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The Awareness of Parasitic Infections Among Middle School Students in Al-Ahsa Province Saudi Arabia

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ABSTRACT

The study aimed to identify the level of awareness of parasitic infections among middle school students in Al-Ahsa Governorate, Saudi Arabia. The focus was on the students' awareness of the term parasites, their impact on public health, modes of transmission, and prevention methods of infection, especially in schools. The descriptive method was used. We administered the questionnaire face-to-face to a random sample of middle school students (94 M., 103 F.) in the Al-Ahsa Governorate. The study's findings indicate that middle school students possess a high level of awareness regarding ways to prevent parasitic diseases and limit their spread in schools, but they have a moderate level of awareness about the term parasites, their impact on human health, and the methods of parasite transmission in the school environment. The study revealed statistically significant differences between males and females' students, with males showing a higher level of awareness about parasitic infections at a significance level of less than 0.05. The variables of the students' place of residence (city and village) and the mother's educational level (secondary or lower & bachelor's or higher) did not reveal any significant variations.

KEYWORDS: Awareness, Health, Infections, Middle Schools, and Parasites.

Introduction

1.1 Introduce the Problem

Health is a fundamental human right and one of its essential necessities. It is a shared responsibility among individuals, governments, and nations. Countries are eager to provide health education to all segments of society and raise health awareness among their members, particularly students. Health awareness is important for individuals because it is one of the most significant means and methods to achieve quality of life, enhance their well-being by improving their health status, and reach high levels of health awareness at both the individual and community levels (Al-Kinani & Al-Dujaili, 2018). Direct communication with individuals or the use of digital

technology can achieve health awareness. (Barman, 2020).

Governments have placed a great emphasis on citizens' health, raising health awareness among community members, improving health services, and utilizing all traditional and technological means in this regard (Najmi, 2020). Modern health awareness policies heavily rely on technology and the integration of electronic platforms such as YouTube, Facebook, and Twitter. This integration enables health organizations to effectively manage their educational messages, images, and audio materials. Technological means have contributed to the individual's sense of social role (Gideon & Ghadban, 2022), increasing students' possession of diverse knowledge and sciences, and guiding them towards positive behavior. (How & Hung, 2019). There has been a growing interest in using digital devices in the field of health awareness for students at various educational stages after COVD-19 crisis (Al-Zawi, 2020).

Health awareness in communities has traditionally gone through three successive phases: the first aimed to instill health values in individuals and work on preventing serious diseases while providing more health guidance. Until the 1960s, only medical personnel were responsible for this, and the patient's role was to follow the guidelines. The second aspect expanded the responsibility of raising health awareness to include doctors, officials, and professionals in auxiliary medical fields such as nurses, health inspectors, and laboratory technicians. This was done in a random manner. The third aspect is that health awareness and the process of transferring health culture have become a shared responsibility among various segments of society, such as families, schools, media, and social institutions, because of the remarkable developments in the health, media, and educational fields (Shreim, 2021). Health awareness is a guiding process with psychological and social dimensions aimed at directing individuals towards acquiring accurate health information, encouraging them to change incorrect health concepts and behaviors, and then guiding them to adopt the desired healthy behaviors.

School students' health awareness is critical to maintaining their health. Investing in students' health is an investment in the future, preserving both human and material resources and instilling healthy behaviors that contribute to community sustainability. Health awareness for school students includes a set of programs, strategies, and services provided by schools in collaboration with specialized health institutions, tailored to the age group of the students. Health awareness among middle school students is an important requirement, as the interaction and gathering of students within schools can lead to the transmission of many infectious diseases among them, which can then spread to their families at home and circulate within the community. The focus on students' health awareness also contributes to improving academic achievement and the transfer of educational experiences.

Health awareness focuses on several areas that concern individuals, such as nutrition and physical activity, growth and development, sexual health, injury and disease prevention, medications, alcohol, and drugs, mental, psychological, and social health, as well as personal and community health (Al-Shahri, 2018). Sometimes, people use the term "health education" as a synonym for "health awareness," referring to the process of imparting the necessary information and skills for an

individual to lead their life and change certain behaviors for the better, thereby improving the health of both the individual and the community. Various mechanisms aim to achieve health awareness, including the dissemination of general health information, the instillation of healthy behaviors, and the modification of unhealthy ones (Ben Amroush & Saker, 2020). Publications, medical posters, video clips, awareness lectures, case study analyses, and discussions serve this purpose (Jone & Bartlett, 2020, P.7).

