

ORIGINAL RESEARCH

# Knowledge and Practices on Deworming in Mothers of Children Aged 2 to 5 Years



Moraima Del Toro Rubio<sup>1</sup>, Keidis Sulay Ruidiaz Gómez<sup>2</sup>, Shirley Paola Fernandez Aragon<sup>3</sup>, Anderson Díaz Perez<sup>4</sup>

<sup>1</sup>Faculty of Nursing, Rafael Nuñez University Corporation, Cartagena, Colombia

<sup>2</sup>Faculty of Nursing, University of Sinú – Elías Bechara Zainúm, Cartagena, Colombia

<sup>3</sup>Faculty of Nursing, University of Cartagena, Cartagena, Colombia

<sup>4</sup>Department of Social and Human Sciences, Simón Bolívar University, Barranquilla, Colombia

## Article Info

### Article History:

Received: 18 September 2023

Revised: 15 April 2025

Accepted: 30 April 2025

Online: 30 April 2025

### Keywords:

Child health; deworming; health practices; maternal knowledge; parasitic infections

### Corresponding Author:

Keidis Sulay Ruidiaz Gómez  
Faculty of Nursing, University of Sinú – Elías Bechara Zainúm, Cartagena, Colombia  
Email: [keydiruidiazg@gmail.com](mailto:keydiruidiazg@gmail.com)

## Abstract

**Background:** Deworming is a key public health intervention, especially in contexts where intestinal parasitic infections are prevalent and affect vulnerable populations lacking basic sanitation services. Despite the global burden of parasitic infections in early childhood, local data on knowledge and practices related to parasitosis and deworming in Colombia remain limited.

**Purpose:** This study aimed to assess mothers' knowledge and practices regarding deworming in children aged 2 to 5 years.

**Methods:** A descriptive cross-sectional study was conducted among 324 mothers selected using convenience sampling. The KP-1 questionnaire on knowledge and practices related to deworming was used to collect data. Chi-square and Fisher's exact tests were used to establish associations between knowledge, practices, and demographic characteristics, with a significance level of  $p < 0.05$ .

**Results:** Most mothers exhibited regular (39.8%) or poor (37.3%) knowledge, while 62.3% reported good deworming practices. Statistically significant associations were found between maternal knowledge and education level ( $p = 0.0110$ ), income ( $p = 0.0010$ ), housing type ( $p = 0.0007$ ), and social security affiliation ( $p = 0.0013$ ). Deworming practices were also significantly associated with education level ( $p = 0.0114$ ), income ( $p = 0.0012$ ), housing type ( $p = 0.0009$ ), and social security ( $p = 0.0011$ ). No significant associations were observed between knowledge levels and deworming practice with age, marital status, occupation, religion, child's age, or gender ( $p > 0.05$ ).

**Conclusion:** Although mothers demonstrated good deworming practices, their knowledge levels were generally regular or poor. Education level, income, housing conditions, and social security coverage significantly influenced both knowledge and practices. These findings highlight the need for community nursing interventions aimed at improving maternal awareness and education on deworming practices.

**How to cite:** Del Toro Rubio, M., Ruidiaz Gómez, K. S., Fernandez Aragon, S. P., & Díaz Perez, A. (2025). Knowledge and practices on deworming in mothers of children aged 2 to 5 years. *Nurse Media Journal of Nursing*, 15(1), 110-122. <https://doi.org/10.14710/nmjn.v15i1.58253>

Copyright © 2025 by the Authors, Published by Department of Nursing, Faculty of Medicine, Universitas Diponegoro. This is an open-access article under the CC BY-SA License (<http://creativecommons.org/licenses/by-sa/4.0/>).

## 1. Introduction

Childhood, especially early infancy, is a critical period in human development, since physical, biological, psychological, and social domains influence short- and long-term growth outcomes. Hence, protecting and caring for infants becomes a priority that promotes healthy environments and stimulates growth, thus reducing factors associated with the onset of prevalent diseases (Keats et al., 2021). In this sense, when early childhood develops in adverse environments, health is often negatively affected. Vulnerable socioeconomic conditions, such as insufficient access to clean water, lack of environmental sanitation, fecal soil contamination, inadequate food, and the presence of domestic animals, are directly related to the likelihood of parasitic infections (Villamizar et al., 2019).

A lack of personal hygiene practices in children or their caregivers, such as not washing hands or improperly preparing food, increases the risk of contracting infections. Parasitosis is a common condition in both developing countries and poor areas of developed countries (Peters et al., 2021). Reports show that soil-transmitted helminths, intestinal schistosomiasis, *Hymenolepis nana*,

*Entamoeba histolytica*, and *Giardia lamblia* are among the organisms responsible for these illnesses (Mohammed et al., 2022). According to the World Health Organization (WHO), soil-transmitted helminth infections are among the most frequent parasitic infections worldwide (WHO, 2023). It is estimated that nearly 267 million preschool-aged children (1-4 years old) and over 568 million school-aged children live in areas with intensive transmission of these parasites, thus increasing the need for treatment, preventive measures, and educational interventions (Balew & Kibret, 2023).

Research indicates that soil-transmitted helminths are the second leading cause of mortality in children under 6 years old in Africa (Tiruneh et al., 2021). Additionally, it is estimated that 46 million children in Latin America and the Caribbean are at risk of infection. This situation is critical when considering that 2.4 billion people worldwide still lack basic sanitation facilities, such as toilets and latrines, and that over 660 million people in developing countries continue to drink water from untreated sources, such as surface water (Tiruneh et al., 2021). The WHO has therefore recommended periodic deworming of preschool-aged children in high-prevalence areas (Gebretsadik et al., 2018). Community awareness and participation are considered key tools for enhancing parasitic disease prevention, emphasizing the need for caregivers, especially primary caregivers, to be informed about parasitic diseases and deworming, which are necessary for appropriate practices (Gebretsadik et al., 2018).

