Prevalence and Risk Factors of Enterobiasis Among Pre-School Children in Selected Barangays in Dumaguete City, Philippines

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The study was an exploratory step, a rapid assessment of the prevalence of *Enterobius vermicularis* (pinworm) and its risk factors among pre-school children in selected *barangays* (villages) in Dumaguete City, Philippines, so that intervention that would contribute to improving the health status of pre-school children in the city may be proposed. A map showing *Enterobius vermicularis* infection "hotspots" was generated. The prevalence and risk factors of enterobiasis among preschool children were determined through questionnaire survey that had three components: the socio-demographic profile, environmental factors, and the KAP (Knowledge, Attitude and Practice) of respondents. Microscopic examination of *Enterobius vermicularis* was done between December 2006 to January 2007 using the perianal tape swab method taken from the target population. A total of 276 children from eight barangays were examined for *Enterobius vermicularis*. Results of the examination revealed a 2.50% overall prevalence, with a range of 0.00% to 11.11%. Eight children were found positive for other parasites such as *Ascaris lumbricoides* and *Isospora belli*. The geographical extent of the enterobiasis indicated a relatively high prevalence on the southwestern side of the *poblacion* (municipality center) where the seat of government is located.

Household environmental scores for the barangays covered by this survey ranged from 63.33% to 71.33%. An evaluation of the day care center environs yielded an environmental score ranging from 75% to 96.67%. Knowledge scores ranged from 36% to 66%. Attitude towards the disease scores ranged from 32.94% to 79.44% while the Practice scores ranged from 73.30% to 81.64%. There are indications that the relationship between KAP, environmental scores, and prevalence is inverse. The low prevalence can be attributed to the relatively high environmental and KAP scores. However, there are barangays that had less than 50% scores, due to low education and negative attitudes towards the disease. This should be prioritized in terms of intervention to keep the prevalence level to a minimum if not eradicated. There are also indications that prevalence of enterobiasis increases with an increasing day care class size. However, correlation analysis shows that this was not significant. The low prevalence of enterobiasis could also be attributed to medications made available to the community by non-governmental organizations as well as the local government.

KEYWORDS: Enterobiasis, prevalence, risk factors, geographical distribution, Knowledge, Attitudes, Practices (KAP).

INTRODUCTION

Intestinal parasites and protozoan infection are amongst the most common worldwide. It is estimated that some 3.5 billion people are affected, and that 450 million are ill as a result of these infections, the majority being children (WHO, 1998). These infections are regarded as a serious public health problem, since they can cause iron deficiency anemia, growth retardation in children and other physical and mental health problems (Evans & Stephenson, 1995; WHO 1998). For pre-school children, anemia reduces their cognitive ability and hence affects their academic performance (Okpala, 1956; Gbakima et al., 1994).

Intestinal parasitic infection remains as an important public health problem in the Philippines causing nutrient mal-absorption, diarrhea, and other states of poor health. The infections are usually acquired through ingestion of contaminated food or water as a result of poor sanitation and wrong attitudes and practices towards the disease (Esparar, Belizario, & Relos, n.d.). The most common mode of transmission is direct hand to mouth transmission. Rarely, retroinfection may occur (Belizario et al., 1997).

The commonest parasitic infections reported globally are *Ascaris lumbricoides* (20%), hookworm spp. (18%) *Trichuris trichura* (10%) and *Entamoeba histolytica* (10%). It is estimated that approximately 208 million people are affected worldwide. However, most reports are based on single samples from a variety of patient groups and controls, and the community prevalence has not been documented in detail (WHO, 1987). In the Philippines, for instance, the studies done were mainly focusing on the prevalence of soil transmitted helminthiasis, and not specifically on *Enterobius vermicularis*. Also such studies did not give emphasis on the risk factors that may contribute to such disease.

The adults of *Enterobius vermicularis* are small, whitish or brownish in color. At the anterior end is a pair of lateral cuticular expansions known as "lateral wings" or "cephalic alae." These structures differentiate adult enterobius from other adult nematodes of medical importance. Another feature of the pinworm adult is the posterior esophangeal bulb. The adult male measures 2 to 5 mm in length; the tail strongly curves ventrad. The single copulatory spicule found in the male measures 100 to 141 um. The female measures 8 to 13 mm in length and has a long pointed tail, thus the common name pinworm.

The eggs, measuring 50 to 60 um by 20 to 30 um, are elongated,

ovoid, flattened on the ventral side giving an appearance similar to a letter "D." The eggshell is composed of two layers, an outer thick hyaline albuminous shell and an inner embryonic lipoidal membrane. The larva is folded once within the egg, usually creating a line visible along the egg's long axis.

