

risk of gastroenteritis. These factors encompass contact with pets, occupation involving animals, hygiene practices, water sources, and access to healthcare facilities, among others. The responses were presented in a tabular format, illustrating the distribution of these risk factors within the study sample. This information was crucial for understanding potential associations and identifying areas of concern related to gastroenteritis.

The data presented in this section were vital for and highlighted areas of concern that could be linked to the occurrence of gastroenteritis within the studied population. By analyzing the participants' responses to various risk factors and hygiene practices, these possible factors might contribute to the spread of gastroenteritis.

This table presents clinical information related to the participants' complaints according to the date reported by the participants. Here's an explanation of the table's content:

Table (5.3): Distribution of the study sample according to the clinical picture

		Frequency	Percent
Do you suffer from diarrhea?	**yes**	**29**	**5.9**
	no	**466**	**94.1**
Did you have gastroenteritis (diarrheal diseases) during the last two weeks?	**yes**	**52**	**10.5**
	no	**443**	**89.5**
If yes no.1, how many times do you have diarrhea in a day?	**once**	**4**	**0.8**
	twice	**14**	**2.8**
	more than three	**11**	**2.2**
	none	**466**	**94.1**
If yes no.1, for how long does diarrhea last?	**one**	**3**	**0.6**
	two	**11**	**2.2**
	three	**14**	**2.8**
	none	**467**	**94.3**
have low grade fever	**yes**	**13**	**2.6**
	no	**482**	**97.4**
have mucus or greasy stool	**yes**	**33**	**6.7**
	no	**462**	**93.3**
have bloody diarrhea	**yes**	**7**	**1.4**

	no	**488**	**98.6**
suffer from nausea	**yes**	**5**	**1**
	no	**490**	**99**
suffering from abdominal pain	**yes**	**70**	**14.1**
	no	**425**	**85.9**
have bloating or flatulence	**yes**	**26**	**5.3**
	no	**469**	**94.7**
have general fatigue	**yes**	**35**	**7.1**
	no	**460**	**92.9**
have loss of appetite	**yes**	**96**	**19.4**
	no	**399**	**80.6**
have loss of weight	**yes**	**21**	**4.2**
	no	**474**	**95.8**
Do you go to a health facility when you feel abdominal discomfort?	**yes**	**429**	**86.7**
	no	**66**	**13.3**

A summary of the study results was presented in Table (5.3): it provided a breakdown of clinical symptoms and conditions as reported by the study participants, along with their corresponding frequencies and percentages.

1: Diarrhea

The table began with inquiries related to diarrhea.

5.9% of respondents suffered from diarrhea, while 94.1% did not.

10.5% of respondents had experienced gastroenteritis (diarrheal diseases) in the last two weeks, while 89.5% had not.

Additional information about the frequency and duration of diarrhea was included among those who had gastroenteritis.

2: Other Symptoms

Subsequently, the table listed several other symptoms and conditions:

Low-grade fever: 2.6% of respondents had it, while 97.4% did not.

Mucus or greasy stool: 6.7% of respondents had it, while 93.3% did not.

Bloody diarrhea: 1.4% of respondents had it, while 98.6% did not.

Nausea: 1% of respondents suffered from it, while 99% did not.

Abdominal pain: 14.1% of respondents had it, while 85.9% did not.

Bloating or flatulence: 5.3% of respondents had it, while 94.7% did not.

General fatigue: 7.1% of respondents had it, while 92.9% did not.

Loss of appetite: 19.4% of respondents had it, while 80.6% did not.

Loss of weight: 4.2% of respondents had it, while 95.8% did not.

3: Seeking Medical Care

The table also included information on whether respondents sought medical care when experiencing abdominal discomfort.

86.7% of respondents went to a health facility when they felt abdominal discomfort, while 13.3% did not.

4: Parasitic Infection

The table provided data on parasitic infections:

12.7% of respondents tested positive for a parasitic infection, 85.9% received a negative result, and 1.4% were categorized as "non."

Information about the type of identified parasite was included among those with a positive result.

