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Research Article

Correlation of the Presence of Parasites in Soil and Nutritional Status of Children Aged 3 to 5 at Purok 15 Barangay Tigatto, Buhangin, Davao City

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ABSTRACT

This study aimed to determine the correlation between the presence of parasites in soil and the nutritional status of children aged 3 to 5 at Purok 15 Barangay Tigatto, Buhangin, Davao City. The research design was descriptive and correlational. The researchers gathered the weight and height of children aged 3 to 5 in Purok 15 of Barangay Tigatto, Davao City. Researchers identified the collected soil samples using a systematic sampling technique. Further, the study used Cobb's method to decant and sieve for detecting parasites. The weight and height were calculated to get the BMI. The mean and standard deviation were used to evaluate the nutritional status of the children and the level of parasites. Furthermore, Pearson r was used to determine the relationship between soil-transmitted helminths and the nutritional status of children aged 3 to 5. Results showed that out of 25 samples, 32% of soil samples got positive results with an infectious parasite (*Strongyloides stercoralis*), while 68% of soil samples were negative from the parasite. Participants' weight (kgs) and height (cm) are normal. In line with this, the BMI of both male and female participants is normal. Also, results showed that the level of the parasites is very low. Moreover, the relationship between the soil-transmitted helminths did not significantly influence the nutritional status of children aged 3 to 5. In conclusion, the soil-transmitted helminths do not affect the nutritional status of children aged 3 to 5. Hence, other factors may influence the nutritional status of children aged 3 to 5. Moreover, since the relationship between STH and the nutritional status of children is not significant, the presence or absence of STH in the latrine area does not affect the nutritional status of children under 3 to 5 years old. Thus, immediate action toward STH elimination could prevent the production of more parasites that could lead to a parasite-free environment.

Keywords: Children, Correlation, Davao City, Nutritional status, Soil-transmitted helminths

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Introduction

Proper nutrition is the best component of one's health, reflecting an individual's well-being and economic status in society. Mainly, it is an essential indication of the health condition of the children. However, Soil-Transmitted Helminths is still prevalent as a health problem worldwide, wherein more than 1.5 billion people are infected. It mainly occurred in developing and underdeveloped countries like Africa, Asia, and certain parts of Latin America (Liao et al., 2016). A conducted nationwide survey revealed the prevalence of intestinal parasites among children, wherein 50- 90% were aged 2-14, and out of 22 million, 30% of them were infected with more than one species of Soil-Transmitted Helminths in the Philippines. Poor hygiene, sanitation practices, and inadequate water, particularly in underprivileged areas, cause Intestinal helminthiasis (Tsegaye et al., 2018). These Soil-Transmitted Helminths occur in an overcrowded, dirty, and polluted environment. Moreover, insufficient nutrition and continuous parasitic reinfection significantly contribute to the irregular growth pattern of children (Liao et al., 2016; Fauziah et al., 2022).

Soil-Transmitted Intestinal Helminthiasis is still a global public health concern, causing morbidity in humans, particularly early childhood (Liao et al., 2016; Utzinger & Keiser, 2019; Senthilkumar et al., 2022). Children are more likely to be infected with parasitic infections, and the burden of infection is higher, unlike adults (Utzinger & Keiser, 2019; Mationg et al., 2021; Senthilkumar et al., 2022). Determinants of transmission influenced the acquisition and distribution of Soil-Transmitted Helminths (Tsegaye et al., 2018; Patricia,-). Other study stated that children under 5 years old are the most vulnerable age group in society because of their low immunity status (Mationg et al., 2021). They are prone to Intestinal parasitic infection due to more contact with contaminated soil (Tsegaye et al., 2018).

Parasitic infection can be acquired through direct and indirect transmission, like skin penetration or ingestion that causes stunted growth, physical growth, and mental development (Wattano et al., 2023). Thus, children within the age group require special care and

follow up (Tsegaye et al., 2018). In addition, Soil-Transmitted Helminths attack the intestinal mucosa of the child, leading to poor nutrient absorption affecting children's cognitive development and nutritional deficiencies (Manila-Med, 2021). Decrease or insufficient nutrition intake can decrease the body's immune function, decrease resistance to disease, and increase susceptibility to Soil-Transmitted Helminths that could negatively impact children's nutritional status (Fauziah et al., 2022). Soil-Transmitted Helminths are correlated with short and long-term difficulties among children (Tsegaye et al., 2018). In Davao City, children aged 3 to 5 years old are affected by Soil-Transmitted Helminths. There is limited data regarding Soil-Transmitted Helminths and Nutritional Status in children aged 3 to 5. Compared to children under 5 years old, the correlation of Soil-