In the life cycle of the pinworm, the adult worm inhabits the cecum with their heads attached to the intestinal wall. In gravid females, the uteri becomes packed with eggs and body becomes distended, which makes the female release its hold on the intestinal wall and migrate down the colon and out of the anus to lay eggs on the perianal and perineal skin. The eggs deposited by a single female vary from 4,672 to 16,888 with a mean of 11,105 eggs per day. The female usually dies after oviposition, while the males die after copulation.

The eggs laid on the perianal region become fully mature or embryonate within 6 hours. When ingested, eggs containing the third-stage juvenile larvae hatch in the duodenum, pass down the small intestines to the cecum and develop into adult egg-laying worms in around a month's time (range: two weeks to two months). The eggs are resistant to putrefaction and disinfectants but succumb to dehydration in dry air within a day. Under cool and moist conditions, the egg may remain viable up to 13 days (Revised Medical Technology Parasitology Manual, 2000).

When planning interventions to control a disease, it is essential to understand the burden of the disease. In the absence of reliable data on the total number of helminthic infections in the country, estimates have often been based on prevalence data from a few limited studies that have been extrapolated from the country as a whole (Brooker, Donelly, & Guyatt, 2000). Although these estimates or surveys may provide an indication of the magnitude of the problem, they are limited to a specific group, mostly coming from the school-aged children because they are more vulnerable to the disease, and subjects are easily gathered. With the establishment and mushrooming of day care centers, it is imperative that studies on intestinal parasitic infections, that is, enterobiasis, be conducted. It is very important that they should be aware of these diseases as part of preventive measures.

In the Philippines, the prevalence varies from 10% in rural areas to 75% in crowded urban areas. Women are more frequently infected than men and children are more frequently infected than adults (Belizario et al., 1997). The knowledge, attitudes, and practices of every individual on personal hygiene and sanitation contribute to the

hygiene and sanitation of their community.

Epidemiological research carried out in different countries has shown that the environmental, social and economic situation of the individual is an important determinant in the prevalence of intestinal parasites. The data show that prevalence was higher in rural areas and with low educational background parents and in children who have poor hygiene and poor behavioral practices, and poor KAP (Okyay, Ertugs, Gultekin, Onen & Baser, 2004). Other studies have shown that some aspects of socio-demographic profile (age and educational level) and environmental factors were contributory to the prevalence of intestinal parasitic infections (Al-Shammari, Khoya, El-Khwasky & Gad, 2001). In this study, children below 12 years old and whose parents had educational level below secondary school showed high intestinal parasitic infections.

Furthermore, those who obtained drinking water from tanks and those who dispose sewage in open channels were independently associated with high intestinal parasitic infections. Another study on estimating the number of helminthic infections was done in the Republic of Cameroon. Based on the method used, it was found that the infection was prevalent among pre-school children and adults was over 32% (Brooker, Donnelly, & Guyatt, 2000), and further suggests that the estimation of the prevalence will be enhanced if the data were stratified by age; that is, the younger the individual, the higher the prevalence. In another study, the demographic survey in shanty town schools showed that the number of school children infected by the intestinal parasite gradually decreased as their ages increased (Ulukanligil & Seyrek, 2003).

A small scale survey was done to know the infection status of intestinal parasites in children living in residential institutions and street communities in Metro Manila. It was found that 62% of the children examined were positive for one or more intestinal parasites (Baldo, Belizario, De Leon, Kong & Chung, 2004) and the prevalence of these infections among children living in institutions was relatively high. A similar study was conducted in Roxas City, Mindoro, Philippines. Multiple infections accounted for 29.6% of the cases, and double infection with A. lumbricoides and T. trichiura was most common. Furthermore, the intestinal helminth infections were highly prevalent in this area (Kim, Ock, Chung, Yong, & Lee, 2003).

Based on the dearth of such studies, I decided to investigate whether socio-demographic profile characteristics (age, household size, educational attainment of parents and monthly family income),

environmental factors (source of drinking water, human and solid waste disposal and type of toilet) and KAP (knowledge, attitudes, practices) of respondents would contribute to the prevalence of *E. vermicularis* in our locality. No such study was conducted in Dumaguete City and even in the Province of Negros Oriental. Thus, this paper served as a baseline study for enterobiasis in Dumaguete City.

METHODOLOGY

The study was conducted through questionnaire survey and microscopic examination of *Enterobius vermicularis* using perianal tape swab taken from the 276 target population between December 2006 and January 2007. I utilized the descriptive study design to determine the prevalence and distribution of *E. vermicularis* and its related risk factors among the pre-school children aging 4-6 years old in eight selected Barangay Day Care Centers in Dumaguete City.