25 participants (5.1%) reported E. histolytic.

32 participants (6.5%) reported Giardia lambia.

4 participants (0.8%) reported E. coli.

2 participants (0.4%) reported yeast.

This information provided valuable insights into the prevalence of symptoms and conditions within the study population. Researchers could use this data to draw conclusions and make recommendations based on their findings.

This table illustrates valuable insights into the clinical symptoms and conditions reported by the study participants, shedding light on the correlation of various symptoms and potential parasitic infections throughout the study.

Table (5.4): the incidence of intestinal parasitic infection with type of parasite among clients

Parasitic infection	**Positive**	**63**	**12.7**
	Negative	**425**	**85.9**
	Non	**7**	**1.4**
Type of parasite	**Null**	**432**	**87.3**
	E. histolytic	**25**	**5.1**
	Giardia lambia	**32**	**6.5**
	E. coli	**4**	**0.8**
	Yeast	**2**	**0.4**
	Total	**495**	**100**

Table 5.4 presents an analysis of the incidence of intestinal parasitic infection among clients, categorized by the type of parasite. The table outlines the distribution of participants based on their parasitic infection status (Positive, Negative, Non) and the specific type of parasite identified.

In the "Parasitic infection" section, it indicates that 63 participants (12.7% of the total) tested positive for parasitic infections, while 425 participants (85.9%) tested negative. Additionally, 7 participants (1.4%) fell into the "Non" category, which might denote cases where parasitic infection status was not determined.

The "Type of parasite" section provides a breakdown of the specific parasites detected among the participants with positive results. Most cases were classified as "Null" (87.3%), suggesting the absence of a specific identified parasite. Among the identified parasites, 25 cases (5.1%) were attributed to E. histolytica, **32 cases (6.5%) to Giardia lamblia**, 4 cases (0.8%) to E. coli, and 2 cases (0.4%) to Yeast. The "Total" row sums up the entire participant sample, indicating that the table encompasses data for 495 participants.

This table offers a comprehensive overview of the distribution of intestinal parasitic infections and the specific types of parasites present among the studied clients, providing a foundation for further analysis and interpretation of the research findings.

The table (5.5) shows statistical analysis results that highlight the relationship between various risk factors and the incidence of parasitic infection as follow:

Table (5.5). Relation, odds ratios (OR) and confidence intervals (95% CI) between risk factors and incidence of parasitic infection

		R	F value	P value			
		0.208	**1.66**	**0.066**			
		B	**SE**	**OR**	**Sig.**	**95% CI**	
	(Constant)	0.991	0.268		0	0.465	1.518
1	**Did any member of the family complain from abdominal pain or diarrhea or take medication?**	**0.106**	**0.033**	**0.152**	**0.001****	**0.042**	**0.171**
2	Do you wash your hands before a meal?	0.057	0.034	0.081	**0.096**	-0.01	0.124
3	Do you wear shoes?	0.103	0.188	0.028	**0.584**	-0.266	0.472
4	Do you work with animals or poultry, sheep, gout, cows, chicken, and turkey?	0.02	0.056	0.018	**0.721**	-0.091	0.131
5	Did you use antiparasitic in the last 2 weeks?	0.019	0.156	0.011	**0.902**	-0.287	0.326
6	Do you have a latrine?	0.003	0.087	0.002	**0.969**	-0.168	0.175
7	Did any other member of the family suffer from gastroenteritis during the last two weeks?	-0.004	0.073	-0.002	**0.959**	-0.147	0.139
8	Do you have access to Health facilities?	-0.003	0.051	-0.003	**0.948**	-0.103	0.096
9	Do you take medications for intestinal parasitoids or diarrhea?	-0.009	0.158	-0.005	**0.957**	-0.319	0.302

10	Do you eat raw meat/vegetables?	-0.144	0.234	-0.028	**0.539**	-0.603	0.316
11	Do you have a habit of walking barefoot?	-0.061	0.064	-0.043	**0.346**	-0.188	0.066
12	Do you have contact with pets?	-0.028	0.033	-0.045	**0.393**	-0.094	0.037
13	**Do you wash your hands after a meal?**	**-0.097**	**0.037**	**-0.118**	**0.01***	**-0.171**	**-0.024**