Transmitted Helminths and Nutritional Status in previous studies is more focused on school-aged children and young adults population (Patricia, -; Novianty et al., 2018; Utzinger, & Keiser, 2019). Children within the age group are the most vulnerable to infections, especially in early childhood, which is the critical period of development and growth (Tsegaye et al., 2018; Patricia, -). Parasitic reinfection that causes morbidity is common in children, developing impaired growth.

Most studies have focused on the factors and effects of parasitic infection. However, few local studies about Soil-Transmitted Helminths were conducted in some areas of the Philippines, like Davao City. This study aims to know the correlation between the presence of the parasites in soil and the nutritional status of children aged 3 to 5 in Purok 15 Barangay Tigatto, Buhangin, Davao City. This study's findings provide accurate information and come up with solutions that primarily affect the health of children aged three to five years old.

The purpose of this study is to correlate the presence of parasites in soil and the nutritional status of children aged 3 to 5 at Purok 15 Barangay Tigatto, Buhangin, Davao City. This study is significant to the parents, children, local public health unit, and future researchers. The study's general objective is to know the level of soil-transmitted helminths from the soil samples taken from the households found in Purok

15 Barangay Tigatto, Buhangin District, and correlate it with the Nutritional Status of Children aged 3 to 5 years old. More specifically, it sought answers to the following questions:

1. What are the demographic profiles of the respondents in terms of the following:
 - 1.1 Age
 - 1.2 Sex
2. What is the nutritional status the respondents in terms of:
 - 2.1 Weight (in kgs)
 - 2.2 Height (in cm)
 - 2.3 BMI status
3. What is the level of Soil-Transmitted Helminths from the soil samples taken from the households found in Purok 15, Barangay Tigatto, Buhangin, Davao City?
4. Is there significant relationship between Nutritional Status of children 3 to 5 years old and Soil-transmitted Helminths?

In this study, researchers obtained data from Barangay about children aged 3 to 5 who live in Purok 15 Barangay Tigatto, Buhangin District, Davao City. This study focuses on the correlation between the presence of parasites in soil samples and the nutritional status of the participants. Participants above 5 years old and who do not live in that local barangay are not within the scope of this study. The study was conducted at Purok 15 Barangay Tigatto, Buhangin District, Davao City, within 3-5 months of the school year 2021-2022.

Methods

Design and Procedure

This research employed Descriptive and Correlational Design. The descriptive study as a type of research that aims to glimpse the existing situation (Stangor & Walinga, 2020). The correlational study aims to uncover correlations between variables and anticipate future events based on current information (Stangor & Walinga, 2020). This study aimed to correlate and describe the parasitic load of Soil-Transmitted Helminths and the Nutritional Status of children aged 3 to 5 years old in Purok 15, Barangay Tigatto, Buhangin, Davao City.

Obtaining Data and Dissemination of Letters

Enable to accomplish the study's objectives, the proper procedures were performed. The permission to conduct study was granted by the Barangay Captain of Tigatto and Purok Leader/s, researchers asked data about population in Purok 15 Tigatto from the Barangay Tigatto, Buhangin, Davao City. At the same time, the Nutritional Status of children aged 3 to 5 was based on the height and weight collected from the Main Tigatto Health Center of the said Barangay. Researchers used systematic sampling technique to determine 25 households to participate in soil sample collection and then calculate their BMI based on the data. Then, researchers asked for guidance from Buhangin Health Workers to identify the participants' houses before and during the collection sample. All selected households had at least one child aged 3 to 5. On the day of collecting soil samples, the researchers, with the help of Buhangin Health Workers, disseminated informed consent to the parents/ legal guardians of the participants.