The questionnaire and quantitative methods complemented each other in producing a more accurate picture of the prevalence and distribution of *E. vermicularis* in Dumaguete City. The sample slide that contains the suspected parasite comprised the quantitative method while the questionnaire survey gathered qualitative data to provide the socio-demographic, environmental aspects, and the knowledge, attitude and practices of the respondents concerning enterobiasis. The respondents in the study questionnaire survey included the mother or father of the children, and the Day Care Workers.

Dumaguete City has 30 barangays, eight of which belong to the poblacion area and were chosen as the study sites. These included Barangays 2, 8, Looc, Calindagan, Tabuc-Tubig, Taclobo, Tinago and Daro (Figure 1).

The data relevant to this study were gathered using two different strategies, namely a) questionnaire and b) laboratory examination of the perianal tape swab, conducted at Silliman University Biology Department. These samples were immediately examined after the collection to avoid possible decomposition.

There was no written protocol for baseline data on *E. vermicularis* in Dumaguete City. Thus, the researcher decided on what data are relevant to the prevalence and distribution on *E. vermicularis* in Dumaguete City. The final questionnaire was composed of five major parts (Table 1).

Figure1. **Map of Dumaguete City.**

Table 1.

Matrix of the Questionnaire for the Prevalence and Distribution of E. vermicularis Among Pre-School Children in Selected Barangay Day Care Centers in Dumaguete City

Variable	Indicators
I. Socio-demographic	age, sex, household size, position of respondents, educational attainment of parents, occupational background of parents, estimate of household monthly income
II. Environmental Factors	type of major sources of drinking water, disposal of human waste, disposal of household solid and water waste, type of toilet used, immediate surroundings, presence of water logged areas and location of the Barangay Day Care Center and homes
III. Knowledge	etiology and nature of *E. vermicularis*, mode of transmission, pathogenesis, prevention and control, management, source of information on *E. vermicularis*
IV. Attitude	awareness of infection on its signs and symptoms whether taken lightly, moderately, or seriously
V. Practices	hand washing with soap and water, washing anal area by hand after defecation, washing of hands before eating, washing of vegetables well, usage of toilet paper, regular check up for perianal swab.
VI. Disease Hot Spots	prevalence and distribution of *E.vermicularis* in selected Barangays in Dumaguete City

Laboratory examination of the specimens from the target population was undertaken. Because of logistical limitations, parents were shown how to perform a perianal tape swab on their child. Presence of D-shaped egg confirmed the presence of *E vermicularis.*

There were two categories of respondents and one category of target population in this study. For the socio-demographics,the perception on environment, and KAP, the respondents were the parents or guardians of the children enrolled in the barangay day care center. For the prevalence of infection, the children enrolled in the barangay day care centers were considered target population whose specimen were obtained using the perianal tape swab method. The day care center teachers were also asked on their perception

concerning the environmental aspect.

A total of 276 pre-school children were examined for *enterobiasi*s and their parents or guardians were requested to answer the questionnaire. The number exceeded the suggested sample size (242) for a total population of approximately 648 (number of enrollees in the eight day care centers) to limit the sampling error to + 5% (with a sample size of 276, the error is estimated to be + 4.47%) as determined by the Sample Size Calculator of the Creative Research System (http://www.surveysystems.som/sscalc.htm).

The socio-demographic data sets were summarized using frequency tables and, where appropriate, descriptive statistics were also employed. For the environmental factors, each of the items was given corresponding points and was summed up and presented as percent score. The total score was taken as the environmental score. For the knowledge, attitudes, and practices, each of the items was likewise given corresponding points, summed up, and presented as percent score.

The prevalence of enterobiasis was determined on a per barangay basis. Computation of the prevalence was based on the formula used by the World Health Organization/ Department of Health where:

$$\text{Prevalence} = \frac{\text{Number of subjects testing positive}}{\text{Total number of enrolled preschool children}} \times 100$$

Table 2.

Category of Prevalence

Community Category	Community Prevalence (%)	Intensity of Infection per Individual (%)
I. High Prevalence	Any (unspecified)	> 10 High Intensity
II. High Prevalence	> 50	< 10 Low Intensity
III. Low Prevalence	< 50	< 10 Low Intensity

* The WHO recommends mass treatment when >50 % of the community is (+) for STH- enterobiasis in this case.
* A >50% community prevalence means that the number of positive subjects has reached 50% or greater from the total subjects examined in a particular community.
* The intensity of infection per individual indicates the number of eggs of the parasite per ml of stool. Greater than 10 shows high intensity of the infection while less than 10 shows low intensity of the infection.

To determine the relationship between prevalence and risk factors, the Pearson Product Moment Correlation was used. To determine if there are differences in the risk factors score between positive and negative children for enterobiasis, the t-test (pooled estimate of variance) was employed. To generate the maps to present the enteriobiasis "hot spots", the 3Dfield™ freeware was used.