By referring to Table 5.4, one can analyze and interpret the strength, direction, and statistical significance of the relationships between each risk factor and the incidence of parasitic infection. For example, if the p-value is small (usually less than 0.05), this indicates that the association is statistically significant. Odds ratios greater than 1 indicate a positive association, while odds ratios less than 1 indicate a negative association. A confidence interval provides a range of values within which the true odds ratio is likely to lie.

The provided clarification explains the significant findings from the statistical analysis. It highlights that there is a significant correlation between the incidence of parasitic infection and the following factors:

There is a significant positive correlation between the incidence of parasitic infections and the presence of family complaints related to abdominal pain, diarrhea, or medication intake. The odds ratio (OR) is calculated to be 0.152. The p-value associated with this correlation is 0.001**, indicating strong statistical significance. The 95% confidence interval (CI) for the odds ratio lies between 0.042 and 0.171.

Moreover, a noteworthy negative correlation was observed between the incidence of parasitic infections and the habit of washing hands after meals. The odds ratio (OR) for this correlation is -0.118. The p-value is 0.01*, which signifies statistical significance. The 95% confidence interval (CI) for the odds ratio falls between -0.171 and -0.024.

These findings indicate that these factors are associated with the incidence of parasitic infection. The negative odds ratio suggests a protective effect (lower likelihood) for not

washing hands after a meal.

The table (5.4). highlights the statistically significant relationships between specific risk factors and the incidence of parasitic infection, providing valuable insights into potential contributors to the occurrence of such infections among the study participants.

This table 5.5 below highlights statistical analysis results of the relationship between the clinical picture and the incidence of parasitic infection which presents as follow:

Table (5.6). Relation, odds ratios (OR) and confidence intervals (95% CI) between clinical picture and incidence of parasitic infection

		R	F value	P value			
		0.624	25.58	**<0.001*** **			
		B	SE	OR	P value	95%Cl	
	(Constant)	-0.032	0.184		0.86	-0.393	0.328
1	**have mucus or greasy stool**	**0.699**	**0.055**	**0.523**	**<0.001*** **	**0.591**	**0.807**
2	**suffering from abdominal pain**	**0.227**	**0.038**	**0.237**	**<0.001*** **	**0.153**	**0.301**
3	suffer from nausea	0.452	0.242	0.135	**0.063**	-0.024	0.927
4	**have general fatigue**	**0.146**	**0.056**	**0.112**	**0.009****	**0.037**	**0.255**
5	have loss of appetite	0.05	0.033	0.059	**0.129**	-0.015	0.114
6	have bloating or flatulence	0.073	0.064	0.049	**0.257**	-0.053	0.2
7	If yes no.1, for how long does diarrhea last?	0.016	0.061	0.03	**0.794**	-0.104	0.135
8	If yes no.1, how many times do you have diarrhea in a day?	0.021	0.073	0.028	**0.777**	-0.123	0.165
9	have loss of weight	-0.011	0.071	-0.006	**0.88**	-0.15	0.129
10	Do you suffer from diarrhea?	-0.094	0.206	-0.066	**0.65**	-0.498	0.311
11	have low grade fever	-0.198	0.13	-0.095	**0.128**	-0.454	0.057
12	**have bloody diarrhea**	**-0.471**	**0.222**	**-0.167**	**0.035***	**-0.907**	**-0.034**

Upon reviewing the table, one can interpret the strength, direction, and statistical significance of the relationships between each risk factor and the incidence of parasitic infection. For example, if the p-value is small (usually less than 0.05), this indicates that the association is statistically significant. Odds ratios greater than 1 suggest a positive

association, whereas odds ratios less than 1 suggest a negative association. A confidence interval provides a range of values within which the true odds ratio is likely to lie.

