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Socioeconomic Disparities in Preventive Practice for Intestinal Parasitic Infections Among Mothers of Preschool Children in Egypt

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A B S T R A C T

Background: Intestinal parasitic infections are among the most common illnesses worldwide, especially in underdeveloped nations. Preschool children are a high-risk category. **Objective:** To assess the association between socioeconomic status and maternal practices regarding preventing intestinal parasitic infections. **Method:** A descriptive cross-sectional design was conducted in randomly selected (one urban, four rural) Maternal and Child health units in Minia district, Egypt. The study included a convenience sample of 382 mothers aged 15-49 years, having at least one preschool child. An Arabic interview-based questionnaire was used for data collection. Questionnaires included the mother's age, El-Gilany socioeconomic status scale and questions for mothers' practice. Binary logistic regression was used to predict variables linked to better practice. **Results:** The average age was 34.95±8.47 years. Most mothers were housewives (75.4%), living in rural areas (76.2%), and having pre-University education or less (75.9%). Previous parasitic infection was found among 61.8% of preschool children. Median practice scores were higher among participants with better socioeconomic classes. Mothers with better preventive practices had significantly higher scores in education (p=0.025), occupation (p<0.001), and home sanitation domains (p <0.001). The home sanitary domain had the highest odds ratio (OR:1.19, CI:1.049-1.359), p=0.007. **Conclusion:** There is a high prevalence of intestinal parasitic infection among preschool children in the Minia district. Maternal Age, domains of occupation and home sanitation were significant predictors for mothers' practice. Carrying out health education campaigns in various community settings to improve public awareness and adherence to preventive practices should target high-risk categories.

INTRODUCTION

Globally, more than 1.5 billion people are infected with intestinal parasite infections (IPIs) making it a major health problem. These parasitic infections are common among populations of low and middle-income countries with about 260 million preschool children residing in high transmission areas. [1]

These parasitic infections may cause mild symptoms such as diarrhea or anemia or severe ones like hepatomegaly or convulsions that can impact the physical and mental growth of children. These infections result in significant costs to public health and society including stunted growth, malnourishment, increased absenteeism from school and poor academic performance .[2, 3]

Fecal-oral transmission when contaminated hands, food, or water contact the mouth is the main route for IPIs transmission. Therefore, personal hygiene practices, proper eating habits and constant anti-parasitic medication ensure prevention.[4,5]

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Preschool children are particularly vulnerable because they are often exposed to unsanitary environments, insufficient hand washing, and underdeveloped immune systems. The first five years of life are critical for a child's future health and development.[6,7] Preschoolers depend solely on their mothers, and their health habits have a big impact on them. Mothers as primary caregivers in homes play an important role in preventing IPIs by motivating good sanitation habits and hygienic practices. [8]

Egypt still struggles with high rates of IPIs with prevalence rates reaching up to 46.2% among children and 76.9% among preschool children.[9] Factors such as low maternal education, poor income, and occupation are potential risk factors for IPIs. [2, 10] However, the relationship between socioeconomic status (SES) and mothers' preventive practices needs further exploration.

This cross-sectional study aims to examine the relationship between SES and maternal practices regarding the prevention of IPIs in Egypt. The El Gilany Socioeconomic Score, which considers factors such as housing conditions, income, employment, and education, was used as a comprehensive tool to assess SES unlike previous studies that used separate entities for assessing SES.[11] By examining these factors, we aim to inform the development of targeted interventions to enhance maternal adherence to preventive behaviors. The objective was to assess the association between socioeconomic status and maternal practices regarding preventing intestinal parasitic infections.

METHODS

A descriptive cross-sectional design was used to perform the study during the period from March 2024 to May 2024.

The study included mothers at reproductive age 15-49 years having at least one preschool children < 5 years. Mothers having no children at preschool age or refused to participate in the study.