RESULTS AND DISCUSSION

Except for Tabuc-tubig and Calindagan where most of the total number of households belong to the 6 to 10 bracket, the rest of the barangays have most of their total household members belonging to the 1 to 5 bracket (Table 3). The households in Tabuc-tubig and Calindagan are most probably composed of extended families.

Table 3.

Number of Household Members Distribution

Household Members / Barangay	1 to 5		6 to 10		> 11		Unspecified	
	Freq.	%	Freq.	%	Freq.	%	Freq.	%
Taclobo	30	51.72	20	34.48	7	12.07	1	1.72
Barangay 2	15	40.54	18	48.65	4	10.81	0	0.00
Tabuc-tubig	9	33.33	12	44.44	6	22.22	0	0.00
Daro	14	60.87	7	30.43	2	8.70	0	0.00
Barangay 8	14	51.85	11	40.74	2	7.41	0	0.00
Calindagan	14	33.33	15	35.71	11	26.19	2	4.76
Tinago	21	46.67	15	33.33	8	17.78	1	2.22
Looc	11	64.71	4	23.53	2	11.76	0	0.00
Overall	128	46.38	102	36.96	42	15.22	4	1.45

Most of the barangays had family income below the poverty line (Table 4). Two barangays, Daro and Barangay 8, had family income in the 3001 to 10,000 bracket. With most of the family income falling below the poverty line and considering that the on-going deworming programs are sponsored mostly by non-governmental organizations (e.g. Rotaract of Dumaguete, school community outreach programs), sustaining such deworming programs might be a challenge in the near future since the communities cannot afford to buy the prescribed anti-helminthic drugs.

Table 4.

Family Monthly Income Distribution

Family Income (PhP)	1 to 3000		3001 to 10000		> 10000		Unspecified	
Barangay	**Freq.**	**%**	**Freq.**	**%**	**Freq.**	**%**	**Freq.**	**%**
Taclobo	37	63.79	9	15.52	6	10.34	6	10.34
Barangay 2	27	72.97	9	24.32	0	0.00	1	2.70
Tabuc-tubig	12	44.44	7	25.93	6	22.22	2	7.41
Daro	7	30.43	11	47.83	5	21.74	0	0.00
Barangay 8	7	25.93	11	40.74	5	18.52	4	14.81
Calindagan	31	73.81	6	14.29	1	2.38	4	9.52
Tinago	27	60.00	14	31.11	4	8.89	0	0.00
Looc	14	82.35	0	0.00	1	5.88	2	11.76
Overall	162	58.70	67	24.28	28	10.14	19	6.88

The results of the examination of children for *E. vermicularis* resulted to a 2.50% overall prevalence (Table 5). Barangays Daro and 2 did not yield any positive results. The highest prevalence was in Tabuc-tubig (11.11%). Based on the World Health Standard and also adopted by the Department of Health indicate that the prevalence is low. For it to be considered high, it should come close to the 50% level.

Table 5.

Prevalence of Enterobius vermicularis among selected pre-school children in Dumaguete City

Barangay	Number of Children Examined	Positive for *Enterobius vermicularis*	Prevalence (%)
Barangay 2	37	0	0.00
Barangay 8	27	2	7.41
Calindagan	42	4	9.52
Daro	23	0	0.00
Looc	17	1	5.88
Tabuc-tubig	27	3	11.11
Taclobo	58	5	8.62
Tinago	45	1	2.22
Total	276	16	5.80