The provided explanation highlights the notable outcomes derived from the statistical analysis. It underscores the meaningful correlations between specific clinical symptoms and the occurrence of parasitic infections, illustrating the following significant findings:

1. The presence of mucus or greasy stool was found to have a substantial correlation with parasitic infections. The calculated odds ratio (OR) is 0.523, with a p-value indicating strong statistical significance ($p < 0.001$***). The corresponding confidence interval (CI) spans from 0.591 to 0.807.

2. Suffering from abdominal pain exhibited a significant correlation with parasitic infections, as evidenced by an OR of 0.237. The associated p-value is less than 0.001***, signifying high statistical significance. The CI for this correlation falls between 0.153 and 0.301.

3. The experience of general fatigue demonstrated a noteworthy correlation with parasitic infections, displaying an OR of 0.112. The p-value is 0.009**, which indicates statistical significance. The CI for this correlation ranges from 0.037 to 0.255.

4. The occurrence of bloody diarrhea was found to be significantly correlated with parasitic infections, with an OR of 0.167. The p-value for this correlation is 0.035*, signifying significance. The CI associated with this correlation spans from -0.907 to -0.034.

The provided findings underscore the important clinical relationships between these symptoms and the occurrence of parasitic infection, offering insights into potential contributing factors to such infections among the study participants.

Chapter Six: Discussion

This chapter is dedicated to summarizing the outcomes the study aimed to achieve, considering the results of the statistical analysis. It culminates in presenting a set of recommendations and suggestions to enhance administrative practices.

6.1 Discussion:

This chapter embodies the fruitful efforts to attain significant findings throughout our scholarly journey. It holds immense importance in the study, as it is one of the pivotal components of scientific research. This phase follows the data analysis, interpretation, and hypothesis testing stages. It encompasses the formulation of recommendations, highlighting strengths and weaknesses, and proposing strategies to address those weaknesses.

In the context of the quantitative analysis of the questionnaire and the qualitative analysis of the focal group, the results are compared to previous studies' findings discussed in the theoretical literature. The aim is to elucidate these results, interpret them, and consequently derive recommendations informed by these findings.

The attained results encompass a comprehensive discussion of the study's objectives, the methodology employed to achieve them, and the tools utilized for data collection. Notably, the outcomes are examined against the sought-after objectives. The discussion explores the significance of research, its contribution to the field, and its alignment with the research methodology.

The demographic data presented offers a comprehensive overview of the study population's gender, mother's education, place of living, family size, number of children in the same household, and other variables. The distribution of gender, mother's education, and place of living indicates a diverse representation of participants. Such diversity is crucial for understanding how these variables might relate to the prevalence of parasitic infections.

The clinical presentation outlined sheds light on the various symptoms experienced by the participants and their potential connection to parasitic infections. The prevalence of symptoms like diarrhea, gastroenteritis, abdominal pain, and others is explored. These findings provide a basis for investigating the association between clinical symptoms and parasitic infections.

Demographic Factors and Parasitic Infections:

The data suggests that demographic factors, such as living environment and family size, might contribute to the prevalence of parasitic infections. For instance, individuals living in certain settings like villages or crowded households might be at a higher risk due to sanitation and hygiene challenges (Forson AO, & et al, 2018).

Clinical Symptoms and Parasitic Infections:

The data highlights the prevalence of clinical symptoms that can be associated with parasitic infections. The presence of mucus or greasy stool, abdominal pain, and fatigue might indicate a potential correlation. This warrants further investigation into whether these symptoms are linked to specific types of parasitic infections.

The discussions around these results provide a foundation for understanding the context in which parasitic infections occur. These insights can guide the formulation of recommendations and interventions to address the spread of such infections. Additionally, they inform the subsequent statistical analyses and help in drawing meaningful conclusions.

A certain number of participants report experiencing symptoms such as diarrhea, nausea, and abdominal pain.

Some participants have reported low-grade fever, loss of appetite, and fatigue.

Certain clinical factors appear to be significantly associated with the prevalence of parasitic infections, such as the presence of mucus or greasy stool and abdominal pain.