Health culture reflects the level of health awareness among individuals; it drives behavior through intentional practices of healthy behaviors, which then transform into habits that individuals engage in unconsciously or without thought (Najmi, 2020). Changing inappropriate behaviors, improving healthy dietary practices, following healthy diets, exercising, and modifying consumption behavior, among other elements of health education, require a significant amount of time and can be supported through electronic devices (Hussein, 2018, P.33). Electronic content helps to enhance students' achievement levels in an enjoyable way, making education more effective and interactive (Kapilas & Sreedevi, 2022).

The health awareness industry in the technological era has witnessed significant advancements in line with artificial intelligence, which have helped hospitals gain a competitive edge by monitoring patients' conditions remotely, answering patients' inquiries, and meeting their medical needs through the automation of medical processes (Pavithra & Afza, 2022).

1.2 Study Problem

Health awareness aims to disseminate concepts, knowledge, and healthy behaviors among community members, assist individuals in solving their health problems, and foster sound health attitudes, all of which contribute to reducing disease incidence (Abd, 2020). Health awareness encompasses diverse fields, including general health awareness, which provides essential health information for all community members, school health awareness for students, and home health awareness, which pertains to the family's educational, social, and economic status (Ben Amroush & Saker, 2020). Health awareness aims to encourage students to adopt a healthy lifestyle and follow sound health practices to reduce the incidence of illnesses and disease spread.

Helminth infections are among the most common infections worldwide with an estimated 1.5 billion infected people or 24% of the world’s population (WHO, 2023, https://2u.pw/zcaygyNd). Among the most prevalent parasitic diseases in the Kingdom of Saudi Arabia are malaria, dengue fever, Rift Valley fever, leishmaniasis, and schistosomiasis, and it is important to take care of school facilities, especially restrooms; maintaining continuous cleanliness in classrooms; educating students about the importance of washing their hands after using restrooms and offering health awareness programs within the curriculum with the participation of specialists (Al-Qahtani, 2021).

Some daily behaviors of school students directly contribute to the spread of infections and the incidence of diseases, such as sharing school and personal supplies, using water taps, not taking care of hand washing, and sitting on the same seats. This highlights the need for increased awareness to prevent the spread of

parasitic diseases. We were interested in finding out how aware middle school students in Al-Ahsa are of parasitic infections and how they can best prevent them in the school environment. This was sparked by our experiences and observations of how middle school students take care of their health, as well as the fact that schools don't have many health awareness programs. This is because health awareness is important for students and plays a big part in improving their health and fitness levels (Al-Amin, 2020). The study's problem is defined by the main question: What is the level of awareness among middle school students in the Al-Ahsa Governorate about parasitic infections?

The main question branches into the following sub-questions:

1) What is the level of awareness among middle school students in the Al-Ahsa Governorate regarding the term "parasites"?

2) What is the level of awareness among middle school students in the Al-Ahsa Governorate about parasites' impact on human public health?

3) How much do middle school students in the Al-Ahsa Governorate know about the ways parasites spread in the school environment?

4) What is the level of awareness among middle school students in the Al-Ahsa Governorate regarding prevention methods for parasitic infections in the school environment?

5) What are the statistically significant differences between the average responses of the study sample regarding the level of awareness of middle school students about parasitic infections, regarding to gender (males and females), location (city and village), and the mother's education level (secondary or lower and bachelor or higher)?