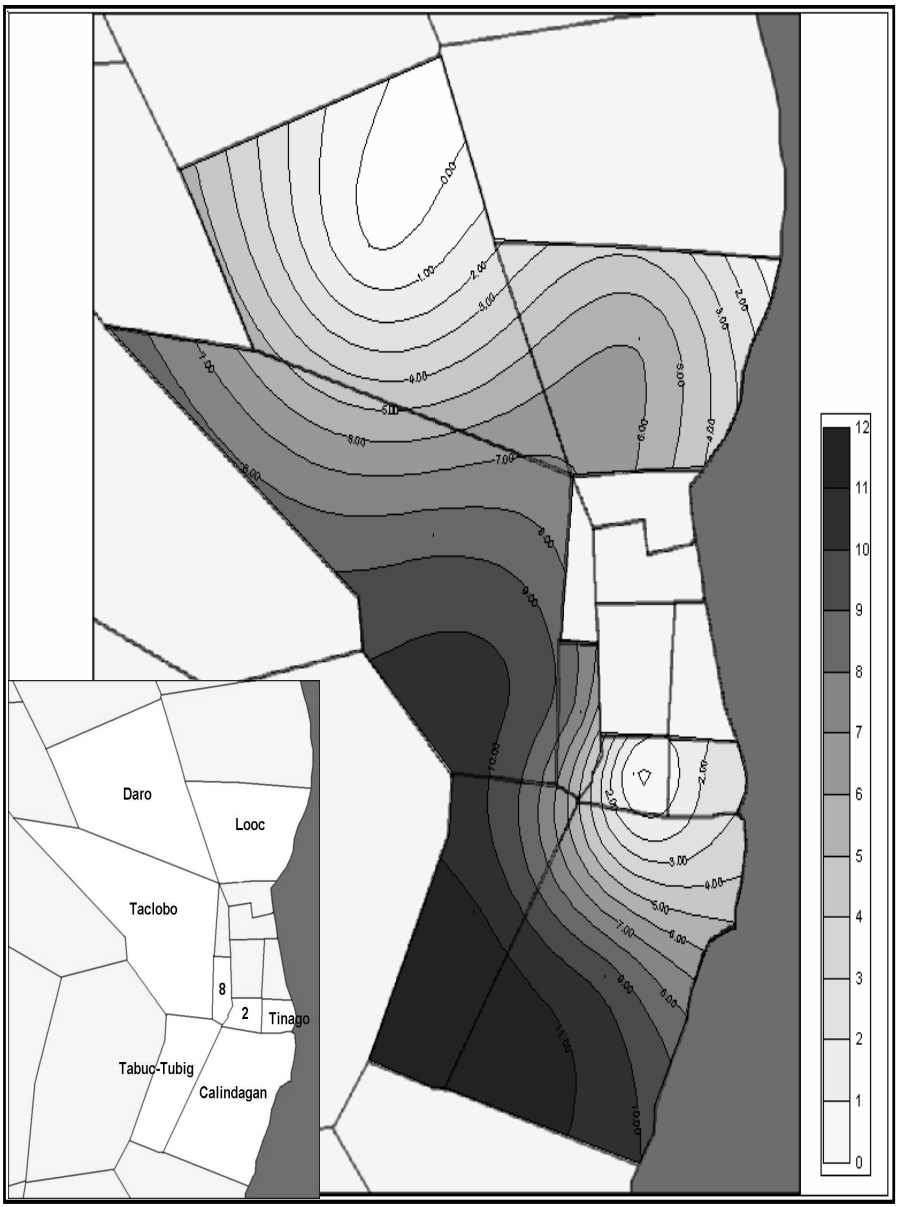

Figure 2. **Map showing geographical distribution of the prevalence of Enteriobius vermicularis infection.**
Note: The darker the shade, the higher is the prevalence.

The prevalence of infections when plotted on the map revealed that enterobiasis seems to be concentrated in the southwestern side of the poblacion.

Barangay Tinago, Calindagan, Tabuc-Tubig, Daro, and Looc, which have households that have a water connection with the Dumaguete City Water District, water sealed toilets, garbage collected by the city sanitary technicians, absence of water logged area in the surroundings, and a relatively cool area obtained the maximum environmental score (Table 6).

Table 6.

Summary of the household environmental scores

Items	Barangay 2	Barangay 8	Calindagan	Daro
Water Source	0.89	0.63	0.71	0.82
Toilet Type	1.00	1.00	0.97	0.95
Sewage Disposal	0.59	0.54	0.54	0.59
Solid Waste Disposal	0.99	0.99	0.95	0.91
General Surroundings	0.38	0.00	0.38	0.26
Temperature	0.43	0.64	0.55	0.45
Total Score	4.28	3.80	4.10	3.98
% Score	71.33	63.33	68.33	66.33

Items	Looc	Tabuc-tubig	Taclobo	Tinago
Water Source	0.82	0.71	0.71	0.77
Toilet Type	0.82	0.95	0.96	0.99
Sewage Disposal	0.62	0.59	0.68	0.54
Solid Waste Disposal	0.97	0.93	0.92	0.96
General Surroundings	0.35	0.38	0.43	0.40
Temperature	0.29	0.50	0.60	0.53
Total Score	3.87	4.06	4.36	4.19
% Score	64.50	67.67	71.67	69.83

Barangay 2 and Taclobo had the highest environmental rating (71.33% and 71.67%, respectively). Barangay 8, on the other hand had the lowest rating (63.33%).

In the geographical distribution of environmental scores (Figure 3), note that the darker the shade, the greater the environmental concern.

Figure 3. **Map showing geographical distribution of the environmental scores.**

The environmental scores for the day care centers in the different barangays that were sampled (Table 7) revealed scores ranging from 75.00% to 96.70%. The Looc Day Care Center was deemed to have the best environmental score.

Table 7.