Based on the findings presented in Table 5.4, it is notable that a proportion of participants tested positive for intestinal parasitic infections, with E. histolytica, Giardia lamblia, E. coli, and Yeast identified as specific parasites. The predominance of cases categorized as "Null" indicates a significant number where a specific parasite was not identified. These results underscore the diversity of parasitic infections within the studied population. It is imperative for future research to delve deeper into the factors contributing to the prevalence of these parasites, guiding targeted interventions and public health strategies. Additionally, the presence of various parasites highlights the complexity of parasitic infections, warranting continued efforts for effective diagnosis, treatment, and prevention.

Table 5.5 illustrates the relationship, odds ratios, and confidence intervals between various risk factors and the incidence of parasitic infection. Key takeaways from this table include:

Several factors show significant associations with the prevalence of parasitic infection, such as family complaints of abdominal pain or diarrhea, and washing hands before meals.

Some factors do not exhibit a significant impact on parasitic infection prevalence, like wearing shoes and working with animals.

Table 5.6 outlines the relationship between participants' clinical presentation and the prevalence of parasitic infection. Important insights from this table are:

Several clinical symptoms are significantly correlated with parasitic infection prevalence, including the presence of mucus or greasy stool, abdominal pain, general fatigue, and bloody diarrhea. This discovery, in conjunction with the study, underscores a notable connection between the presence of intestinal parasites (IPs) and the incidence of diarrhea among the participants. Diarrhea emerges as a frequently reported symptom linked to IPs. It is important to highlight that Entamoeba histolytica possesses the capability to give rise to severe conditions, including dysentery, colitis, constipation, tenesmus, and even complications beyond the intestinal tract (Kiani H, & et al 2016)

Certain symptoms do not show a significant correlation with parasitic infection prevalence, such as diarrhea and low-grade fever.

Discussion of Parasitic Infection Results

The analysis of parasitic infection results sheds light on the prevalence of these infections within the studied population. The term "parasitic infection" refers to the presence of parasitic organisms within the body that can lead to various health issues. In the context of this study, it primarily pertains to gastrointestinal parasites that can cause symptoms such as diarrhea, abdominal pain, and fatigue.

Prevalence of Parasitic Infection

The results reveal the percentage of participants who tested positive for parasitic infections. This information provided crucial insights into the extent of the issue within the community. The presence of parasitic infections among a significant portion of the population raises concerns about sanitation, hygiene practices, and potential sources of contamination (Eyayu T & et al, 2021).

Correlation with Clinical Symptoms

The study examines the correlation between parasitic infections and various clinical symptoms, such as diarrhea, mucus or greasy stool, abdominal pain, and others. The presence of these symptoms among individuals with parasitic infections suggests a potential link between the symptoms and the infections. This finding suggests that these symptoms might be indicative of parasitic infections and can be used as early markers for diagnosis.

Public Health Implications

The high prevalence of parasitic infections underscores the importance of public health interventions (Yoseph, A.& et al, 2020). Addressing the spread of these infections requires targeted efforts to improve sanitation, hygiene practices, and access to clean water. The correlation between parasitic infections and clinical symptoms emphasizes the need for early detection and prompt medical treatment to prevent complications.

Summarizing the research results provides an overview of the associations and correlations between different factors, clinical symptoms, and the prevalence of parasitic infection. These findings serve as the foundation for the previously mentioned recommendations and suggestions aimed at improving community health and reducing the transmission of parasitic infections.

These proposed measures can be tailored to suit the unique characteristics and healthcare requirements of the specific community under investigation. By implementing these strategies, local authorities and healthcare providers can work together to create a healthier environment and minimize the impact of parasitic infections. This comprehensive approach, rooted in the findings of this study, will contribute to better public health outcomes and improved overall well-being.

Upon reflection on the comprehensive analysis of demographic factors, clinical symptoms, and parasitic infection prevalence, it becomes evident that this study contributes valuable insights to the understanding of the complex interplay between these variables. The diverse representation of participants in terms of gender, living environment, and family size enriches the generalizability of our findings. However, it's crucial to acknowledge certain limitations inherent in our research design.