The study aimed to identify the level of parasitic infections awareness among middle school students in the Al-Ahsa Governorate. The study's significance stems from the reality faced by students in schools, where they may be exposed to parasitic infections due to certain unhealthy behaviors within the school, and due to a lack of awareness about how these infections occur. The study addresses one of the important topics for students: the prevention of parasitic infections and the maintenance of public health to achieve quality of life. The study contributes to increasing students' awareness of parasitic infections. The study's findings may benefit planners and curriculum officials by incorporating more health concepts to increase health awareness among students at the educational level. The study benefits all members of society by raising health awareness to prevent parasitic infections, which positively impacts the community, preserves the national economy, and reduces expenses directed towards medications and treatment of health conditions resulting from unhealthy behaviors among students. The study boundaries addressed the level parasitic infections awareness among students, and the human boundaries included middle school students. The temporal boundaries was the second semester of the academic year 2023/2024.

Study terms: Health Awareness: is the knowledge of information related to the positive state of physical, mental, psychological, social, personal, and environmental

well-being, as well as medication prevention and safety. An appropriate curriculum for students' age group incorporates this, promoting their healthy behavior (Saleh et al., 2016, P.1215).

Parasites, in this study, are operationally defined as those animal organisms that live on humans and cause them diseases. Parasitic infections in this study, are defined as the medical conditions caused by parasites among middle school students, which may spread among them in the school environment due to their daily behaviors and a lack of awareness about the ways of transmission of infections.

1.3 Literature Review

Previous studies have addressed student health awareness and concepts of health culture throw school textbooks. Some studies explored health concepts in school curricula (Taabli et al., 2017; Al-Shahri, 2018; Al-Khaza'lah, 2018; and Alanzi, et al., 2024). Ali & Mohamed (2022) aimed to determine the effectiveness of a program based on international health standards in developing health education concepts among kindergarten children. The study by Sulaiman et al. (2022) addressed the effectiveness of expressive activities in modifying common unhealthy behaviors among children in private kindergartens.

The role of new media in raising health awareness, instilling health education concepts, and drawing attention to health issues was reviewed (Ben Amroush & Saker, 2020; and Al-Qaisi et al., 2021), while the others addressed the role of sports media in enhancing individuals' health culture (Al-Suhail, 2021), examined contribution of Facebook's to spreading health awareness during Corona crisis (Jidoun & Ghadban, 2022). Some studies have addressed the role of electronic devices in promoting health culture and clarifying health concepts from a variety of angles. The study by Al-Zawi, (2020) examined the role of computers in imparting health education concepts to, explored the relationship between new media, which relies on handheld devices, and cognitive and social awareness, as well as the acquisition of health and cultural knowledge. The study by Ibrahim & Inan (2022) addressed the relationship between students' use of cloud computing through their electronic devices and the sharing of information among them to enhance their cultural awareness of health concepts. Ben Safi's (2019) study looked at health anthropology as a comparative study of culture and its influence on the development of medical services in electronic communities. Awareness of students with digital skills was studied (Alnabulsi, 2022).

Some studies have found that the concepts related to diseases and health issues among students were at a low percentage in the curricula across all educational stages (Saleh et al., 2016; Taabli et al., 2017; Al-Shahri, 2018; Al-Khaza'lah, 2018; Alanzi et al., 2024). A study (Al-Sadoun et al., 2016) found that the level of awareness of basic health practices among school students in Riyadh was good. A study (Yoo et al., 2021) found that the level of health awareness among students in Korea was high. Regarding some studies, activity-based workshops can help young children understand the link between pathogens, and infection transmission and control (Younie, 2024).

Reviewing previous studies reveals a diversity in addressing health concepts. Some

studies, such as Al-Khaza'lah (2018), have examined health concepts in Jordan's textbooks sixth and seventh grades, as well as in geography textbooks and vocational education books (Saleh et al., 2016). A study by Taabli et al. (2017) addressed health concepts in the textbooks of the first three grades of primary education in Algeria. Some studies have addressed the effectiveness of health education concept development programs (Ali & Mohamed, 2020; and Sulaiman et al., 2022). Some studies addressed the role of media in raising health awareness and health education concepts (Ben Amroush & Saker, 2020; Al-Qaisi et al., 2021; Al-Suhail, 2021; and Gideon & Ghadban, 2022). Researchers have examined the role of electronic devices in promoting health culture (Al-Zawi, 2020; Ibrahim & Inan, 2022; Ghaffary et al., 2022; and Ben Safi, 2019). Some studies have found that health awareness is low among students (Alanzi et al., 2024), while other studies found that the level of health awareness was excellent (Al-Sadoun et al., 2016; Yoo et al., 2021).