Summary of the Day Care Center Environmental Scores

Items	Barangay 2	Barangay 8	Calindagan	Daro
Water Source	1.00	1.00	1.00	1.00
Toilet Type	1.00	1.00	1.00	1.00
Sewage Disposal	0.50	0.50	0.50	1.00
Solid Waste Disposal	1.00	1.00	1.00	1.00
General Surroundings	1.00	0.00	1.00	1.00
Temperature	0.00	1.00	0.00	0.00
Total Score	4.50	4.50	4.50	5.00
% Score	75.00	75.00	75.00	83.33

Items	Looc	Tabuc-tubig	Taclobo	Tinago
Water Source	1.00	1.00	1.00	1.00
Toilet Type	1.00	1.00	1.00	1.00
Sewage Disposal	1.00	1.00	0.50	1.00
Solid Waste Disposal	0.50	1.00	1.00	1.00
General Surroundings	1.00	1.00	0.00	1.00
Temperature	1.00	0.00	0.00	0.00
Total Score	5.50	5.00	3.50	5.00
% Score	96.67	83.33	58.33	83.33

Figure 4. **Map showing geographical distribution of the environmental scores of the day care center facility.**
Note: The darker the shade, the greater the environmental concern.

The children in Barangay Daro, Tabuc-Tubig, 2 and Calindagan had parents who are knowledgeable on the nature of *E. vermicularis*, mode of transmission, general and extreme case symptoms, preventive measures and the medication aspect are deemed to garner large knowledge points (Table 8).

Table 8.

Knowledge Score Summary

Items	Barangay 2	Barangay 8	Calindagan	Daro
Knowledge about				
E. vermicularis	0.84	0.81	0.88	0.83
Mode of Transmission	0.53	0.32	0.50	0.48
Symptoms	0.50	0.23	0.46	0.56
Extreme Case Symptoms	0.34	0.14	0.30	0.40
Prevention	0.64	0.37	0.60	0.68
Medication	0.46	0.29	0.50	0.61
Total Score	3.31	2.16	3.24	3.56
% Score	55.17	36.00	54.00	59.33

Items	Looc	Tabuc-tubig	Taclobo	Tinago
Knowledge about				
E. vermicularis	0.94	0.96	0.82	0.96
Mode of Transmission	0.32	0.45	0.36	0.57
Symptoms	0.35	0.44	0.34	0.54
Extreme Case Symptoms	0.27	0.35	0.28	0.44
Prevention	0.40	0.66	0.49	0.65
Medication	0.29	0.56	0.40	0.56
Total Score	2.57	3.42	2.69	3.72
% Score	42.83	57.00	44.83	62.00

It can be said that the respondents from Barangay 8, Looc, and Taclobo are relatively not knowledgeable on E. vermicularis and enterobiasis owing to their relatively low knowledge scores. The knowledge scores (Figure 5) ranged from 36% (Barangay 8) to 62% (Tinago).