Internationally, research has demonstrated varied information on knowledge and practices regarding parasitosis. For example, in India, it has been observed that 47% of caregivers have inadequate knowledge about these issues. A significant correlation ( $p < 0.05$ ) was found between knowledge and deworming practices, as well as variables such as gender, religion, educational level, marital status, and residence (Rwamwejo et al., 2023). In the Peruvian context, it was shown that the level of knowledge about intestinal parasitic diseases is low among mothers (26.9%) (Kasimayan et al., 2021). In another study, knowledge was found to be moderate (67%), while practices tended to be good (53%) (Bordignon et al., 2022). In another locality, good knowledge was observed regarding preventive measures (60%), although practices were mostly inadequate (60%) (Alo et al., 2021). In Colombia, studies have reported a prevalence of 43.3% of parasitism, with the most frequent parasite species being *Blastocystis spp* (24.6%), *Entamoeba coli* (13.4%) and *Giardia intestinalis* (11.8%). In this context, practices that increased the risk of infection included living with domestic animals (46%) and livestock (8.5%), as well as the presence of pests inside homes (63.1%), especially cockroaches (52.4%), flies (38.5%), and rodents (21.9%). Additionally, boiling water for consumption was infrequently practiced (37.5%) (Muñoz et al., 2017). In other areas of the country, a parasitosis prevalence of 74.2% was reported, with recurrent polyparasitism (71.2%) compared to infestations with one (4.6%) or two types of these organisms (24.2%). Risk practices included drinking spring water (16.9%), walking barefoot (53.9%), contact with soil (56.2%) and animals (82.0%), and the disposal of wastewater outdoors (76.4%) (Rodríguez-Sáenz et al., 2020).

Despite the global burden of parasitic infections in early childhood, local data on knowledge and practices related to parasitosis and deworming in Colombia remain limited. Few studies have explored this topic in depth. One notable contribution reported a 70.5% prevalence of parasites among children aged 2 to 5 years in community homes of the ICBF in the Industrial and Bay Area of Cartagena. This high prevalence was linked to poor hygiene practices, inadequate food preparation, and suboptimal caregiving by community mothers (Pedraza et al., 2019). However, emerging evidence suggests that parasitic infections in children are not solely the result of hygiene-related issues. Various caregiver demographic characteristics, such as educational level (34.3%), income (47.8%), and sources of health information (39%), also play a critical role (Croke & Atun, 2019). This is especially concerning given that, although parasitic infections are rarely fatal, moderate to severe cases are associated with serious morbidities, including growth delays, impaired nutrient absorption, anemia, school absenteeism, and diminished cognitive performance (Croke & Atun, 2019). These findings point to a clear gap in the literature that, while infection prevalence and general risk factors have been documented, less is known about caregivers' specific knowledge and practices related to deworming. Therefore, this study aimed to assess mothers' knowledge and practices regarding deworming in children aged 2 to 5 years and to examine their relationship with maternal demographic characteristics. This study is expected to provide evidence that informs targeted educational interventions to improve maternal

knowledge and address barriers to consistent deworming, thus reducing morbidities associated with parasitic infections and supporting better outcomes in children's growth and development.

## **2. Methods**

### *2.1. Research design*

This study employed a descriptive, cross-sectional design to observe and analyze the knowledge and practices of mothers in Cartagena regarding deworming at a specific point in time, namely, during the year 2022.

### *2.2. Setting and samples*

The population consisted of 69,889 mothers of children aged 2 to 5 years residing in the city of Cartagena, according to population data from the most recent census conducted by the National Administrative Department of Statistics (DANE, 2023). The final sample included 324 mothers, selected through convenience sampling, with post hoc statistical adjustment made based on the population's demographic characteristics, using census data and findings from previous studies for comparison. The sample size was estimated using a power analysis performed with G\*Power software (version 3.1) assuming a significance level of 5% ( $\alpha=0.05$ ), a statistical power of 80% ( $1-\beta=0.80$ ), and a medium effect size ( $f=0.25$ ) (Faul et al., 2007). This calculation suggested a minimum required sample size of approximately 300 participants to ensure statistical validity in comparative analyses. The selected sample size was further supported by previous research conducted in similar maternal populations in urban Latin American contexts, providing a robust methodological basis for data collection (Pedraza et al., 2019). Inclusion criteria were as follows: (1) being a mother aged 18 years or older; (2) having at least one child aged 2 to 5 years; (3) residing in the city of Cartagena; and (4) providing written informed consent. Mothers with physical or psychological conditions that could hinder participation in the study were excluded.

### *2.3. Measurement and data collection*

Data on knowledge and practices related to deworming among mothers of children aged 2 to 5 years were collected using the knowledge and practices version 1 (KP-1) questionnaire developed by the researchers. The questionnaire consisted of three sections; the first section addressed sociodemographic aspects, while the second and third sections covered knowledge and practice dimensions. The sociodemographic data included the mother's age, marital status, education level, occupation, income, religion, type of housing, child's age and gender, and social security.

The second section addressed the knowledge dimension. Knowledge about deworming is defined as the set of knowledge, attitudes, and practices that enable the identification, prevention, and control of intestinal parasites, emphasizing the importance of health education in modifying behaviors and reducing disease incidence (Vera Duarte et al., 2025). In this study, the variable is used to measure the degree of information that mothers have regarding deworming their children. The researchers developed the KP-1 questionnaire based on the theoretical constructs indicated in previous studies (Flores & Seminario, 2020; Peña Sandoval, 2019; Romani & Quispe, 2020). This questionnaire includes six items related to aspects that mothers should know about their children. The level of knowledge was determined based on the number of correct items as follows: (1) good knowledge: 5 to 6 correct items; (2) fair knowledge: 3 to 4 correct items; and (3) poor knowledge: 0 to 2 correct items. The questionnaire was validated through a pilot test that included 45% of the study sample, according to participant availability and access. The characteristic diversity within the population subgroups (age, gender, educational level) was taken into account. Construct validity was assessed through exploratory factor analysis (EFA) using the R test, which showed a significant correlation between each item ( $r=0.62$ ,  $p<0.015$ ). To evaluate the data adequacy, the Kaiser-Meyer-Olkin (KMO) test was used, with values ranging from 0.80 to 0.84. Furthermore, the Cronbach's alpha for the KP-1 knowledge dimension was 0.65.