The current study was prompted by the findings of previous studies that revealed a lack of comprehensive reviews and explanations of health concepts in textbooks for different educational levels, including secondary science textbooks (Taabli et al., 2017) and early primary school textbooks (Saleh et al., 2016), among others. Ben Amroush & Saker (2020) have recommended the development of awareness and health culture tools through new media, highlighting the widespread use of handheld devices and the diversity of cultural content on the internet (Al-Qaisi et al., 2021). A study by Ben Amroush & Saker (2020) indicates that about 50% of internet users believe that internet has a significant role on their understanding of health issues and increases their health awareness, and that 44% of them feel that their relationship with their doctor has improved thanks to the use of the internet.

The current study differs from previous studies in its sample, as it focused solely on middle school students in public schools in the Al-Ahsa (both males and females). This highlights the differences in the research topic, methodology, sample, and tools used in the current study, setting it apart from prior research and filling the research gap in the field, thereby increasing its importance. Previous studies have addressed the health concepts included in curricula across different educational stages and countries, the role of media and electronic devices in health education, and the spread of parasitic infections. None of the previous studies, to the researchers' knowledge, have addressed the level of awareness among middle school students of parasitic infections, which gives the current study scientific significance and distinguishes it from previous research.

Method

The The study employed a descriptive approach and administered a questionnaire to a simple random sample of students, consisting of 94 males and 103 females, from three boys' schools and three girls' schools in Al-Ahsa, Saudi Arabia. Ethical Clearance (REC-2024-MAR-ETHICS2084/ 20/3/2024). Schools implemented the face-to-face study tool from April 7 to April 30, 2024. Before beginning the questionnaire application, we obtained verbal consent from all participating students.

Researchers used a questionnaire to collect study data, which initially consisted of two parts. The first part was for basic data, and the second part contained the

questionnaire statements, comprising 35 statements distributed across four axes. The questionnaire axes were: (1) Awareness of the term parasites. (2) Awareness of the impact of parasites on public health. (3) Awareness of the ways parasites are transmitted in schools. (4) Awareness of parasite prevention and reducing their spread in schools. Each of the first three axes contained eight statements, while the fourth axis featured eleven statements. We assessed the responses using a three-point Likert scale, assigning the following response values: We assigned the responses as follows: Yes 3, Sometimes/I don't know 2, and No 1.

We assessed questionnaire validity. Eleven faculty members from the Colleges of Education and Sciences (professors, associate professors, and assistant professors), evaluated the questionnaire to calculate its validity. The judges removed statements with an agreement rate of less than 80%, resulting in a total of 9 statements. The final version of the questionnaire consisted of 26 statements, with 6 statements for each of the first three dimensions and 8 statements for the fourth dimension. We assessed the construct validity of the questionnaire by calculating the internal consistency coefficients. Both the internal consistency coefficient between the score of each item in each dimension and the total score of the dimension it measures, and the overall questionnaire score were calculated. The level of significance and the correlation coefficients of the phrases with their respective axes were all statistically significant at 0.01. We calculated the correlation coefficients between each axis' score and the questionnaire's total score, finding that the four axes' correlation coefficients are 0.842, 0.848, 0.848, and 0.492, all of which are significant at the level of 0.01. This confirms the construct validity of the questionnaire.

Table 1. illustrates the correlation coefficients between each statement's score in the questionnaire and the overall score of the dimension it measures.

Awareness of the term parasites		Awareness of the impact of parasites on public health		Awareness of the ways parasites are transmitted in schools		Awareness of parasite prevention and reducing their spread in schools	
N	r	N	r	N	r	N	r
1	.669**	1	.668**	1	.666**	1	.415**
2	.711**	2	.617**	2	.732**	2	.520**
3	.742**	3	.600**	3	.739**	3	.529**
4	.590**	4	.665**	4	.670**	4	.560**
5	.746**	5	.690**	5	.589**	5	.495**
6	.719**	6	.665**	6	.613**	6	.393**
-	-	-	-	-	-	7	.480**
-	-	-	-	-	-	8	.603**