The sample size was 382 and calculated using epi-info software version 7.2, using the following criteria: Confidence interval (CI)= 95 %, the margin of error= 5%, population size was 240248 which represents females at reproductive age in Minia district (obtained from regional health authority), percentage of inadequate practice from previous study= 53.1% .[12]

Sampling technique: Five maternal and child health care (MCH) centers (one urban, four rural) were randomly selected from all 57 MCH centers (13 Urban, 44 rural) in Minia district, Egypt. The urban unit was " Western Minia medical center" and four rural health units were "Tala, behdal, Demsher and Tewa MCH centers." A convenient sample of mothers attending the previously selected MCH centers. Around 75% of the total sample was chosen from rural centers and 25% from the urban center to be proportionate to the actual rural/urban distribution of the population in the Minia district.

Data collection procedure: Data was collected by nursing students as part of their practical curriculum after they received training and orientation by researchers on how to fill the questionnaire through direct view with mothers. At the beginning of the study, the mothers of preschool children were informed about the purpose and nature of the study. The required time to answer the questionnaire was about 15-20 minutes. The data collection was carried out during the period from March 2024 to May 2024 under the research's supervision.

Data collection tool: An Arabic questionnaire was used as an instrument for this study by direct view with the participants. The Questionnaire consisted of two parts. *Part I* Sociodemographic data: mother's age and the updated validated version of El-Gilany socioeconomic status scale. It has 7 domains (education and cultural domain / occupation domain / Family domain/Family possessions domain/Home sanitation domain/Economic domain/health care domain) with a total score of 84. The socioeconomic level is classified into very low, low, middle and high level depending on the quartiles of the calculated score.[11] *Part II* included (1) having previous parasitic infection among one or more children during the last 6 months determined by documented stool analysis. (2) Practice assessing questionnaire: included 19 questions, adopted from Abdel Al et al., 2022. [13] and modified by the researcher after reviewing literatures. The questionnaire covered the following items: periodic stool examination for children, giving appropriate treatment for the infected children with appropriate dose and medication repeating, food hygiene questions in form of washing vegetables and fruits, proper cooking and covering food, hand hygiene questions for mother, , children and all family

Table 1: Socioeconomic characteristics of the studied mothers (N=382)

	Number	%
Age (years)		
Mean±SD	34.95±8.47	
Range	21-49	
Education		
Illiterate	65	17.0
read and write	22	5.8
Pre-university	203	53.1
University and postgraduate	92	24.1
Mother job		
Housewife / not working	288	75.4
Unskilled manual worker	5	1.3
Skilled manual worker	3	0.8
Trades and business	12	3.1
Semi-professional	17	4.5
Clerk/ professional	57	14.9
Residence		
Rural	291	76.2
Urban	91	23.8
Family income		
Insufficient	17	4.5
Just meet routine expense	132	34.6
Meet routine expenses and emergencies	188	49.2
Able to save and invest money	45	11.7
Socioeconomic classes		
Very low	103	26.9
Low	98	25.7
Fair	86	22.5
Good	95	24.9

Data were presented as number and percentages, unless mentioned otherwise. SD, standard deviation.

members, home hygiene measures mainly for kitchen and bathroom. The responses were in the form of the Likert format (never=1, sometimes=2 and always=3). The total maximum score was 57. The outcomes were considered as better practice if the calculated score was higher than or equal the median of the calculated score (≥52) and sorted as worse practice if the score was lower than the median.

Tool validation: The content validity of the questionnaire was assessed by three public health experts who served as a jury, and their recommendations for changes to the data collection tools were implemented. The reliability was assessed by using Cronbach's alpha that yielded to 79% reliability rate. Additionally, a pilot study was conducted using 10% of the sample to examine if the tool was applicable and understandable. Adjustments were made to the tool, so those participants were excluded from the main study population.