The third section of the questionnaire addressed the practice dimension. Practices are understood as activities or actions that are carried out consistently and with commitment, becoming habitual behaviors rather than isolated events or circumstances. The parasite control practices assessed in the KP-1 questionnaire consisted of 20 items related to preventive actions, based on the Integrated Management of Childhood Illness (IMCI) strategy (World Health Organization & UNICEF, 2016). Responses were categorized according to the number of correct items as follows: Good practices: 14–20 correct items; Regular practices: 7–13 correct items; Poor

practices: 0–6 correct items. To assess the internal consistency and reliability of the practice dimension, Cronbach's alpha was calculated, yielding a value of 0.738.

The study was conducted between March and October 2022. The surveys were administered by the researchers in the mothers' homes, following strict biosecurity measures due to the COVID-19 epidemiological emergency.

#### 2.4. Data analysis

The data were analyzed using descriptive statistics to present the distribution of variables, including frequencies, scores, percentages, means, and standard deviations. To establish the correlation between sociodemographic characteristics, knowledge, and deworming practices, the Chi-square and Fisher's exact tests were used, with a p-value <0.05 considered statistically significant. The strength of the correlation was assessed by calculating the coefficient (r), and the adequacy of the data was evaluated using the Kaiser-Meyer-Olkin (KMO) test. To compare medians and account for asymmetric distributions or outliers, the Kruskal-Wallis test was employed. Statistical analysis was performed using SPSS software version 24.0 (IBM Corporation, Armonk, NY, USA).

#### 2.5. Ethical considerations

The ethical foundation of the project is based on the principles of respect, autonomy, and beneficence as stated in Resolution 8430 of 1993 (Ministry of Health, Republic of Colombia, 2021), which outlines the academic, technical, and administrative regulations for health research in Colombia. During the implementation of the project, informed consent was obtained in a manner that avoided coercion and encouraged voluntary participation and signing. Confidentiality was maintained by ensuring the anonymity of the participants. The principle of social value was upheld by presenting the final results of the study to each participant during a collective session organized by the neighborhood community action board. The study is classified as research with minimal risk since no intentional intervention or modification of the biological, physiological, psychological, or social variables of the individuals who participated in the study was carried out. The study proposal was approved by the ethics committee of the Rafael Núñez University Corporation (CURN-001-2022).

### 3. Results

#### 3.1. Sociodemographic characteristics of participants

As shown in Table 1, 324 mothers of young children participated in the study. Their average age was 28.39 years (SD=7.64), with 85.6% living in a consensual union, 58.6% dedicated to household duties, and 81.5% having an income below the minimum monthly wage. Regarding their children, the average age was 3.23 years (SD=1.13), with similar participation rates between boys (50.6%) and girls (49.4%). The data showed that the mother's age varied according to the age quartile of the child in her care [Kruskal-Wallis test statistic:  $\chi^2(2) = 24.936, p < 0.001$ ].

#### 3.2. Level of knowledge and deworming practices in mothers

This study found that the level of knowledge among mothers of children aged 2 to 5 was predominantly regular (39.8%) and poor (37.3%), with a smaller proportion demonstrating good knowledge about deworming (22.8%). On the other hand, 62.3% of the mothers reported good deworming practices with their children, in contrast to their level of knowledge; regular and poor practices were reported less frequently (29.0% and 8.6%, respectively) (Table 2).

Furthermore, the scores from the KP-1 instrument for the knowledge dimension indicated that mothers correctly understood that "*Taking a medication called an antiparasitic to eliminate parasites from the intestine*" is an appropriate action (82.7%). However, related to the item "*An appropriate and safe way to deworm my child is to go to the pharmacy and buy any antiparasitic*," 51.2% of the sample responded incorrectly (Table 3).

The analysis of correct and incorrect components within deworming practices showed that the actions most correctly performed by mothers included: *Deworming the child every 6 months* (84.3%), *Washing hands with soap and water after using the toilet* (83.3%), *Bathing the child daily with soap and water* (81.2%), *Washing hands with soap and water before and after changing the baby's diapers* (81.2%), *Keeping the child's face and nose clean* (78.4%), and *Cutting the child's nails* (77.2%) (Table 4).

**Table 1.** Sociodemographic characteristics of participants (n=324)

Variables	Mean (SD)	Frequency (f)	Percentage (%)
Mother's age (years)	28.39 (7.64) (95%CI: 27.55-29.22)		
Marital status			
Common-law marriage		180	55.6
Married		71	21.9
Single		67	20.7
Separated or divorced		4	1.2
Widowed		2	0.6
Education level			
No education		16	4.9
Primary school		67	20.7
High school		134	41.4
Technical or technological education		77	23.8
Undergraduate degree		27	8.3
Graduate degree		3	0.9
Occupation			
Homemaker		190	58.6
Employed		68	21.0
Self-employed		33	10.2
Student		21	6.5
Unemployed		12	3.7
Family income (based on SMLV)			
Less than 1 SMLV		264	81.5
Between 1 and 2 SMLV		52	16.0
Between 3 and 4 SMLV		7	2.2
More than 4 SMLV		1	0.3
Religion			
Catholic		160	49.4
Christian		108	33.3
None		37	11.4
Jehovah's Witness		17	5.2
Other		2	0.6
Type of housing			
House		163	50.3
Apartment		72	22.2
Other types of housing		46	14.2
Room		43	13.3
Child's age (years)	3.23 (1.13)		
Child's gender			
Boy		164	50.6
Girl		160	49.4
Social security affiliation			
Subsidized		272	84.0
Contributory		43	13.3
Special regime		5	1.5
Uninsured		4	1.2

Note. \*Family income was categorized based on the SMLV (Legal Minimum Monthly Wage)

**Table 2.** Percentage distribution of knowledge level and practices among mothers (n=324)

Variable	Poor	Regular	Good
	f (%)	f (%)	f (%)
Knowledge	121(37.3)	129(39.8)	74(22.8)
Practice	28(8.6)	94(29)	202(62.3)

In contrast, some practices were predominantly performed incorrectly, such as the habit of asking relatives, friends, or neighbors what is best for treating parasites (96.3%), and following recommendations from these informal sources to deworm the child (75.3%) (Table 4). In both

cases, these practices are inappropriate, as advice and recommendations should come from doctors, pediatricians, or nurses—qualified professionals authorized to prescribe medications in correct dosages for the pediatric population (Table 4).

