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Research Article

Prevalence of *Enterobius vermicularis* among Primary School Children of Barangay Gravahan, Matina, Davao City

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ABSTRACT

Enterobiasis, commonly known as pinworm infection, is caused by the roundworm *Enterobius vermicularis*, and is considered the most prevalent parasitic infection in humans worldwide. This study aims to determine the prevalence of *Enterobius vermicularis* among primary school children in Barangay Gravahan, Matina, Davao City. The researchers utilized a Quantitative Correlational Research Design to determine if there is a significant association between the participants' demographic profile and the prevalence of Enterobiasis, using a Chi-Square Test for Association. A purposive sampling technique was used to select children aged 6-12 from different households in Barangay Gravahan, Matina as study participants. Specimen collection was conducted early in the morning using the adhesive cellophane tape method. Results showed an overall prevalence of 35.0% for Enterobiasis, with 14 out of 40 samples testing positive for *Enterobius vermicularis* eggs. Additionally, the study found no significant correlation (p-value: >0.05) between the prevalence of Enterobiasis and the participants' demographic profile. The results highlighted that *Enterobius vermicularis* remains a significant health issue for children aged 6-12. To help prevent its spread, it is important to practice good hand hygiene, avoid habits that can spread pinworm eggs (such as nail biting), and taking daily morning showers to remove any eggs deposited overnight.

Keywords*: Enterobius vermicularis*, *Prevalence, 6-12 years' old*

Introduction

Enterobius vermicularis (otherwise known as pinworm, threadworm, or seatworm) is one of the most widespread human parasitic infections worldwide, particularly in moderate climates (Li, 2015). It is a leading cause of growth retardation and malnutrition in children aged 5-10 years old, resulting for more than 30% of cases (Al-Daood, 2020). *Enterobius vermicularis* infection, known as Enterobiasis,

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is primarily associated with poor environmental sanitation, food contamination, and inadequate personal hygiene, regardless of social, economic, or ethnic factors. Enterobiasis is prevalent in crowded situations, including kindergartens and elementary schools, due to simple transmission from infected to uninfected children (Fan, 2019). Its primary symptoms include perianal skin itchiness, nightmares, irritability, and malnourishment, but it can also result in appendicitis and urinary tract inflammation due to ectopic parasitism. It has also been stated that in some rare cases, *E. vermicularis* may enter the fallopian tubes and kidneys, which produces ectopic Enterobiasis and has serious health consequences and even death (Huang, 2022). The most typical method of transmission is fecal-oral and rarely transmitted through the inhalation route when eggs are inhaled and subsequently ingested (Prashanth, 2019)

Moreover, prevalence rates for Enterobiasis vary globally, ranging from 0.21% to 54.86%, with children being the most affected demographic (Laoraksawong, 2020). According to reports, this age group has a prevalence of 61,000 per 100,000 individuals throughout India, 50,000 throughout England, 39,000 throughout Thailand, 37,000 throughout Sweden, and 29,000 throughout Denmark (Gibson, n.d.). A study also found that males had a higher prevalence (24.5%) compared to females (20.31%). In Southern Iraq, 7.8% of samples tested positive for *E. vermicularis*, with children aged 6 to 8 showing the highest infection rates. The researchers also discovered an association between *E. vermicularis* infection and the residency, demographics, the mother's educational background, and the mother's understanding of pinworm treatment and prevention (Khazaal, 2020). In the Philippines, prevalence studies in Bagac, Bataan, Philippines reveal that hygiene practices among children and their families play a crucial role in the spread of Enterobiasis (Flores, 2018).

The most common diagnostic method for Enterobiasis is the adhesive cellophane tape method, also known as the pinworm paddle method, which involves pressing a tape against the perianal area to collect eggs. The sample is then examined under a microscope, where eggs typically measures 50 by 30 microns and have a flattening surface. On the other hand, female worms range from 8 to 13 mm, while males are smaller (2-5 mm). The test is most effective when performed early in the morning, and a negative result on consecutive mornings rules out the diagnosis.

According to the World Health Organization (2024), over 1.5 billion people do not have sanitation facilities, which causes an increase in parasitic infections due to a lack of proper hygiene. In connection, Barangay Gravahan is a populated area with closely spaced houses and shared facilities. This observation led the researchers to conduct a study to assess the potential health risks in the community.

Furthermore, this study will benefit children, parents, and local government programs by raising awareness of the risks associated with Enterobiasis and encouraging better hygiene practices to prevent its spread.