Statistical analysis: SPSS version 27 was used to analyze the data. Descriptive statistics, in the form of proportions, means and standard deviations (SDs), were included in the analyses. The student t-test was performed to compare means of SES domains between two groups and Kruskal-Walli's test, a non-parametric test, was used to assess differences in practice scores among different socioeconomic classes groups. A binary logistic regression analysis was used to predict variables linked to better practice scores. Odds ratio (OR) and 95% CI were calculated, and statistical significance was considered at $p < 0.05$.

RESULTS

Table 1 shows that the mean age of the studied females was 34.95±8.47. More than half of mothers had pre-university education (53.1%) while 17% were illiterate. The majority were housewives (75.4%) and lived in rural areas (76.2%). Only 11.8% had a family income that allowed them to save and invest money.

Regarding the relationship between mothers` practice categories (worse practice and better practice) and previous parasitic infection in the past 6 months among one or more of their preschool children, the overall percentage of those with previous infection was 61.8% compared to 38.2% without previous infection. The percentage of worse practices was higher among those with previous parasitic infections (52.1%) compared to those with no previous parasitic infections (45. 9%). In addition, better practices were lower among those with previous parasitic infections (47.9%) compared to those with no previous parasitic infections (54.1%) but this was statistically insignificant (Figure 1)

In Figure (2), based on a Kruskal-Wallis Test, practice scores significantly varied across different socioeconomic classes ($p = 0.013$). Median practice scores were higher in participants with better socioeconomic classes, ranging from 49 in very low social class to 54 in good social class.

Table (2) clarifies that mothers with better preventive practices had significantly higher scores in education ($p=0.025$), occupation ($p<0.001$), and home

Table 2: Relation between age and scores of socioeconomic domains with mothers' practice

	Group	Number	Practice Mean±SD	t (95% CI)	p-value
Education domain	Worse	190	15.87±7.03	-2.24 (-2.99, -.019)	**0.025**
	Better	192	17.46±6.84		
Family domain	Worse	190	6.24±1.32	0.46(-.21, 0.34)	0.646
	Better	192	6.18±1.42		
Economic domain	Worse	190	2.78±0.96	1.33(-0.07,0.37)	0.186
	Better	192	2.63±1.21		
Occupation domain	Worse	190	3.63±2.52	-3.82 (-1.62, -0.52)	**<0.001**
	Better	192	4.70±2.95		
Family possession domain	Worse	190	6.48±2.25	-0.98 (-0.67, 0.22)	0.328
	Better	192	6.71±2.21		
Home sanitary domain	Worse	190	7.45±1.91	-3.54 (-1.04, -0.29)	**<0.001**
	Better	192	8.15±1.78		
Health domain	Worse	190	3.19±1.19	0.604 (-0.16, 0.32)	0.546
	Better	192	3.11±1.22		
Total SES score	Worse	190	45.68±11.35	-2.87(-5.53, -1.03)	**0.004**
	Better	192	48.96±10.93		
Maternal age (max49)	Worse	190	33.98±8.43	-2.23 (-3.63, -0.22)	**0.026**
	Better	192	35.91±8.43		

CI: confidence interval

Table 3: Logistic regression analysis for factors associated with better practice

	Odds ratio	Confidence interval		p-value
		Lower	Upper	
Age	1.037	1.009	1.067	**0.010**
Education domain	1.012	0.971	1.054	0.584
Family domain	0.860	0.729	1.013	0.071
Economic domain	0.813	0.658	1.005	0.056
Occupation domain	1.138	1.027	1.260	**0.014**
Family possession domain	0.983	0.884	1.093	0.748
Home sanitary domain	1.194	1.049	1.359	**0.007**
Health domain	0.890	0.745	1.063	0.198
Constant	0.248			0.113

sanitation domains (p <0.001). Total SES was also higher among mothers with better practice compared to the group with worse practice. Slightly older mothers tend to have better practice (p = 0.026). No significant differences were found in family, economic, family possession, and health domains.

The regression analysis demonstrated in Table (3) shows that age, occupation, and home sanitation domains were significant predictors of better practice. For each additional year, the odds of being in the better group increased by 3.7%.