**Table 3.** Distribution of correct and incorrect response to the knowledge questionnaire (n=324)

Items	Incorrect	Correct
	f (%)	f (%)
a. Deworming consists of ingesting a medication called antiparasitic, in order to exterminate parasites within the intestine.	56(17.3)	268(82.7)
b. It does not matter which de-wormer is given to the child, even without a medical prescription; the important thing is to get rid of the parasites.	155(47.8)	169(52.2)
c. Only patients with a positive coprological exam should be dewormed.	163(50.3)	161(49.7)
d. An appropriate and safe way to deworm my child is to go to the pharmacy and buy any antiparasitic.	166(51.2)	158(48.8)
e. It does not matter which antiparasitic is given to my child, as long as it eliminates any parasites they may have.	166(51.2)	158(48.8)
f. If I suspect that the child has parasites, I can give them some medication to expel them, regardless of whether the doctor has prescribed it or not.	169(52.2)	155(47.8)

**Table 4.** Distribution of correct and incorrect response to the practice questionnaire (n=324)

Items	Incorrect	Correct
	f (%)	f (%)
Deworm the child every 6 months	51(15.7)	273(84.3)
Wash hands with soap and water after using the toilet	54(16.7)	270(83.3)
Bathe the child daily with soap and water	61(18.8)	263(81.2)
Wash hands with soap and water before and after changing the baby's diaper	61(18.8)	263(81.2)
Keep the child's face and nose clean	70(21.6)	254(78.4)
Trim the child's nails	74(22.8)	250(77.2)
Wash hands with soap and water before preparing food	81(25.0)	243(75.0)
Wash hands with soap and water before eating and feeding the child	84(25.9)	240(74.1)
Dispose of garbage in covered containers or plastic bags	85(26.2)	239(73.8)
Safely dispose of feces by putting them in the toilet or a covered pit	89(27.5)	235(72.5)
Clean the house with disinfectant solution	93(28.7)	231(71.3)
Buy only the deworming medication prescribed by the doctor for the child	99(30.6)	225(69.4)
Keep the pets clean, well-fed, and dewormed	100(30.9)	224(69.1)
Avoid drying hands with dirty towels	106(32.7)	218(67.3)
Take the child to the doctor every time the parent suspects the baby has parasites	112(34.6)	212(65.4)
Clean the toilet or latrine daily	134(41.4)	190(58.6)
Give the child boiled or filtered water	165(50.9)	159(49.1)
Buy deworming medication prescribed by doctors for friends' or relatives' children	231(71.3)	93(28.7)
Following the recommendations given by family members, friends, or neighbors to deworm the child	244(75.3)	80(24.7)
Asking family members, friends, or neighbors what is best for the parasites	312(96.3)	12(3.7)

### 3.3. Association between sociodemographic characteristics and knowledge level

To examine the association between sociodemographic characteristics and knowledge level, Fisher's exact test was applied to the variables of marital status, religion, and income due to low frequencies in certain subcategories, which violated Chi-square assumptions. The remaining variables met the assumptions for the Chi-square test and were analyzed accordingly. As shown in Table 5, a statistically significant association was observed between the level of knowledge about deworming and the variables of education level ( $p=0.0110$ ), income ( $p=0.0010$ ), housing type ( $p=0.0007$ ), and social security affiliation ( $p=0.0013$ ). These findings suggest that mothers

with higher educational attainment, better economic conditions, adequate housing, and access to formal health insurance are more likely to have greater knowledge about deworming. This finding highlights the importance of structural and institutional determinants in enabling access to preventive health information.

In contrast, no significant association was identified between knowledge level and other variables such as age ( $p=0.7930$ ), marital status ( $p=0.1290$ ), occupation ( $p=0.2560$ ), religion ( $p=0.8870$ ), child's age ( $p=0.7290$ ), or child's gender ( $p=0.9620$ ). While these may have contextual relevance, in this sample, they did not act as determining factors in the level of knowledge that mothers have regarding deworming practices (Table 5).

**Table 5.** Correlation between demographic characteristics and knowledge levels (n=324)

Variables	Knowledge Level			p-value <sup>a</sup>
	Poor f (%)	Regular f (%)	Good f (%)	
Age	45 (37.2)	56 (46.3)	20 (16.5)	0.7930
Marital status	55 (36.4)	65 (43.0)	31 (20.5)	0.1290 <sup>b</sup>
Education level	61 (50.4)	38 (31.4)	22 (18.2)	0.0110
Occupation	59 (40.1)	63 (42.9)	25 (17.0)	0.2560
Income	66 (54.1)	36 (29.5)	20 (16.4)	0.0010 <sup>b</sup>
Religion	47 (36.7)	58 (45.3)	23 (18.0)	0.8870 <sup>b</sup>
Housing type	72 (59.5)	33 (27.3)	16 (13.2)	0.0007
Child's age	43 (35.2)	58 (47.5)	21 (17.2)	0.7290
Child's gender	60 (37.3)	66 (41.0)	35 (21.7)	0.9620
Social security	70 (53.8)	39 (30.0)	21 (16.2)	0.0013

Note: <sup>a</sup>Chi-square test applied unless otherwise indicated; <sup>b</sup>Fisher's exact test applied.

P-values are reported to four decimal places to capture subtle differences;  $p<0.05$  is considered statistically significant.

### 3.4. Association between sociodemographic characteristics and deworming practices

Table 6 presents the association between sociodemographic characteristics and deworming practices. Fisher's exact test was applied to the variables of marital status, religion, and income due to low frequencies in certain subcategories, which violated Chi-square assumptions. The remaining variables met the assumptions for the Chi-square test and were analyzed accordingly. The results revealed statistically significant associations between deworming practices and the following variables: education level ( $p=0.0114$ ), family income ( $p=0.0012$ ), type of housing ( $p=0.0009$ ), and social security ( $p=0.0011$ ). Mothers with higher education, better income, adequate housing, and formal health insurance were more likely to engage in consistent and appropriate deworming practices. A higher level of knowledge was also associated with improved health behaviors.