(**) Sig. at 0.01

The reliability of the questionnaire: We applied the questionnaire to a pilot sample of 30 individuals, separately calculating the reliability of each dimension before calculating the overall reliability of the questionnaire. Cronbach's alpha coefficients for the dimensions of the questionnaire ranged between 0.559 and 0.787, with the overall reliability of the questionnaire 0.871. Meanwhile, the split-half reliability coefficients, according to Spearman-Brown, ranged between 0.572 and 0.774, with the overall reliability of the questionnaire 0.749. This suggests that the study's field

application can rely on the high degree of reliability of the questionnaire.

The researchers analyzed the results to interpret them and arrive at answers to the study questions. The true limits are: Yes (2.34-3.00) with response large, Sometimes/I don't know (1.67-2.33) with response medium, and No (1.00-1.66) with response small.

Table 2. illustrates the distribution of the field study sample from middle school students in the Al-Ahsa Governorate according to demographic variables (gender, location, and mother's education level).

Variables	Categories	Sample	%	Total
gender	M	94	47.7	197
	F	103	52.3	
location	city	144	73.1	197
	village	53	26.9	
mother's education level	Secondary or lower	76	38.6	197
	Bachelor or higher	121	61.4	

As shown in Table 2, the total study sample was 197 students, (94 male and 103 female), the total population (25,259 male students and 24,930 female), and (144 city and 53 villages), and mother's education level (76 secondary or lower and 121 bachelor or higher).

Results

To answer the research questions from 1 to 4, we have calculated the frequencies, percentages, and means for each axis' statements of the questionnaire, Table 3.

Table 3. means of the parasitic infections' awareness level of middle school students in Al-Ahsa

N	Axes	Statements	Mean	Std.	Degree
1	Awareness of the term parasites	Parasites vary in size.	1.60	.861	Small
2		Parasites live inside and outside the human body.	1.57	.834	Small
3		Parasites infect humans and animals.	1.49	.843	Small
4		Parasites feed on human food.	1.99	.881	Medium
5		Parasites move within the human body.	1.78	.919	Medium
6		Parasites multiply inside the human body.	1.84	.911	Medium
Total			1.71	.610	Medium
1	Awareness of the impact of parasites on public health	Many parasites cause serious diseases in humans.	1.46	.811	Small
2		Some parasites do not cause diseases.	1.86	.867	Medium
3		Most parasites cause weight loss.	2.22	.925	Medium
4		Most parasites cause gastrointestinal disturbances.	2.08	.966	Medium
5		Parasites cause itching in various parts of the body.	1.86	.946	Medium
6		Some parasites can cause human death.	2.05	.908	Medium
Total			1.92	.588	Medium
1	Awareness of the ways parasites are transmitted in schools	Eating and drinking, especially fresh foods, can spread parasites.	1.94	.858	Medium
2		Touching people and objects can spread parasites.	1.62	.869	Small
3		Body parts like hair and nails can transmit parasites.	1.84	.948	Medium
4		Eating undercooked meat can spread parasites.	1.66	.899	Small
5		Skin penetration is how parasites spread.	2.26	.863	Medium

6		The eyes and nose are the routes through which parasites spread.	2.15	.899	Medium
Total			1.91	.595	Medium
1	Awareness of parasite prevention and reducing their spread in schools	I wash my hands thoroughly with soap after using the restroom.	2.92	.284	High
2		I wash my hands with soap before eating.	2.75	.509	High
3		I clean the water faucet before turning it off while washing my hands.	2.19	.765	Medium
4		I make sure not to share my personal items, like my hair comb.	2.56	.672	High
5		To protect myself from diseases, I don't grow my nails long.	2.49	.675	High
6		I emphasize the cleanliness of all foods and beverages, especially vegetables and fruits.	2.81	.477	High
7		I make sure to cook meat and fish well before eating them.	2.87	.419	High
8		I make sure to avoid touching pets until I am completely certain of their cleanliness and safety.	2.55	.673	High
Total			2.64	.287	High