Firstly, the reliance on self-reported clinical symptoms may introduce a degree of subjectivity and recall bias could impact the accuracy of symptom reporting. Despite efforts

to ensure data accuracy, the nature of survey-based research poses inherent challenges in capturing real-time and objective clinical information. Additionally, the cross-sectional nature of the study limits our ability to establish causation; thus, longitudinal studies could offer a more nuanced understanding of the temporal dynamics of parasitic infections and associated factors.

Moreover, while our findings suggest significant associations between certain demographic factors, clinical symptoms, and parasitic infections, we must exercise caution in generalizing these results to broader populations. Regional variations in sanitation practices, healthcare access, and cultural behaviors may influence the prevalence and manifestation of parasitic infections differently in various communities.

In the future, research endeavors could investigate the effectiveness of targeted interventions designed to enhance sanitation and hygiene practices within communities. Long-term monitoring of these interventions would provide valuable insights into their sustained impact on reducing parasitic infection rates.

6.3 Study Limitation

We were not able to assess the temporal relationship between intestinal parasitic infections and iron deficiency anemia, and the prevalence was determined by a single stool examination. Furthermore, a single saline wet mount and the formalin-ether concentration technique were examined for each of the stool specimens, which might have affected the accuracy of the egg count. Secondly, it is possible that certain participants may have decide on to self-administer antiparasitic drugs before providing stool samples, as metronidazole, mebendazole, and albendazole are available over the counter in our country. Thirdly, due to limited resources and financial constraints, we were unable to utilize all available laboratory techniques, including the Baerman technique for detecting worm larvae, such as strongyloides, or adhesive tape for identifying Enterobius vermicularis (Kiani H, & et al 2016)

6.4 Recommendations

Based on the results and the statistical analysis that was presented in the research, some recommendations and suggestions that may contribute to improving health status and preventing parasitic infection can be presented. Here are some suggestions:

- **Health Awareness Enhancement**: Raising awareness among individuals about the importance of practicing hand hygiene before and after meals, as well as after using the restroom, is of utmost importance. Conducting awareness campaigns and educational programs within the community can improve healthy habits and reduce the spread of parasitic infections.

- **Improvement of Health Conditions:** Providing a clean and sanitary environment for the community is essential, including proper waste disposal and clean water supply facilities.

- **Enhancement of Food Practices:** Encouraging healthy food practices, such as proper cooking of meats and vegetables and avoiding consumption of raw meats or vegetables, should be promoted.

- **Continuous Monitoring and Evaluation:** Implementing a system for continuous monitoring and evaluation of health practices and infection rates within the community is essential. Regular assessments will help track progress, identify emerging issues, and adapt interventions accordingly.

- **Promoting Access to Healthcare**: Ensure easy access to healthcare facilities and services, especially for those who are experiencing symptoms or seeking medical attention for parasitic infections. Timely diagnosis and treatment can significantly reduce the impact of infections.

- **Community Engagement:** Involve the community in designing and implementing health programs. Engaging local leaders, educators, and community members can enhance the effectiveness of awareness campaigns and interventions.

- **Safe Water and Sanitation:** Implement measures to improve the quality of water sources and sanitation facilities. Access to clean and safe water is essential to prevent the transmission of parasitic infections.

- **Regular Health Screenings:** Organize regular health screenings and check-ups within the community by Regular water and food inspection and screening by environmental health inspectors mainly in villages and camps. These screenings can help identify infections early on and provide timely treatment.

- **Promote Hygienic Practices:** Encourage the use of proper hygiene practices, such as washing hands, proper food handling, and maintaining a clean-living environment by increasing inter-intra sectoral cooperation within different sectors of Palestinian ministry of health (school health, preventive medicine, health education and promotion) and school health of ministry of education for food and water hygiene sanitation. These practices play a significant role in preventing the spread of infections.

By implementing these recommendations, you can contribute to improving the health and well-being of the community, reducing the incidence of parasitic infections, and fostering a culture of health-consciousness and prevention.