Conversely, no significant associations were observed with variables such as age ( $p=0.7930$ ), marital status ( $p=0.1290$ ), occupation ( $p=0.2580$ ), religion ( $p=0.8850$ ), child's age ( $p=0.7270$ ), and child's gender ( $p=0.9600$ ), suggesting these factors did not substantially influence deworming practices among the study participants (Table 6).

**Table 6.** Correlation between demographic characteristics and deworming practices (n=324)

Variables	Deworming Practice			p-value <sup>a</sup>
	Poor f (%)	Regular f (%)	Good f (%)	
Age	10 (8.3)	24 (20.0)	86 (71.7)	0.7930
Marital status	11 (7.3)	32 (21.2)	108 (71.5)	0.1290 <sup>b</sup>
Education level	18 (14.9)	31 (25.6)	72 (59.5)	0.0114
Occupation	12 (8.2)	30 (20.4)	105 (71.4)	0.2580
Income	21 (17.2)	28 (23.0)	72 (59.8)	0.0012 <sup>b</sup>
Religion	8 (6.3)	28 (22.0)	91 (71.7)	0.8850 <sup>b</sup>
Housing type	23 (19.0)	30 (24.8)	68 (56.2)	0.0009
Child's age	9 (7.2)	24 (19.2)	92 (73.6)	0.7270
Child's gender	10 (6.2)	28 (17.5)	122 (76.3)	0.9600
Social security	20 (15.4)	29 (22.3)	81 (62.3)	0.0011

Note: <sup>a</sup>Chi-square test applied unless otherwise indicated; <sup>b</sup>Fisher's exact test applied.

P-values are reported to four decimal places to capture subtle differences;  $p<0.05$  is considered statistically significant.



#### 4. Discussion

This study provides critical insights into the knowledge and deworming practices of mothers with children aged 2 to 5 years in Cartagena, Colombia. The analysis revealed a marked discrepancy between knowledge and practice: while 62.3% of mothers reported good deworming practices, only 22.8% exhibited good knowledge levels. This divergence suggests that although appropriate behaviors may be occurring, they are often carried out without a full conceptual understanding of the risks and rationale involved, potentially driven by routine, tradition, or informal advice.

Specifically, the study found that mothers' knowledge about deworming was generally regular (39.8%) or poor (37.3%). This finding is consistent with international reports, such as that of Flores and Seminario (2020), who reported a predominance of moderate knowledge (67%) about deworming, and Romani and Quispe (2020), who identified a prevalence of medium or moderate knowledge (58.1%), and noted that the greatest knowledge gap was in understanding the concept of intestinal parasitosis (63.4%). Similarly, Fátima et al. (2016) suggested that mothers have little knowledge about parasitic infestations in their young children. In contrast, Bahago and Oyewole (2022) found that 96.2% of their study participants had good knowledge about deworming and only 3.8% had moderate knowledge. These variations across studies may reflect differences in public health education strategies, socioeconomic conditions, and access to reliable health information in different settings.

In this study, certain items demonstrated particularly high levels of correct knowledge, such as the statement *"Deworming consists of ingesting a medication called antiparasitic, in order to exterminate parasites within the intestine."* This suggests that mothers were generally aware of the basic purpose and mechanism of deworming medication. Similar patterns have been reported by Masaku et al. (2017), who found adequate parental knowledge regarding the etiology, signs and symptoms, treatment, and preventive methods of parasitosis. Such findings indicate that while general concepts, such as the role of antiparasitic drugs, are well understood, gaps may still exist in more detailed or nuanced aspects of knowledge, including risk factors, reinfection prevention, and treatment schedules.

Regarding specific practices, it was found that many mothers properly washed their hands with soap and water after using the bathroom, as well as before and after changing the baby's diaper and before eating or feeding the child. The habit of trimming children's nails was common, along with regular deworming every six months. This aligns with the findings of Flores and Seminario (2020), who reported that mothers implemented good hygiene practices such as bathing their babies daily and consistently washing their hands properly. Similarly, Peña Sandoval (2019) reported that the most favorable practices in her research were related to daily bathing and handwashing before eating and after using the bathroom. Kasimayan et al. (2021) also found similar results, showing that participants in their study usually washed their children's hands before every meal (90.8%), changed dirty clothes frequently, and trimmed their nails. Moreover, Eze et al. (2020) highlighted regular deworming as an important practice, noting that mothers often learned about these practices through conversations with family and friends, as well as through health talks delivered via radio, television, or school programs.

However, it was considered unfavorable that many mothers followed the recommendations of family, friends, or neighbors when deworming their child, leaving the choice of medication and dosage to these acquaintances and disregarding the guidance of health professionals. This finding is concerning because trained health personnel take into account the type of parasites causing the infection, as well as the child's weight, age, and height, and the severity of the parasitosis when prescribing deworming agents. In this regard, Singh et al. (2021) point out that, although most participants in their study were aware that self-medicating with antiparasitic drugs poses health risks for children, they still engaged in this harmful practice due to a lack of money for medical consultations or lack of time to visit a doctor, often using common medications such as mebendazole, albendazole, and metronidazole.

The most significant contribution of this study is the identification of four sociodemographic determinants that were statistically associated with both maternal knowledge and deworming practices: education level, family income, housing type, and social security affiliation. Education level emerged as a particularly powerful determinant. Mothers with higher levels of education demonstrated both better knowledge and more appropriate practices, reinforcing the well-established link between educational attainment and health literacy. These findings align with



previous studies by Flores and Seminario (2020) and Ayele et al. (2021), which concluded that formal education improves understanding of parasitic diseases and fosters critical health behaviors. The work of Bahago and Oyewole (2022) further supports this, indicating that even informal education within households can reduce childhood parasitic infections when combined with effective communication. Taken together, these results highlight the pivotal role of education in shaping effective deworming practices and improving child health outcomes.