Soil Sample Collection

Researchers obtained informed consent from parents/ legal guardians of the participants and their oral consent on the day of collecting soil samples. The researchers wear appropriate PPE during the collection of soil samples. Also, the researchers utilized systematic sampling to select the nth household from a list of all households with children aged 3 to 5 (Raina, 2024). Researchers determined that 25 soil samples were collected only in the dry season in March. It starts from 7:00 AM to 11:00 AM, in which the humidity is favorable with soil moisture enabling the environment to sustain ova and larvae of parasites (Goodhead & Ayenku, 2022). Hence, the researchers chose this research design to correlate the Soil-Transmitted Helminths. As the letter to conduct the Dean permitted to study, the researchers asked permission in the Office Barangay Tigatto to obtain data about the population profile, height of children, and the collection of soil samples. Household vicinities, latrine areas, as well as the playground of children may influence the infection rate of parasites, and STH can be de-

tected from soil close to the latrine with approximately 100 grams of soil at a depth of 2-3cm³⁸. Researchers observed the soil's wetness, trash, and feces at the sampling location. Each sample contained 100g of soil from a depth of 2-3 cm using a small metal spade sanitized through ethanol and a paper towel in each sample from an area that was not directly exposed to sunlight. Samples were taken around the house entrance, latrine entrance, or children most likely play because these areas were most likely contaminated by STH (Husseini et al, 2022; Genet et al., 2021; Delaluna et al., 2020). Researchers recorded the area. Collected soil samples were stored in sterile polythene bags assigned a labeled label (time, date, and exact site location), then kept in a cooler box and immediately taken to the laboratory on the same day.

Laboratory Assay

In this study, researchers examine the soil for the presence and concentration of STH. Researchers used the decanting and sieving on Cobb's method to extract STH by Bezooijen (Isip, 2022; Odikamnoru, 2013; Bezooijen, 2022). The soil samples are free from debris and are air-dried briefly and then stirred in a water-filled beaker, detaching the nematodes from the soil particles—the suspension pass through a decreasing measurement of sieves. After the sieving process, the supernatant was transferred to a glass slide using a disposable pipet, examined under the microscope, and STH was identified according to its characteristics.

Materials and Instruments

The researchers asked the Barangay Hall of Barangay Tigatto for updated data on their Barangay Profile. This Barangay profile helps the researchers to determine the total population of children aged 3 to 5 in the Purok 15. For the data collection of the children's BMI, researchers asked the Health Center for updated data about the height and weight of children aged 3 to 5 in Purok 15 to calculate their BMI. Researchers collected 25 soil samples from the area sampling site, which the researchers determined using a systematic sampling technique. The sample size was determined by

systematic sampling technique, $N/n = SI$ (sampling interval) (Raina, 2024), where N is the number of households in Purok 15, Tigatto, and n is the sample size (Mostafa& Ahmad, 2018). Next, the positive soil samples are calculated together with the BMI of participants using statistical tools.

Frequency. The purpose of frequency is to determine the demographic profile of children.

Mean. The purpose of the mean is to determine the level of BMI status of the children and soil-transmitted helminths.

Research Locale

The study will be conducted at Purok 15 Sto. Nino Hillside of Barangay Tigatto, Buhangin Davao City, Philippines, and the sample collection will be done in the same area. It is situated at approximately 7.1275, 125.595, on the island of Mindanao. At these coordinates, the elevation is measured to be 28.7 meters or 94.2 feet above the mean sea level (Bezooijen, 2006). The Purok 15 of Barangay Tigatto is estimated at more than 10,000 square meters and has several 543 households, with a total population of 1,673 within the Purok.

Inclusion and Exclusion Criteria

The Purok 15 Sto. Niño Hillside of Barangay Tigatto, Buhangin, Davao City is estimated to measure 10,000 square meters with a total population of 1,673 and 543 of a total number of households. Based on the record of Purok 15 Barangay Tigatto, 50 households have 3 to 5 years old as of February 2022. In this study, researchers will only utilize updated data records from the Health Center of the Barangay Tigatto, Buhangin, Davao City, as the Nutritional status of children aged 3 to 5. The data obtained from the Barangay Health center are the height and weight of children aged 3 to 5. Researchers determined that 25 households would be included in this study using the systematic sampling technique. The total sample population was based on the number of children aged 3 to 5; children under the age of 3 or more than 5 would be excluded. The researchers also collect soil within the area of Purok 15 Sto. Niño Hillside to identify the presence of parasites. Therefore, there was no fecalysis conducted by the participants. These would only determine