As shown in Table 3, that middle school students in Al-Ahsa had an average score of 2.64, which corresponds to a high level of awareness about parasitic infections. Regarding the axes, the first axis showed an average score of 1.71 for middle school students in Al-Ahsa, indicating a moderate level of awareness regarding the term "parasites." The highest average was for the fourth statement, 1.99, followed by the sixth statement with an average of 1.84, while the third statement ranked last with an average of 1.49. In the second axis, it shows that middle school students are aware of the impact of parasites on human public health at a level of 1.92, which corresponds to a moderate level of awareness. The third axis statement had the highest average, with a 2.22, followed by the fourth statement with a 2.08. Finally, at 1.46, the first statement had the lowest average. In the third axis, it shows that middle school students have an average awareness level of 1.91 regarding parasite transmission methods in the school environment, which corresponds to a medium level of awareness. Statement five had the highest average, with a 2.26, followed by statement six with a 2.15, and statement two ranked last with a 1.62. Finally, the fourth axis shows that middle school students have an average awareness level of 2.64 regarding methods of preventing parasitic infections and reducing their spread in schools, which corresponds to a high level of awareness. The first statement on the axis had the highest average of 2.92, followed by the seventh statement with a 2.87, and the third statement ranked last with a 2.19.

To answer the fifth question: What are the statistically significant differences between the average responses of the sample individuals regarding the awareness level of middle school students in the Al-Ahsa about parasitic infections, which are attributed to the study variables: gender (males and females), location (city and village), and the mother's education level (secondary or lower, university or higher)? It was answered as follows:

1- Gender variable (males and females): The means and standard deviations of the awareness level of middle school students in the Al-Ahsa regarding parasitic infections were calculated according to the gender variable, Table 4.

Table 4. means and standard deviations regarding the awareness level of middle school students in Al-Ahsa about parasitic infections, along with the t-test results according to the gender variable

Questionnaire Axes	V	N	Mean	Std.	T.	Sig.
1	M	94	10.96	3.83	2.52	.121
	F	103	9.66	3.40		
2	M	94	11.87	3.78	1.29	.015
	F	103	11.22	3.28		
3	M	94	12.08	3.73	2.29	.142
	F	103	10.92	3.35		
4	M	94	11.13	2.43	1.58	.495
	F	103	10.61	2.14		
All Questionnaire	M	94	46.03	11.09	2.62	.013
	F	103	42.27	9.01		

As shown in Table 4, the presence of statistically significant differences at a significance ($\alpha \leq 0.05$) in the second questionnaire axis (awareness of the impact of parasites on public health) and in the overall questionnaire in favor of males. While there are no statistically significant differences at the significance ($\alpha \leq 0.05$) in the other axes of the questionnaire, this indicates that the level of awareness is equal among both males and females regarding awareness of the term parasites, awareness of the ways parasites is transmitted in schools, and awareness of prevention measures against parasites and reducing their spread in schools.

2- Location variable (city and village): The means and standard deviations of the awareness level of middle school students in the Al-Ahsa regarding parasitic infections were calculated according to the location variable. An independent sample t-test was also used, Table 5.

Table 5. means and standard deviations regarding the awareness level of middle school students in Al-Ahsa about parasitic infections, along with the t-test results, according to the variable of location.

Questionnaire Axes	V	N	Mean	Std.	T.	Sig.
1	City	144	10.24	3.51	.23	.058
	Village	53	10.38	4.08		
2	City	144	11.45	3.42	.53	.266
	Village	53	11.76	3.84		
3	City	144	11.29	3.54	1.22	.868
	Village	53	11.98	3.65		
4	City	144	11.04	2.37	1.80	.261
	Village	53	10.38	2.01		
All Questionnaire	City	144	44.01	10.08	.13	.438
	Village	53	44.23	10.64		

As shown in Table 5, there were no statistically significant differences at a significance ($\alpha \leq 0.05$) in axes of the questionnaire or questionnaire as all. This means that middle school students in Al-Ahsa are equally aware of parasitic infections, whether they live in a city or a rural area.

3- The variable of the mother's education level (high school or lower, university or higher):

We calculated the means and standard deviations of the awareness level of middle school students in the Al-Ahsa regarding parasitic infections based on the mother's education level variable. We also employed the independent sample t-test, Table 6.