Family income also showed a consistent and significant association with both outcomes. Households with greater economic stability likely benefit from better access to healthcare professionals, prescribed medications, clean water, and sanitation. These results parallel those reported by Kasimayan et al. (2021), who highlighted income as a central barrier to timely and consistent deworming. Furthermore, Alfonso and Castro (2022) warn that knowledge alone may not be sufficient when structural poverty prevents caregivers from translating it into action. Additionally, housing conditions, as represented by the type of dwelling, proved to be another key factor. Mothers living in stable housing environments (such as formal houses or apartments) were more likely to engage in good deworming practices than those residing in precarious conditions. These findings echo the research by Muñoz et al. (2017) and Rodríguez-Sáenz et al. (2020), who documented how poor housing is associated with higher parasitic burden due to environmental exposure, lack of sanitation, and proximity to vectors such as rodents and domestic animals.

Social security affiliation was the fourth significant determinant. Mothers affiliated with the contributory or special regimes—who typically have more stable employment and better access to health services—demonstrated better knowledge and practices. This aligns with WHO (2023) recommendations on the importance of universal health coverage not only for access to services but for improving public health literacy through professional interaction and community-based programs. In contrast, this study found no statistically significant associations between the level of knowledge or practices and variables such as age, marital status, occupation, religion, or the child's age or gender. These findings suggest that structural and systemic conditions may play a more influential role than cultural or individual identity-based characteristics. However, this contrasts with certain studies (e.g., Masaku et al., 2017; Kasimayan et al., 2021), which reported gender and marital status as relevant factors, indicating the need for contextual and region-specific analyses. Overall, the evidence underscores the importance of addressing socioeconomic and systemic barriers to improve maternal knowledge and deworming practices effectively.

The findings of this study point to the urgent need for nursing-led, intersectoral interventions that go beyond health education alone. Interventions must integrate socioeconomic support, housing improvement, and strengthened access to primary healthcare. Moreover, community health initiatives should leverage peer education, culturally tailored communication strategies, and reinforcement through community leaders, especially in populations with limited literacy or unstable access to services. Closing the gap between behavior and knowledge also presents an opportunity. While many mothers already engage in key hygiene and deworming practices, enhancing their understanding of why and how these actions matter could improve adherence and reduce reliance on informal sources. Community-based education, visual materials, family counseling, and periodic reinforcement by health workers during home visits can strengthen this connection.

## **5. Implications and limitations**

The findings of this study have implications for nursing practice. Nursing professionals should focus on community education by providing clear and accessible information about deworming practices and proper hygiene measures. It is also crucial to promote educational strategies that take into account the socioeconomic context of mothers and their families to improve knowledge and practices related to deworming. Finally, nurses should advocate for health policies that facilitate access to quality health services and prevent self-medication, as well as implement community intervention programs that integrate ongoing education on hygiene and food handling. These combined efforts will contribute to reducing parasitic infections and their complications in children under five years of age.

Despite the results obtained, this study has limitations: (1) the sample size allowed for the analysis of variables; however, it was not sufficient to determine a causal relationship between demographic characteristics and factors influencing the level of knowledge; (2) the cross-sectional design did not allow for the establishment of cause-effect relationships between the

study variables or their behavior over time; and (3) only some neighborhoods in the southeastern areas of Cartagena were included, so the reported data do not allow for generalizations regarding deworming in children across the entire city of Cartagena.

For future studies, it is recommended to increase the sample size to analyze variables with greater precision and establish causal relationships between demographic characteristics and knowledge levels. Additionally, the adoption of a longitudinal design is advised to examine cause-effect relationships over time, along with the inclusion of more neighborhoods in Cartagena and other settings to obtain more representative and generalizable results on childhood deworming. Lastly, the implementation of clinical trials and large intervention studies is recommended to improve deworming practices and reduce parasitic infections in children under five years of age.

## 6. Conclusion

This study provides a comprehensive understanding of the knowledge and deworming practices among mothers of children aged 2 to 5 years in Cartagena, Colombia. The findings revealed that most participants were young women with secondary education, engaged in household work, living on low incomes, and predominantly affiliated with the subsidized health insurance scheme. Despite showing acceptable levels of deworming practices, particularly in hygiene-related behaviors and routine administration of antiparasitics, their overall knowledge about deworming remained limited, largely categorized as poor or average.

Critically, the present study identified that both knowledge and practices were significantly influenced by four key sociodemographic factors: educational level, family income, type of housing, and social security affiliation. These variables reflect broader structural determinants that shape health behaviors, access to information, and the capacity for informed decision-making. Notably, mothers with higher education, more stable economic conditions, adequate housing, and formal health coverage were more likely to demonstrate appropriate deworming practices and possess greater understanding of the topic. Conversely, the continued reliance on non-professional sources for advice and the persistence of self-medication underscore the need for targeted educational interventions and stronger linkages with formal healthcare systems.

Moving forward, future studies and public health efforts should prioritize the development of context-sensitive, culturally tailored, and participatory educational strategies. Such interventions should not only aim to improve maternal knowledge, but also address the socioeconomic and systemic barriers that perpetuate inequities in access to safe and effective deworming. Intersectoral collaboration between health, education, and social development agencies is essential to promote sustainable behavioral change, reduce the prevalence of parasitic infections, and improve child health outcomes in vulnerable populations.

## Acknowledgment

The authors would like to thank all the mothers who participated in the study, as well as the students of the research seedbeds, particularly Naysa Carolina Duarte, Nadia Patricia Martínez Baldovino, Estefany Contreras Peñaranda, and Liseidys Ortega Benavidez.

## Author contribution

Conceptualization, design, statistical data review (MT, KR, SF, AP), article writing and draft review (MT, KR, SF, AP), final version review and translation (MT, KR), editing and approval (MT, KR, SF).

## Conflict of interest

No conflict of interest has been declared by the authors.