This study aims to determine the prevalence of *Enterobius vermicularis* among primary school children of Barangay Gravahan, Matina, Davao City. It specifically aims to answer the following questions;

- What are the demographic profiles of the participants in terms of age, sex, monthly income, and ethnicity?
- What is the prevalence of Enterobiasis among primary school children of Barangay Gravahan, Matina, Davao City?
- Is there a significant association between the participants' demographic profile and the prevalence of Enterobiasis among Primary School Children of Barangay Gravahan, Matina, Davao City?

Methods

Data Gathering Procedure

The researchers surveyed the area to select participants using the purposive sampling method and selected children aged 6-12 from different households in Barangay Gravahan, Matina, Davao City. The specimen collection was conducted using the adhesive cellophane tape method (Tankeshwar, n.d.) followed by specimen examination. In addition, personal data such as age, sex, monthly income, and ethnicity were obtained from the participant's parents or guardians after collecting the specimen.

Sample Collection

A total of 40 samples were collected from the children in Barangay Gravahan, Matina, Davao City. The sample size was determined using the Cochran formula followed by Finite Population Correction (FPC) formula to adjust the sample size from the Cochran formula (for a finite population).

As calculated by the study's statistician:

Cochran formula:

$$\boldsymbol{n = \frac{Z^2 \times p \times q}{d^2}}$$

Where:
n = sample size
Z = 90% confidence level (Z = 1.645)
p = proportion (p = 0.8)
q = 1– p (q = 0.2)
d = precision (±10%)

Calculation:

$$\boldsymbol{n = \frac{(1.645)^2 \times 0.8 \times 0.2}{(0.1)^2}}$$

$$\boldsymbol{n = \frac{2.71 \times 0.8 \times 0.2}{0.01}}$$

$$\boldsymbol{n = \frac{0.4336}{0.01}}$$

$$\boldsymbol{n = 43.36}$$

Rounded up to the nearest integer:

$$\boldsymbol{n = 44}$$

Finite Population Correction (FPC) formula:

$$n_{adjusted} = \frac{n_{cochran} \times N}{N + n_{cochran} - 1}$$

Where:
$n_{adjusted}$ = adjusted sample size for finite population
$n_{cochran}$ = initial sample size calculated by Cochran's formula which is equal to 44
N = total population size (N = 358)

Calculation:

$$n_{adjusted} = \frac{44 \times 358}{358 + 44 - 1}$$

$$n_{adjusted} = \frac{15,752}{401}$$

$$\boldsymbol{n = 39.3}$$

Substituting the given values into the formula, the calculated sample size is 39.3. However, as recommended by the study's statistician, 40 children were included in the sample to ensure a more reliable representation.

Given the limitations encountered in the present study, such as the small sample size and the possible degradation of samples prior to laboratory examination, the researchers recommend increasing the sample size for future investigations and selecting an acceptable sampling method. Furthermore, the principle behind the adhesive cellophane tape method is that throughout the night, the female adult pinworm lays eggs on the outer layer of the skin close to the anus. The sticky texture of the adhesive cellophane tape will attract the eggs (Tankeshwar, n.d.), which may then be observed under a microscope using the low power (10x) objective (Song, 2024). After collection, samples were placed individually in clean plastic bags, labeled with the participant's name and date of collection, and transported to the laboratory for the determination of *Enterobius vermicularis* eggs.

Data Analysis

The researchers used the Chi-Square Test for Association to determine if there is a statistically significant association between the prevalence of Enterobiasis and the participant's demographic profiles. The Chi-square test analyzes categorical data through five steps: formulating hypotheses, specifying expected values, comparing observed and expected counts, calculating the test statistic, and determining if the Chi-square value is significant enough to reject the null hypothesis (Mindrila, n.d.). A p-value of greater than 0.05 was deemed insignificant.

Results and Discussions

This section provides an analysis and discussion of the data collected throughout the study. The results are presented through the use of tables and statistical methods to facilitate a clear understanding of the findings.

Table 1. Demographic profile of Participants (n = 40)

Profile Variables	Category	Frequency	Percentage (%)
Age (in years)	6	4	10.0
	7	4	10.0
	8	10	25.0
	9	5	12.5
	10	5	12.5
	11	6	15.0
	12	6	15.0
Sex	Female	19	47.5
	Male	21	52.5
Monthly Income (₱)	1,000 – 5,000	25	62.5
	6,000 – 10,000	12	30.0
	11,000 – 15,000	3	7.5
Ethnicity	Bisaya	28	70.0
	Blaan	3	7.5
	Bul'anon	3	7.5
	Ilonggo	1	2.5
	Kaolo	5	12.5

Note. Percentages are based on the total number of participants (n = 40).