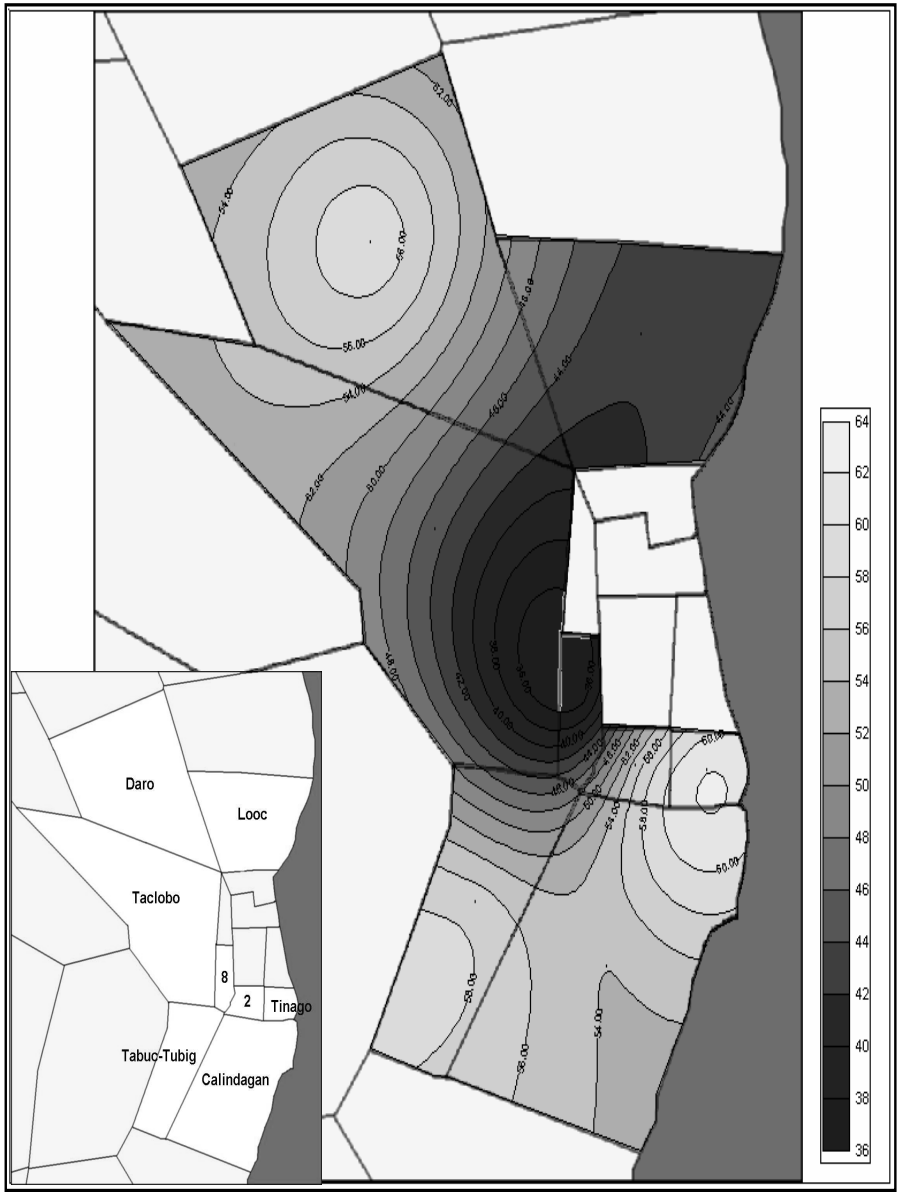

Figure 5. **Map showing geographical distribution of the knowledge scores**
Note: the darker the shade the lower the knowledge level.

The parents' attitudes (Table 9) towards disease were measured using their opinions to the signs and symptoms, fatality of the disease, the disability caused by the disease, the cost of treatment and the attitude towards seeking treatment. Barangay Looc showed the lowest attitude level (32.94%) while Barangay Tinago (79.44%) garnered the highest score.

Table 9.

Attitude Scores of the Parents

Attitude	Barangay 2	Barangay 8	Calindagan	Daro
Signs and symptoms	69.59	55.56	53.57	70.65
Disease can be fatal	74.32	53.70	54.17	76.09
Disease can cause disability	72.97	53.70	48.81	76.09
Cost of Treatment	70.27	54.63	54.17	66.30
Getting Treatment	76.35	62.04	72.02	72.83
Average	72.70	55.93	56.55	72.39

Attitude	Looc	Tabuc-tubig	Taclobo	Tinago
Signs and symptoms	69.59	55.56	53.57	70.65
Disease can be fatal	74.32	53.70	54.17	76.09
Disease can cause disability	72.97	53.70	48.81	76.09
Cost of Treatment	70.27	54.63	54.17	66.30
Getting Treatment	76.35	62.04	72.02	72.83
Average	72.70	55.93	56.55	72.39

Figure 6. **Map showing geographical distribution of the attitude scores.**
Note: The darker the shade the lower the attitude level.

Parents' practices were evaluated using the following criteria: the use of soap in washing the hands after defecation, washing anal region by hand after defecation, the use of toilet paper after defecation,

washing of hands before eating and food preparation, hand hygiene (clean & short fingernails), following the medications, and regular check-ups for stool/perianal tape swab method.

Results of the practices evaluation (Table 10), shows Barangay 8 as having the lowest practice level (73.30%). Barangay 2 revealed the highest practice level (81.64 %).

Table 10.

Target Population and Parents Practices

Items	Barangay 2	Barangay 8	Calindagan	Daro
A. Use of soap in washing hands after defecation	89.19	85.19	88.10	95.65
B. Washing of anal region by hand after defecation	83.78	70.37	86.90	93.48
C. Use of toilet paper after defecation*	17.57	11.11	26.19	26.09
D. Washing of hands before eating/food preparation	89.86	86.11	87.50	95.65
E. Hands hygiene (clean and short fingernails)	95.95	90.74	92.86	97.83
F. Following the medications**	100.00	100.00	35.71	100.00
G. Regular stool checkups	31.08	7.41	14.29	2.17
Average	81.64	73.30	78.27	80.80

Items	Looc	Tabuc-tubig	Taclobo	Tinago
A. Use of soap in washing hands after defecation	85.29	92.59	79.31	93.33
B. Washing of anal region by hand after defecation	85.29	94.44	86.21	84.44
C. Use of toilet paper after defecation*	26.47	26.32	20.69	24.44
D. Washing of hands before eating/food preparation	83.82	96.30	89.22	88.33
E. Hands hygiene (clean and short fingernails)	88.24	88.89	94.83	92.22
F. Following the medications**	100.00	100.00	100.00	100.00
G. Regular stool checkups	5.88	7.41	13.79	13.33
Average	74.75	79.94	77.23	78.61

*Not included in the final average scoring.
** Computed based on the number of positive cases.