## References

- Alfonso, R. O. A., & Castro, A. S. L. (2022). *Desigualdad, inequidad y corrupción. Análisis de los rasgos perennes del acceso al agua potable y al servicio sanitario de eliminación de excretas en Colombia* [Inequality, inequity, and corruption: An analysis of the enduring features of access to drinking water and sanitation services in Colombia] [Thesis, Universidad Externado de Colombia]. <https://doi.org/10.57998/bdigital/handle.001.1154>
- Alo, C., Akamike, I., Agbo, U. N., Eze, I. I., Madudueze, U. C., Okedo-Alex, I. N., Azuogu, B. N., Una, A. F., Elum, P. O., Ugochukwu, C., Nwonwu, E. U., & Ogbonnaya, L. (2021). Prevalence,

- knowledge, attitude and preventive practices regarding intestinal and urinary parasites among primary school children in a rural community in Ebonyi State, Nigeria. *Journal of Epidemiological Society of Nigeria*, 4(1), 39-50. <https://doi.org/10.46912/jeson.39>
- Ayele, A., Tegegne, Y., Derso, A., Eshetu, T., & Zeleke, A. J. (2021). Prevalence and associated factors of intestinal helminths among kindergarten children in Gondar Town, Northwest Ethiopia. *Pediatric Health, Medicine and Therapeutics*, 12, 35-41. <https://doi.org/10.2147/PHMT.S290265>
- Bahago, N. I., & Oyewole, E. O. (2022). *Knowledge, perception and practice of deworming among mothers of under-five children in rural communities of Lafia LGA, North Central Nigeria* [Preprint]. SSRN Electronic Journal. <https://doi.org/10.2139/ssrn.4202185>
- Balew, M., & Kibret, M. (2023). Prevalence of enteric bacterial pathogens in diarrheic under-five children and their association with the nutritional status in Bahir Dar Zuria District, Northwest Ethiopia. *BMC Nutrition*, 9(1), 35. <https://doi.org/10.1186/s40795-023-00678-0>
- Bordignon, J. C. P., Paulino, É. T., Silva, M. E. C., Alencar, M. F. L., Gomes, K. N. F., Sotero-Martins, A., Santos, J. A. A., Boia, M. N., & Moraes Neto, A. H. A. (2022). Prevalence of intestinal parasitic infections versus knowledge, attitudes and practices of male residents in Brazilian urban slums: A cross-sectional study. *Revista do Instituto de Medicina Tropical de São Paulo*, 64, e41. <https://doi.org/10.1590/S1678-9946202264041>
- Croke, K., & Atun, R. (2019). The long run impact of early childhood deworming on numeracy and literacy: Evidence from Uganda. *PLoS Neglected Tropical Diseases*, 13(1), e0007085. <https://doi.org/10.1371/journal.pntd.0007085>
- Departamento Administrativo Nacional de Estadística (DANE). (2023). Proyecciones y retroproyecciones de población municipal para el periodo 1985-2017 y 2018-2035 con base en el CNPV 2018. Serie municipal de población por área, sexo y edad, para el periodo 2018 - 2026 [Projections and retro-projections of municipal population for the period 1985-2017 and 2018-2035 based on the 2018 national population and housing census (CNPV 2018). Municipal population series by area, sex, and age for the period 2018-2026]. <https://www.dane.gov.co/index.php/estadisticas-por-tema/demografia-y-poblacion/proyecciones-de-poblacion>
- Eze, P., Agu, U. J., Aniebo, C. L., Agu, S. A., & Lawani, L. O. (2020). Perception and attitudinal factors contributing to periodic deworming of preschool children in an urban slum, Nigeria. *BMC Public Health*, 20, 1839. <https://doi.org/10.1186/s12889-020-09958-x>
- Fatima, S. R., Qureshi, A. H., Kumar, R., Naveed, I., Khushik, I. A., & Ronis, K. (2016). Assessment of knowledge, attitude, and practice (KAP) about worm infestation and deworming among mothers of children under-5 years of age living in the slum of Islamabad, Pakistan. *Isra Medical Journal*, 8(1), 19-23.
- Faul, F., Erdfelder, E., Lang, A.-G., & Buchner, A. (2007). G\*Power 3: A flexible statistical power analysis program for the social, behavioral, and biomedical sciences. *Behavior Research Methods*, 39(2), 175-191. <https://doi.org/10.3758/BF03193146>
- Flores Torres, C. P., & Seminario Cieza, V. D. C. (2020). Conocimientos, actitudes y prácticas de las madres para prevenir parasitosis intestinal en niños preescolares. Caserío Cruz del Médano, Mórrope-2018. <https://tesis.usat.edu.pe/handle/20.500.12423/2400>
- Gebretsadik, D., Metaferia, Y., Seid, A., Fenta, G. M., & Gedefie, A. (2018). Prevalence of intestinal parasitic infection among children under 5 years of age at Dessie referral hospital: Cross sectional study. *BMC Research Notes*, 11, 771. <https://doi.org/10.1186/s13104-018-3888-2>
- Kasimayan, P., Kasirajan, A. K. T., Rajan, D. R., Subbiah, S., & Balasundaram, H. (2021). Knowledge and practice on prevention of intestinal parasitic infection among mothers of under-five children in Bulehora Town, Bule Hora, Oromia Region, Southern Ethiopia [Preprint]. <https://doi.org/10.21203/rs.3.rs-743842/v1>
- Keats, E. C., Das, J. K., Salam, R. A., Lassi, Z. S., Imdad, A., Black, R. E., & Bhutta, Z. A. (2021). Effective interventions to address maternal and child malnutrition: An update of the evidence. *The Lancet Child & Adolescent Health*, 5(5), 367-384. [https://doi.org/10.1016/S2352-4642\(20\)30274-1](https://doi.org/10.1016/S2352-4642(20)30274-1)
- Masaku, J., Mwendu, F., Odhiambo, G., Musuva, R., Matey, E., Kihara, J. H., Thuita, I. G., & Njomo, D. W. (2017). Knowledge, practices and perceptions of geo-helminthes infection among parents of pre-school age children of coastal region, Kenya. *PLoS Neglected Tropical Diseases*, 11(3), e0005514. <https://doi.org/10.1371/journal.pntd.0005514>