Regarding SES domains, better occupation status increased the odds of the outcome by 13.8% and better home sanitation increased the odds of the outcome by 19.4%. Other domains such as education, Family, Economic, Family Possession and Health domains were not significant predictors for better practice.

DISCUSSION

Throughout the world, IPIs continue to be a major health concern, particularly in developing countries. Thus, our study aimed to identify the impact of total

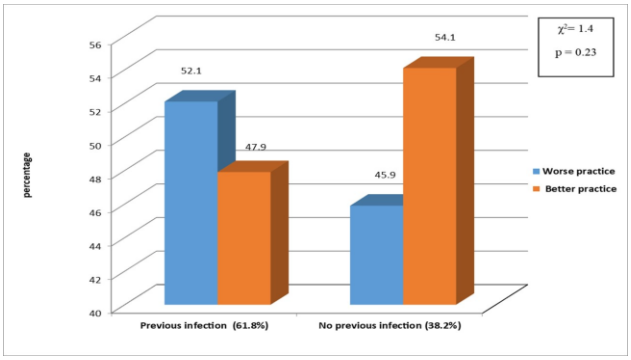

Figure 1: Relation between mothers' practice and previous parasitic infection among their children

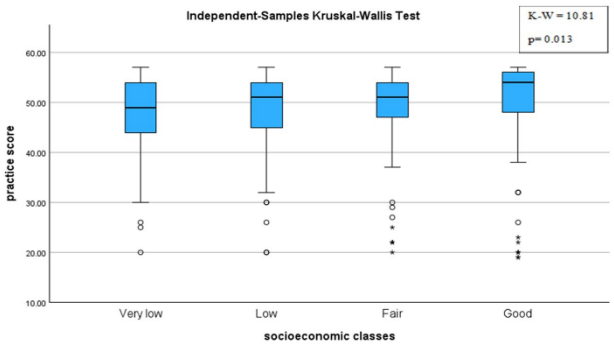

Figure 2: Relation between median practice scores and socioeconomic classes

SES, SES domains on mothers' practice regarding prevention of intestinal parasites among their preschool children. El–Gilany score was used as comprehensive measurement for SES.

Our study included 382 mothers; their mean age was 34.95±8.47 years. Near half of mothers had pre-university education. Around three fourths of them were housewives and more than three fourths of them were from rural areas. Slightly less than half of them reported that family income covered routine expenses and emergencies.

Concerning mothers' practice, according to methodological classification in our study 192 (50.3%) of mothers were in the better practice group as their scores were above median value while 190 (49.7%) of them were below median value and classified as the worse practice group.

There were previous studies that used the same methodology for scoring and operational definition. A similar study conducted in Ethiopia, based on the median value, revealed that 51.1% of mothers were above the median and had good practice, while 48.9% of mothers were below the median and had poor practice regarding prevention for IPIs .[14] Another study conducted in Southern Ethiopia using the calculated mean value showed that 53.1% of mothers had helpless practice while 46.9% had good practice.[12] Other studies from Egypt and Nepal found that most of mothers had adequate total reported practice [15,16] while others revealed majority poor practice either from Egypt [13] or in different African countries like Rwanda and Ethiopia .[17,18] However, these studies can't be comparable to ours due to different methods for practice scoring.

The overall Reported prevalence of parasitic infections among preschool children in the current study is 61.8%. The prevalence of parasitic infections varied in different studies among preschool children. Likewise, a previous Egyptian study reported that more than half of preschool children had parasitic infection.[15] In Ethiopia 85.1% of preschool children were found infected with one or more intestinal parasites. [19] Lewetegen et al. also found a prevalence of 52.3%.[18]

Regarding the association between socioeconomic classes and maternal practice scores, this study revealed that better socioeconomic classes had a higher median practice score. Previous studies found an association between SES and parasitic infections. According to UNICEF, the main rate of IPI was high among children whose families were suffering from poverty and lower SES [20]. Lower socioeconomic background was a main cause of parasitic infections as reported by Karan and his colleagues.[21]