Table 1 presents the demographic profiles of the 40 participants involved in the study. When categorized by age, 4 participants (10.0%) were aged 6; 4 participants (10.0%) were aged 7; 10 participants (25.0%) were aged 8; 5 participants (12.5%) were aged 9; 5 participants (12.5%) were aged 10; 6 participants (15.0%) were aged 11; and 6 participants (15.0%) were aged 12. The highest number of participants belonged to the 8-year-old age group. Regarding sex, 19 participants (47.5%) were female and 21 participants (52.5%) were male, indicating a slightly higher proportion of males. As for monthly household income, 3 participants (7.5%) reported an income between ₱11,000 and ₱15,000; 12 participants (30.0%) had an income ranging from ₱6,000 to ₱10,000; and 25 participants (62.5%) reported a monthly income between ₱1,000 and ₱5,000. In terms of ethnicity, the majority were Bisaya (28 participants or 70.0%), followed by Blaan (3 participants or 7.5%), Bul'anon (3 participants or 7.5%), Ilonggo (1 participant or 2.5%), and Kaolo (5 participants or 12.5%).

Table 2. Prevalence of Enterobiasis Among Primary School Children in Barangay Gravahan, Matina, Davao City

Sample size (n)	Positive for Enterobiasis	Prevalence (%)
40	14	35.0

Table 2 presents the overall prevalence of Enterobiasis among primary school children in Barangay Gravahan, Matina, Davao City, which was found to be 35.0%. This indicates a high occurrence of *Enterobius vermicularis*, in comparison to previous studies, with 14 out of 40 stool samples testing positive for the presence of *E. vermicularis* eggs. This is consistent with the findings of earlier studies conducted by Khazaal (2020), Olorode (2022), Totanes (2009), and Khayyat (2015).

Table 3. Chi-Square Test Results: Association Between Prevalence of Enterobiasis and Demographic profiles

Demographic profiles	Category	Positive	Negative	Total	Chi-Square	p-value	Phi	Remarks
Age	6	0	4	4	12.234	0.05	0.553	**Insignificant**
	7	1	3	4				
	8	3	7	10				
	9	5	0	5				
	10	1	4	5				
	11	2	4	6				
	12	2	4	6				
Sex	Female	8	11	19	0.803	0.370	0.142	**Insignificant**
	Male	6	15	21				
Monthly Income	11,000–15,000	0	3	3	1.861	0.394	0.216	**Insignificant**
	6,000–10,000	5	7	12				
	1,000–5,000	9	16	25				
Ethnicity	Bisaya	8	20	28	5.505	0.239	0.371	**Insignificant**
	Blaan	2	1	3				
	Bul'anon	2	1	3				
	Ilonggo	1	0	1				
	Kaolo	1	4	5				

The chi-square test results on table 3 indicate no significant associations between the prevalence of Enterobiasis and the demographic profiles examined. In each case, the p-values were above the significance threshold of 0.05, suggesting that these variables do not have a significant impact on Enterobiasis prevalence. Specifically, while the infection rate varied slightly between sexes, with a higher rate in females (42.1%) compared to males (28.6%), the difference was not statistically significant.

While this study found no significant association, several factors may explain this outcome. One possibility is due to similar exposure across different demographic groups. In areas where Enterobius vermicularis is prevalent, particularly in populated communities with shared sleeping arrangements, the risk of infection may be evenly spread across various socioeconomic and age groups. A study conducted in urban Manila reported a similar pattern, finding no significant variation in Enterobiasis rates among different age groups, likely due to common hygiene habits and shared living environments (Flores, 2018). In contrast, a 2024 study conducted in the rural region of Kidapawan City, Philippines, reported a prevalence rate of 15.21%, highlighting additional significant risk factors such as the mother's level of education and bed-sharing practices that may contribute to the spread of Enterobiasis (Oñez, 2024). These findings suggest that other environmental and behavioral conditions play a crucial role in the transmission dynamics of Enterobiasis.

The present study revealed a 35.0% prevalence of Enterobius vermicularis among primary school children in Barangay Gravahan, Matina, Davao City. This figure is particularly higher than the 22.1% prevalence reported by Basha et al. (2021) in preschool-aged children in the West Bank, Palestine. The difference could result from differences in age group, environmental hygiene, and community infrastructure between the two places. It is also important to note that the children in this study are in primary school, which could expose them to more public transmission situations than children in preschool.

Conclusion

This study found that 35.0% of primary school children in Barangay Gravahan, Matina, Davao City were infected with Enterobius vermicularis, showing that Enterobiasis is still highly prevalent in the area. This highlights

that the infection remains a serious health concern for children aged 6 to 12. To address this, the researchers recommend that healthcare workers implement hand hygiene practices to limit the risks of acquiring Enterobiasis and other parasitic infections efforts. It is also important to involve the whole community, especially parents and caregiver, through health education programs that raise awareness, support early detection, and encourage healthy habits.

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