the relationship between Nutritional Status and Soil-Transmitted Helminths from the data and samples gathered by the researchers. Aside from obtaining data and sample collection, there were no other activities conducted. In addition, qualified respondent/s or the parents/guardians of the qualified respondents could withdraw or refuse to partake in the research study anytime. When withdrawing from the study, the parents/guardians of the research respondent/s should notify the researchers. The responders' parents/guardians may explain but were not obligated. The researchers ensure their safety withdrawal participation if

they wish to discontinue their involvement in the research study. Furthermore, only eligible research respondents for the study were regarded as withdrawals. Withdrawals would be a briefing by the researcher and, with the help of Buhangin Health Workers (BNS), explaining that the information retrieved from them would be disposed of or discarded to protect their privacy. Researchers would ensure their safety by keeping the information remains confidential. Hence, the researchers entertain any concern or clarification through provided contact.

Result and Discussion



Figure 1. *Strongyloides stercoralis*

Researchers collected 25 soil samples within the area of each household wherein children are at risk of contracting soil-transmitted helminths, specifically at the latrine entrance or where children usually visit to play. Among the parasites recovered from the 25 soil sam-

ples, Figure 3 shows the parasite identified using Cobb's method. Out of 25 samples, 8 (32%) were detected from the *Strongyloides stercoralis* validated by Registered Medical Technologists. The study's findings show that there are 16 rhabditiform of *Strongyloides stercoralis*.

Table 1. Identified Participants Ages 3 to 5 positive on the soil sample

	Male	Female	TOTAL
Age (3 years old)	2	0	2
Age (4 years old)	4	2	6
TOTAL	6	2	8

Table 1 shows the frequency of socio-demographic profile of participants based on the positive results on the soil sample. In this study, there were 25 research participants aged 3 to 5 years old, and the researchers collected soil

samples—only two males aged 3 were positive for the STH. A total of 6 participants are aged 4, comprising four males and two females. Hence, eight positive soil samples were identified for STH.

Table 2. The Level of Nutritional Status of Children Ages 3-5 years old

	N	Mean	SD	Qualitative Description
Weight (in kg)	8	14.91	2.266	Normal
Height (in cm)	8	100.13	5.668	Normal
BMI (for females)	2	15.57	0.265	Normal
BMI (for males)	6	14.52	0.833	Normal

Table 2 shows the mean and standard deviation of weight and height for Nutritional Status in females and males aged 3 to 5. The weight (kg) of positive participants from the soil sample has a total mean of 14.91 and a standard deviation of 2.266, indicating a normal weight. At the same time, the height (cm) was calculated to get the mean of 100.13 and a standard

deviation of 5.668, which indicates a normal height. As for the BMI, researchers specifically indicated the BMI of females and BMI of males. In line with this, the BMI of females in the mean is 15.57 and in standard deviation is 0.265, which indicates normal, while the BMI of males in the mean is 14.52 and in standard deviation is 0.823, which indicates normal.

Table 3. The Level of Soil-transmitted Helminths

	N	Mean	SD	Qualitative Description
Level of Soil-Transmitted Helminths	8	2	2.449	Very low

Table 3 shows the data result of the level of soil-transmitted helminths from the soil samples taken from the households. Based on the data, 8 is the highest number detected, whereas 1 is the least detected parasite per household.

In line with this, using a statistical tool of mean and standard deviation, the result for the mean is 2 and a standard deviation of 2.449. The researchers used this range of means which the statistician approved.

<i>Mean Range Level Interpretation</i>	
<i>RANGE OF MEANS</i>	<i>DESCRIPTION</i>
1.00-2.74	Very Low
2.75-4.49	Low
4.50-6.24	Moderate
6.25-7.99	High
8 and above	Very High

In line with this, this finding indicates that with a mean of 2, the level of parasites is very low.

Table 4. The Relationship Soil Transmitted Helminths between and Nutritional Status of Children

	N	r-value	p-value	Qualitative Description
Relationship between Nutritional Status of Children and Soil-Transmitted Helminths	8	-0.485	0.222	Not significant

Table 4 shows the relationship between the nutritional status of children and soil-transmitted helminths by using Pearson r . The 8 positive samples from the households have an R -value of -0.485, indicating a very low relationship. On the other hand, the p -value is 0.222, greater than the average p -value of 0.05. Thus, the calculated data showcases that there is no significant relationship between the soil-transmitted helminths and nutritional status of children, whether there are many or few parasites detected in soil within the household area.