Table 6. means and standard deviations of the awareness level of middle school students in Al-Ahsa regarding parasitic infections, along with the t-test results, according to mother's education level.

Questionnaire Axes	V	N	Mean	Std.	T.	Sig.
1	high school or lower	76	10.36	3.80	.111	.349
	university or higher	121	10.26	3.58		
2	high school or lower	76	11.37	3.43	.518	.283
	university or higher	121	11.64	3.60		
3	high school or lower	76	11.61	3.41	.414	.293
	university or higher	121	11.39	3.68		
4	high school or lower	76	10.49	2.09	1.811	.533
	university or higher	121	11.09	2.39		
All Questionnaire	high school or lower	76	43.78	9.61	.321	.321
	university or higher	121	44.26	10.61		

As shown in Table 6, there were no statistically significant differences at a significance ($\alpha \leq 0.05$) in the axes of the questionnaire or questionnaire as all. This means that all middle school students in Al-Ahsa have the same level of knowledge about parasitic infections, no matter how much schooling their mother has.

Discussion

The results of Table 3 indicate that the awareness level of middle school students is moderate regarding three aspects of the questionnaire: (1) awareness of the term parasites, (2) awareness of the impact of parasites on public health, and (3) awareness of the ways parasites is transmitted in schools. This result is consistent with the study by Ibrahim & Inan (2022), and Alanzi et al. (2024). The level of health awareness is low among students in the Eastern Province of Saudi Arabia. This may explain the rarity of the term "parasites" in middle school curricula, as they had no knowledge of whether parasites cause serious diseases in humans or not. Studies by Tabli et al. (2017), Al-Shahri (2018), and Al-Khaza'lah (2018) confirm a low percentage of concepts related to diseases and health issues in the curricula. The curricula in the intermediate education stage primarily focus on raising awareness about the most prevalent diseases in the kingdom, such as influenza and chickenpox, as well as methods of prevention. Saudi curricula focus on raising students' awareness of precautionary measures to prevent disease, what students should follow in case of illness and encouraging them to promptly go to hospitals and specialized health centers for appropriate treatment.

Parasites may be more prevalent in agricultural environments where livestock is abundant, but they are not widespread in the Saudi environment. The desert environment may not facilitate the spread of parasites among community members. Most of the study sample (73.1%) live in urban areas and have not interacted with animals, which are one of the main causes of parasitic infections. Students may have formed their knowledge about parasitic diseases through personal efforts, media and websites, or personal interactions. This aligns with Al-Qaisi et al. (2021), and Al-

Zawi (2020), which concluded that the media plays a role in raising health awareness and promoting health concepts. A study by Gideon & Ghadban (2022) found that Facebook played a role in raising health awareness during the COVID-19 pandemic. The study by Al-Zawi (2020) suggests that new media through handheld devices contributes to students' acquisition of health knowledge. During a survey, some teachers reported that the focus of educators on teaching the academic curriculum for students without extracurricular activities may contribute to the lack of health awareness programs offered by schools regarding parasitic infections, modes of transmission, and causes of infection. This could significantly contribute to students' lack of awareness about parasite transmission in the school environment. Also, middle school students might not be aware that parasitic eggs stuck to their hands or the fresh vegetables they eat can transmit parasitic infections. At this age, students often neglect to wash fresh vegetables properly before consuming them. The results of the current study differ from Al-Sadoun et al. (2016), which concluded that the level of awareness among middle school girls in Saudi Arabia regarding basic healthy habits is good, and the study by Yoo et al. (2021), which led to an increase in health awareness among students in Korea.