- Ministry of Health, Republic of Colombia. (2021). *Resolución número 8430 de 1993: Por la cual se establecen las normas científicas, técnicas y administrativas para la investigación en salud* [Resolution No. 8430 of 1993: Establishing scientific, technical, and administrative standards for health research]. [http://www.unisabana.edu.co/fileadmin/Documentos/Investigacion/comite\\_de\\_etica/Res\\_\\_8430\\_1993\\_-\\_Salud.pdf](http://www.unisabana.edu.co/fileadmin/Documentos/Investigacion/comite_de_etica/Res__8430_1993_-_Salud.pdf)
- Mohammed, J., Shiferaw, A., Zeleke, A., Eshetu, Y., Gebeyehu, Z., Ayehu, A., & Adem, Y. (2022). Prevalence and associated risk factors of intestinal parasites among diarrheic under-five children attending Bahir dar and Han health centers, Northwest Ethiopia: A cross-sectional study. *Journal of Parasitology Research*, 2022, 7066529. <https://doi.org/10.1155/2022/7066529>
- Muñoz, N. F. S., Arteaga, L. R. V., Fernández, D. G., Agudelo, N. D. M., Cuellar, F. E. G., Carvajal, J. B. M., & García, M. E. P. (2017). Situación del parasitismo intestinal en preescolares de un hogar infantil estatal en Popayán, Colombia [Situation of intestinal parasitism in preschoolers from a state-run childcare center in Popayán, Colombia]. *Medicina & Laboratorio*, 23(11), 573-584. <https://dialnet.unirioja.es/servlet/articulo?codigo=8741506>
- Pedraza, B., Suarez, H., De-la-Hoz, I., & Fragoso, P. (2019). Prevalence of intestinal parasites in children aged 2–5 years in community homes in Cartagena de Indias, Colombia]. *Revista Chilena de Nutrición*, 46(3), 239-244. <http://dx.doi.org/10.4067/S0717-75182019000300239>
- Peña Sandoval, M. C. (2019). *Conocimientos, actitudes y prácticas sobre medidas preventivas de parasitosis intestinal en madres de niños menores de 5 años atendidos en Puesto de Salud Puente Internacional, diciembre 2017–abril 2018* [Knowledge, attitudes, and practices regarding preventive measures for intestinal parasitosis among mothers of children under 5 years attended at Puente Internacional Health Post, December 2017–April 2018] [Bachelor's thesis, Universidad San Pedro]. USANPEDRO Institutional Repository. <http://repositorio.usanpedro.edu.pe/handle/USANPEDRO/11807>
- Peters, L., Burkert, S., & Grüner, B. (2021). Parasites of the liver–Epidemiology, diagnosis and clinical management in the European context. *Journal of Hepatology*, 75(1), 202-218. <https://doi.org/10.1016/j.jhep.2021.02.015>
- Rodríguez-Sáenz, A. Y., Mozo-Pacheco, S. A., & Mejía-Peñuela, L. E. (2020). Parásitos intestinales y factores de riesgo en escolares de una institución educativa rural de Tunja (Colombia) en el año 2015 [Intestinal parasites and risk factors among schoolchildren of a rural educational institution in Tunja (Colombia) in the year 2015]. *Medicina & Laboratorio*, 23(03-04), 159-169. <https://www.medigraphic.com/cgi-bin/new/resumen.cgi?IDARTICULO=94776>
- Romani Solis, N. M., & Quispe Torres, L. V. (2020). *Conocimiento Sobre Parasitosis Intestinal En Madres Con Niños De 2 A 5 Años. Centro De Salud Santiago–Ica, 2019*. [Knowledge of intestinal parasitosis among mothers of children aged 2 to 5 years at the Santiago Health Center – Ica, March to October 2019] [Master's thesis, Universidad Autónoma de Ica]. Repositorio Universidad Autónoma de Ica. <https://hdl.handle.net/20.500.14441/624>
- Rwamwejo, F., Ndatinya, G. I., Mkata, M. I., Blauman, A., Regnier, D., & Lackner, S. C. (2023). Assessing the knowledge, attitudes, practices, and perspectives of stakeholders of the deworming program in rural Rwanda. *PLOS Neglected Tropical Diseases*, 17(8), e0010759. <https://doi.org/10.1371/journal.pntd.0010759>
- Singh, G., Njamnshi, A. K., & Sander, J. W. (2021). Vector-borne protozoal infections of the CNS: Cerebral malaria, sleeping sickness and chagas disease. *Current Opinion in Neurology*, 34(3), 439-446. <http://dx.doi.org/10.1097/WCO.0000000000000919>
- Tiruneh, T., Sharew, B., Hailesilassie, H., & Eyayu, T. (2021). Prevalence of intestinal parasites using formal ether concentration technique and its associated factors among school children at Dawudo primary school, Dessie, Northeast Ethiopia: A cross-sectional study. *PAMJ-One Health*, 5, 7. <https://doi.org/10.11604/pamj-oh.2021.5.7.26160>
- Vera Duarte, C. B., Flores Mendoza, J. E., & Aria Zaya, L. S. (2025). Nivel de conocimiento de los padres acerca de la parasitosis en niños y niñas [Level of parental knowledge about parasitosis in boys and girls]. *Revista científica Ciencias De La Salud*, 7, 01–08. <https://doi.org/10.53732/rccsalud/2025.e7104>

- Villamizar, X., Higuera, A., Herrera, G., Vasquez-A, L. R., Buitrón, L., Muñoz, L. M., González-C, F. E., López, M. C., Giraldo, J. C., & Ramírez, J. D. (2019). Molecular and descriptive epidemiology of intestinal protozoan parasites of children and their pets in Cauca, Colombia: A cross-sectional study. *BMC Infectious Diseases*, 19(1), 190. [https://doi.org/10.1016/S2352-4642\(20\)30274-1](https://doi.org/10.1016/S2352-4642(20)30274-1)
- World Health Organization & UNICEF. (2016). Integrated management of childhood illness: Chart booklet for children aged 2 months up to 5 years. WHO. [https://platform.who.int/docs/default-source/mca-documents/policy-documents/operational-guidance/zwe-ch-14-01-operationalguidance-2016-eng-imnci-chart-booklet.pdf?utm\\_source](https://platform.who.int/docs/default-source/mca-documents/policy-documents/operational-guidance/zwe-ch-14-01-operationalguidance-2016-eng-imnci-chart-booklet.pdf?utm_source)
- World Health Organization. (2023, January 18). *Soil-transmitted helminth infections*. <https://www.who.int/news-room/fact-sheets/detail/soil-transmitted-helminth-infections>