Out of 25 soil samples collected from households, only eight got positive from soil-transmitted helminths. *Strongyloides stercoralis* were the only soil-transmitted helminths present in the samples. Several studies recorded the presence of *Strongyloides stercoralis* at much higher numbers (Tchakounté et al., -; Oyebamiji et al., 2018; Joël et al., 2021; Nath et al., 2021). This means the identified parasite was known for infecting humans since the parasite can be acquired through direct contact with contaminated soil. Especially people usually wear thong-type slippers, which provide poor protection against skin penetrating parasites like *Strongyloides stercoralis* (Paller & Babia-Abion, 2019).

The level of STH present in the soil is much lower compared to other studies (Maganira et al., 2020; Paller & Abion, 2018; Bacelar et al., 2023; Imalele et al. 2023; Yahia et al., 2023; Gurmassa et al., 2023). Hence, there is a very low chance/risk of children being exposed to STH (Oyebamiji et al., 2018; Hassan & Oyebamiji, 2018). This might be due to differences in environmental factors like climate, topography, surface temperature, altitude, soil type, and rainfall, which significantly impact STH distribution (Oyebamiji et al., 2018; Hassan & Oyebamiji, 2018; Hassan & Oyebamiji, 2018; Tadege et al., 2022). Even though the results show a very low STH level, children are still susceptible to contracting STH through contact with contaminated soil (Tsegaye et al., 2028; Patricia, -), due to several habits like walking barefoot, poor hand washing practice, and sucking/ biting nails (Zemene et al., 2018; Elmonir et al., 2021; WHO, 2023; Anwar et al., 2018).

The data presented in Table 4 shows no significant relationship between STH and Nutritional Status in children aged 3 to 5. It implies that any changes in nutritional status of children 3 to 5 years old do not mean the presence of STH parasites or infection. Thus, other factors may influence the nutritional status of children like low family economic status, food security, household size, nutrition-related disease/ illness/ deficiency, educational level status, nutrient knowledge, and lifestyle^{53, 54, 55}.

Furthermore, the data presented in Table 4 shows no significant relationship between STH and Nutritional Status in children aged 3 to 5. It implies that any changes in nutritional status of children 3 to 5 years old do not mean the presence of STH parasites or infection. This may be due to deworming activity program provided by their local barangay. The deworming program is conducted twice a year for children, which is appended in this paper. It is possible that children were not infected with parasites because of the preventive measures that eliminated the manifestation of parasitosis. Thus, other factors may influence the nutritional status of children like low family economic status, food security, household size, nutrition-related disease/ illness/ deficiency, educational level status, nutrient knowledge, and lifestyle (Anwar et al., 2018; Palacios et al., 2022; Mohamed, 2019).

Conclusion

The study aims to analyze the correlation between the presence of the parasites in soil and the nutritional status of children aged 3 to 5. Eight households identified positive for STH, specifically *Strongyloides stercoralis*, based on the soil samples. These eight research participants comprised two males aged 3, four males, and two females ages 4. Meanwhile, the levels of nutritional status of the participants are normal in females and males aged 3 to 5. The findings in this study revealed a very low level of soil-transmitted helminths in Purok 15 Barangay Tigatto, Davao City. Furthermore, from the calculated data, the study concludes that the soil-transmitted helminth has no significant relationship with nutritional status in children aged 3 to 5. This implies that the presence of STH in the soil does not affect the nutritional

status of the children. In line with this, the deworming activity program conducted in the barangay helps the children prevent parasitic infections. Therefore, other factors such as low family economic status, food security, household size, nutrition-related disease/ illness, health habits, educational level status, nutrient knowledge, and lifestyle may influence the nutritional status of children aged 3 to 5^{53, 54, 55}. Moreover, since the level of relationship between STH and the nutritional status of children is not significant, the presence or absence of STH in the latrine area does not affect the nutritional status of children under 3 to 5 years old. In line with this, considering the very low risk of contracting STH, a necessary health checkup for children is required to check if they have a parasitic infection and to prescribe anti-helminthic medicine for children infected with STH. In addition, preventive measures improve primary environmental and sanitary conditions via community-oriented health education programs to eliminate parasites. Thus, immediate action toward STH elimination could prevent the production of more parasites that could lead to a parasite-free environment.

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