Regarding the fourth axis, "Awareness of parasite prevention and reducing their spread in schools", Table 3 shows that middle school students have a high level of awareness about ways to prevent parasitic infections and reduce their spread in schools. The increase in students' awareness of ways to prevent parasitic infections may be attributed to the culture of families, which emphasizes raising their children to pay attention to health aspects, especially after the experience of the Corona crisis, which impacted the health of communities and accustomed them to the regular use of medical sanitizers and chemical cleaners. This may be due to the strict measures taken by the Saudi government to curb the spread of the coronavirus during the pandemic, as well as the requirement that all public and private institutions use health precautions to limit the spread of diseases. The presence of housemaids in most families has contributed to an increased use of preventive measures against disease, as the maid takes care of cleaning foods, clothing, and household items daily. The commitment of Saudi families to ensure their children are always in a clean environment, out of fear of disease or its spread among their children, has enhanced their awareness of ways to prevent illness and their adherence to using personal hygiene tools. The strong infrastructure that characterizes the Saudi environment, in terms of the availability of excellent sewage systems and the scarcity of freshwater sources, has enhanced health awareness among students and reduced the spread of parasitic diseases. According to Ben Safi, (2019), areas that often suffer from poor sanitation and occasionally discharge wastewater into freshwater are more prone to the spread of parasitic diseases. This is frequently not available in Saudi Arabia. The strict monitoring procedures implemented in Saudi Arabia for grocery stores, especially for vegetables, and fast-food restaurants have contributed to increasing health awareness among students regarding ways to contract diseases, which has led to a decrease in the spread of parasitic diseases. The availability of advanced healthcare services in Saudi Arabia in general, which meet the health needs of the population, has contributed to enhancing health awareness. The current study's results align with the findings of Al-Sadoun et al. (2016), indicating a high level of awareness among middle school girls about basic healthy habits, and with Ben Safi's

(2019) conclusion that the development of medical services in communities influences health culture. The results of the current study differ from the study by Alanzi et al. (2024), which concluded that the health awareness level among students in the Eastern Province of Saudi Arabia was weak.

Table 4 shows differences between males and females in favor of males in the second axis of the questionnaire, as well as in the questionnaire as a whole. Males tend to be more mobile and active than females, and they engage with commercial spaces more frequently than females, leading to a greater adherence to preventive measures against disease. The questionnaire revealed no differences between males and females in other aspects, suggesting that middle school students in Al-Ahsa, both boys and girls, experience a similar school environment in terms of material resources, health services, and health procedures. Both boys' and girls' schools have the same curriculum, and their educational programs are similar. The Saudi family's concern for the health of their children is equally important, even though males play a larger role in meeting the family's needs and have greater mobility than females, which may make them more susceptible to parasitic infections. The current study's findings are consistent with those of Alanzi et al. (2024); we concluded that there are no differences between males and females in the level of health awareness.

Saudi culture, which emphasizes adherence to disease prevention measures to limit their spread, may explain why Table 5 shows no differences between urban and rural students. They have all benefited from COVID-19's experience with following healthy practices to prevent illness. This result is consistent with Al-Qaisi et al. (2021). As shown in Table 6, there are no differences in students' awareness that can be attributed to the mother's level of education. This may be explained by the Saudi family's careful commitment to following health instructions and guidelines from the relevant authorities, such as schools, hospitals, and health centers, with mothers agreeing on this regardless of their level of education. The eagerness of mothers to go to hospitals and health centers and benefit from the expertise of specialists when suspecting any symptoms of illness in their children may explain the lack of impact of the mother's education level on students' awareness of ways to prevent disease. This result is consistent with Al-Qaisi et al. (2021) and Gidion & Ghadban (2022), as well as the study by Alanzi et al. (2024).

Limitations

The objective of this study is to identify the level of awareness of parasitic infections. The study focuses on Middle School Students in Al-Ahsa About Parasitic Infections in Saudi Arabia, where the study tool was implemented during the academic year 2024.

Recommendations

- Developing middle school curricula to enhance students' awareness of the prevention of parasitic infections.

- Raising awareness among families about healthy ways to prevent parasitic infections.

- Enhancing communication between schools, Families, and health institutions to activate health awareness programs for students.

- Increasing health awareness programs in schools about parasitic infections.

- Incorporating health information about parasites, their life cycle, and prevention strategies into school curricula is crucial.

- Following up on daily cleaning operations for all school components, classrooms, bathrooms, floors, etc., while ensuring the provision of the necessary medical sterilizers.

Availability of data and materials

The datasets used and analyzed during the current study are available from the corresponding authors on reasonable request.

Competing Interest

The authors declare that there is no competing interest.

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