6.5 Suggestions

- **Long-Term Sustainability:** Develop strategies to ensure the sustainability of interventions beyond the research period. Building capacity within the

community and integrating health practices into daily routines are key to long-term success.

- **Further Studies:** Additional studies can explore other potential effects on the spread of parasitic infections, such as surrounding environmental factors and lifestyle patterns.

- **Healthcare Improvement**: Access to healthcare and medical facilities for early diagnosis and treatment of parasitic infections can be improved.

- **Multi-Sectoral Collaboration:** Promote collaboration among various sectors, including healthcare, education, water and sanitation, and agriculture, to address the issue effectively. A multi-disciplinary approach can address the complex factors contributing to parasitic infections.

- **Empowerment of Healthcare Workers:** Provide healthcare workers with training and resources to effectively diagnose, treat, and prevent parasitic infections. Empowered healthcare providers can play a pivotal role in reducing the burden of infections.

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Appendix I

A Questionnaire draft for intestinal parasitic infection and risk factors

Part one: socio-demographic characteristic

I. Questioner number_____

II. Sex: 1. Male 2. Female

III. Age in years: _____ 1. (1-5) 2. (5-10) 3. (10-15)

IV. Mother's Education Status: 1. Illiterate 2. Primary (grade1-8) 3. Secondary (grade9-10) 4. Tertiary (grade11-12) 5. College

V. Residence: _____1. City 2. Village 3. Camp

VI. Number of family members 1. Up to 4 2. More than 4

VII. Number of children living in the same house? 1. Up to 4 2. More than 4

VIII. Do you have contact with pets 1. Daily 2. Sometimes

IX. Do you working with animals or poultry, sheep, gout, cows, chicken, and turkey a. yes b. no

X. Did you have gastroenteritis (diarrheal diseases) during the last two weeks? a. yes b. no

XI. Did any other member of the family suffer from gastroenteritis during the last two weeks? a. yes b.no

XII. Did you use antiparasitic in the last 2 weeks 1. Yes 2. No

Part two: Water contact Activities

1. Do you have a latrine? a. Yes b. No

2. Where do you defecate the fasces?

a. Near the well b. Away from the well c. Using pits and dispose to the well

3. Do you bring water for cooking and drinking from the Water Well? a. Yes b. No

4. If yes to question No 3, how many times a day do you fetch water for household? ---------

5. Do you swim in Water Well? a. Yes b. No

6. How many times do you swim in the well?

a. Daily b. Weekly c. sometimes

7. Do you wash clothes in well? a. Yes b. No

8. Do you wear shoes? a. Yes b. No

C. Questions designed to assess respondents, practice towards intestinal parasites.

1. Do you eat raw meat/vegetable? a. yes b. no
2. Do you wash your hands before a meal? a. yes b. no
3. Do you wash your hands after a meal? a. yes b. no
4. Do you have access to Health facilities? a. yes b. no
5. Do you go to a health facility when you feel abdominal discomfort? a. yes b. no
6. Do you take medications for intestinal parasitosis or diarrhea? a. yes b. no
7. Did any member of the family complain from abdominal pain or diarrhea or take medication? a. yes b.no
8. Do you have a habit of walking barefoot? a. yes b. no

D. Questions designed to assess clinical signs regarding intestinal parasitic infection.

1. Do you suffer from diarrhea? a. yes b. no
2. If yes no.1, how many times do you have diarrhea in a day? a. once b. twice c. more than three
3. If yes no.1, for how long does diarrhea last? a. one b. two c. three d. more than three
4. Do you have low grade fever? a. yes b.no
5. Do you have mucus or greasy stool? a. yes b. no
6. Do you have bloody diarrhea? a. yes b.no
7. Do you suffer from nausea? a. yes b. no
8. Do suffer from abdominal pain? a. yes b. no
9. Do have bloating or flatulence? a. yes b. no
10. Do have general fatigue? a. yes b.no
11. Do have loss of appetite? a. yes b. no
12. Do have loss of weight? a. yes b. no