Figure 7. **Map showing geographical distribution of the practice scores.**
Note: The darker the shade, the lower the practice level.

A t-test (pooled estimate of variance) was employed to determine if there are significant differences in the scores of positive cases for *Enterobius vermicularis* and scores of negative cases. All of the combinations (Table 11) did not yield any significant differences (prob. value > 0.05).

Table 11.

Mean scores of positive and negative cases for E. vermicularis.

Factors	Positive		Negative	
	Avg.	S.D.	Avg.	S.D.
Environmental Factors	61.98	19.06	66.35	19.76
Knowledge	40.76	25.76	52.50	32.47
Attitude	57.50	43.47	61.44	43.26
Practices	59.19	19.39	62.57	18.35

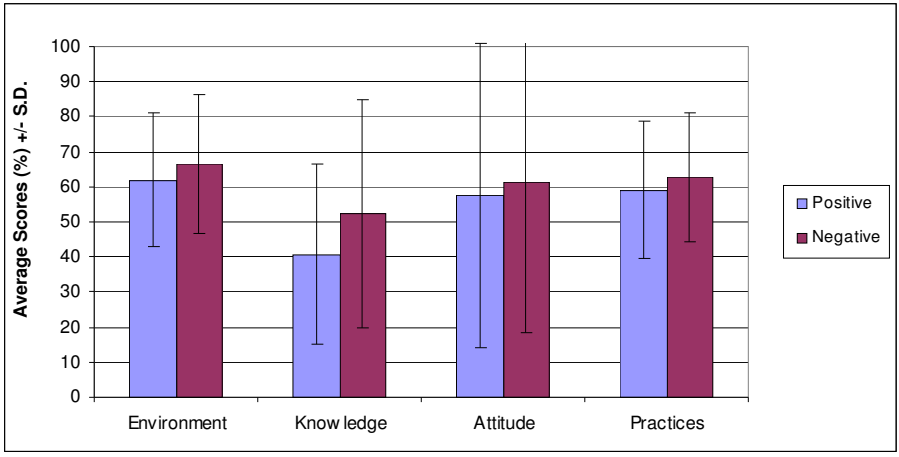

Figure 8. **Mean scores of positive and negative cases for *E. vermicularis*.**

CONCLUSIONS

Findings in this study seem to indicate that knowledge, attitudes, and practices (KAP) do have an inverse relationship with enterobiasis prevalence in that as the KAP scores increase, the prevalence decreases. However, results of the Pearson Product Moment Correlation did not

yield any significant correlation as indicated by the probability value (for each of the correlations made) greater than 0.05 level of significance.

The results of the study also show that the prevalence of 2.50% for enterobiasis is low for the barangays covered by this survey. However, Barangay Tabuc-tubig should be an area of concern considering that the prevalence is 11.11%.

While the statistical analysis did not yield a significant correlation for the factors and prevalence, there are indications that the low prevalence can be attributed to the relatively high environmental and KAP scores. However, there are barangays that had less than 50% KAP scores, especially those with low education and negative attitude towards the disease. These localities should be prioritized in the intervention programs, particularly those aimed at keeping the prevalence level of infection to a minimum, if not complete eradication of the parasite.

The low prevalence could also be attributed to medications made available to the community by non-governmental organizations as well as the local government. With family income level generally falling in 1 to 3000 Php bracket per month (which is below the poverty line), affordability of the medicines becomes an issue.

For logistical reasons, this study was limited to barangays close to the poblacion. Therefore, caution should be exercised in considering the prevalence value as representative of the whole of Dumaguete City as no samples were taken from the other barangays. It is therefore recommended that there is a need to expand the study to all the other barangays to make the prevalence map more comprehensively a tool in future health program planning.

Furthermore, health education programs on parasitism (enterobiasis) should give emphasis on the knowledge of the mode of transmission of the disease and its clinical signs and symptoms; the attitude of the parents towards the disease; and proper practices and good personal hygiene. Such health education programs are necessary even if practice scores showed a higher level of scores since the results in this study seem to indicate that the knowledge, attitudes, and practices (KAP) and environmental factors do have an inverse relationship with the prevalence of enterobiasis in that as the KAP and environmental scores increase, the prevalence decreases. Thus, KAP and environmental scores are crucial in making intervention programs. Lastly, deworming program should be enhanced so that complete eradication of *Enterobius vermicularis* will be realized.

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