Concerning domains of SES in the current study, both education and occupation domains were significantly higher in the group with better practice. Similarly, other Egyptian studies revealed that both mother's and father's educational levels affected practice.[13,22]

Other studies found that maternal education affected the practice of IPI prevention. Education was found to encourage changes in mothers` preventive behaviors towards IPIs.[18,23] However, Yones et al. reported that the father's education didn't affect the mother's awareness about preventive behaviors of IPI.[24]

In previous studies mother's occupation was one of the factors affecting practices of preventive behaviors of IPIs.[10,13] This may be because employee mothers had higher education and awareness, Also, the working mothers had interactions with different other people compared to housewives, so they are expected to have higher knowledge and practice.[25] However, Gadisa and Jote reported that the mother occupation wasn't a

factor affecting the mother's practices regarding preventive behaviors of IPIs.[26]

The home sanitation domain was composed of the presence of basic home services (water supply, sewage system, waste collection method, etc..), type of house, and crowding index. A higher score was significantly associated with better maternal practice. In previous studies, poor sanitation, unsafe drinking water, lack of toilet facilities, or absence of municipal services were associated with higher IPI in both tropical and sub-tropical countries.[2,27] This may be because fecal-oral transmission of diseases is very common among communities characterized by poor environmental hygiene. Likewise, our findings, a study conducted by Niazi found that Parasitic infection increased in big family size.[10] This can be explained as large-sized households usually have poor sanitary conditions that may lead to poor health practices.[21]

As regards the health domain which identified sources of health care, there was no significant association with maternal practice. Although different studies investigated the prevalence of parasitic infection reported higher prevalence among children using public health care facilities. In addition, deterioration of the health situation and absence of health services were found to increase the number of cases.[10]

Regarding the Influence of mother age on maternal practice. In the present study, mothers with higher mean age had better practice this can be due to older mothers may obtain more experiences from either discussing with others or from their personal experiences. In concordance with this, Dayanand and his colleagues reported a good knowledge score among mothers of higher age.[25] In a study by Kasimayan et al, the age group of mothers (31-35 years) had the highest odds of good practice than younger age groups.[12]

Concerning factors predicting better maternal practice, the current study revealed that age, occupation, and home sanitation domains were significant predictors of better practice. A study conducted in Ethiopia also found that age (OR 2.94, 95% CI 1.38-6.24), and mothers' education (OR 3.97, 95% CI 1.26-12.49) were among the significant predictors of the preventive practice of IPIs.[12]

***Limitations*:** Research was cross-sectional with a limited number of subjects. Subjective questions were used to assess maternal practice.

CONCLUSIONS

There is a high prevalence of parasitic infection among preschool children in Minia district. Lower maternal practice score of IPIs prevention was associated with lower socioeconomic class. Maternal age, domains of occupation and home sanitation were the main predictors affecting mothers' practice. In light with these results, we recommend organizing and carrying out health education campaigns in the various community settings for improving public awareness and adherence to IPIs preventive practices. Community development and improvement of home sanitation in communities with lower SES should be a priority for health authorities.

Ethical Consideration

Verbal consent was obtained from the study participants, and they were informed about the confidentiality of their information and assured that their information would be used for research purposes only. Data collection was carried out in closed private rooms in MCH centers where a safe and quiet environment was maintained to confirm privacy and free reporting of information. The approval to conduct this study was obtained from the research ethics committee of Faculty of medicine, Minia University. No 1056/2/2024.

Conflict of Interest

All authors have no known conflict of interest that could have appeared to influence the work reported in this paper.

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Author Contributions

Chrestina Monir Fekry: questionnaire preparation, data entry and data analysis and writing methodology section. Nehal Refaat Raouf: Writing background, discussion, conclusion and abstract of manuscript.

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