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Children Intestinal parasites related to socio-economic factors in Salé Hospital, Morocco

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ABSTRACT: In a cross-sectional study, the prevalence of intestinal parasites infection and its association with socio-economic factors were explored among children aged 0 to 15 years hospitalized in Moulay Abdellah Hospital in Salé province (Morocco). The study was conducted from June 2012 to May 2013. A total of 200 stool samples were examined by direct microscopic examination in physiological saline and iodine, an enrichment method Ballenger and MIF. A questionnaire for common risks factors was completed for each participant. Mono or poly-parasitisme was detected in 69 (34,5%) of the children (26,4% of males and 41,3% of females). Various species of helminthes and protozoan infections were detected. *Blastocystis hominis* and *Giardia intestinalis* were detected in 14,5% and 12,5% respectively of examined samples. Others helminthes parasites included on the first *Enterobius vermicularis* with 3,5 % cases, the second was *Ascaris lumbricoides* in 3% and the third one was *Taenia saginata* with 1 %. The prevalence of intestinal parasite infections was statistically association with the age and sex (*p<0,05).* In addition, a significant association was observed with wash hand and family size (*p<0,05*). According to the results, the socio economic conditions favorable for the transmission of intestinal infection remains and show that intestinal parasites are still a public health problem, affecting mostly children. Improvements in personnel hygienic conditions and behavioral characteristics are important to control parasitic infection among children in salé province.

KEYWORDS: Intestinal parasites, prevalence, socioeconomic factors, children, Salé, Morocco.

1 INTRODUCTION

In the world, intestinal parasites cause one of the most important health problems through their effects in causing undernutrition, dehydration, anemia and resistance to drop infections particularly in children compared to adults **[1], [2].** The World Health Organization (WHO) estimates that approximately 50 million people worldwide endure insidious amoebic infection each year, resulting in 40–100 thousand deaths yearly **[3], [4]** . The high prevalence of these infestations is closely correlated to poverty poor environmental hygiene and impoverished health services **[5], [6]**.

In Morocco, like other developing country, intestinal parasitic infection is a major health problem. The prevalence rate of intestinal parasite infection among the children is ranging from 23 **%** to a max of 68 **%** in different studies, conducted in various parts of the country **[7], [8], [9]**. Indeed**,** the importance of intestinal parasitic infections in Public health is maintained as a result of their high frequency. Unfortunly, there is scarcity of available literature regarding the correlation between the infection of intestinal parasites and socio-economic status; in particular those of Rabat- sale region. The study was carried out to fill that gap. Therefore, the aim of this study was undertaken to estimate the prevalence of intestinal parasites in urban and rural children hospitalized in Moulay Abdellah Hospital in Salé province and relate this to their socioeconomic status.

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2 MATERIALS AND METHODS

2.1 STUDY AREA

This cross-sectional descriptive, analytical study was carried out from June 2012 to May 2013 in Moulay Abdellah Hôspital in Salé province in Morocco, salé province is a city in north-western Morocco, on the right of the Bouregreg river opposite the national capital Rabat. It has population, estimated at 800 000 habitants (2004). The superficies of area is about 672 km². Salé province has a subhumid climate with 500 and 600 mm/year for precipitation.

2.2 STUDY POPULATION

All patient **200** children upto the age of 15 years admitted with complaints of diarrhea, abdominal pain, nausea, vomiting and malnutrition were include in this study. The fresh stool collected in the morning, in clean plastic, are immediately stored in a 10% formalin solution and transported to laboratory of the National Institute of Hygiene Rabat.

2.3 THE QUESTIONNAIRE AND FAMILY INFORMATION FORM

The questionnaire was designed, based on Socio-demographic data [age, gender, residence, occupation of parents, family size (number of adults and children in the family)], Environmental and behavioral sanitary habits (housing conditions [type of habitat, hand washing, Presence of visible sewage near house and sewer type] and Knowledge of the transmission of disease. An informational document about the study, including how to supply a stool specimen and a cellulose tape slide, was given to each participant for their family.

2.4 LABORATORY INVESTIGATION

Examination of the stool samples was held at the department of Parasitology in Institut National d'Hygiène in Rabat. Each sample was first examined for its consistency, color, the presence or absence the blood and the presence of the adult parasites. The recognition of intestinal parasites was observed by using a binocular microscope under 10x and confirmed by observing under40x **[10], [11].**

Saline and iodine wet mount preparations were made and examined before and after concentration of the sample by the formal-ether technique concentration method and again iodine stained slides were prepared and examined microscopically

The presence of parasites was confirmed when observed by any of the methods above (enrichment methods according Bailenger and MIF (Merthiolate Iod Formol).

The stool specimens (0.5–1.5 gr) were examined for the presence of parasites by direct wet mount, Lugol's iodine solution and modified formaline- ethyl acetate sedimentation techniques.

2.5 ANALYSIS DATA

Data were analyzed using the Epi info (version 4, 2007). The chi-square was applied to evaluate significant difference of infection rate among children of different socioecomic factors as risk factors for this purpose. The confidence interval used is 95% and association is considered significant when the *p* value is less than 0.05.

3 RESULTS

PREVALENCE BY SOCIO-DEMOGRAPHY

Out of **200** subjects (91 males and 109 females) examined 69 (34, 5%) were infected with one or more of the intestinal parasites, the mean of age was 7, 21 ± 3, 09 and the sex ratio was 0,8.

The rural residents recorded the highest prevalence of infection (53,3%) followed by the semi –urban residents (36,1%) while those from urban setting recorded the least prevalence of infection (29,5%) .There is was no significant difference in the prevalence of intestinal parasites between and residence of the children ($p > 0,05$). Furthermore, the females showed a higher prevalence of intestinal parasites infection (41,3%) than the males (26,4%). this is statistically significant ($p< 0.05$). Age distribution of the prevalence of infection showed that the infection rate was highest among the children aged more 10 years

(54,5%) and least among the children less than 3years. This observed difference in prevalence by age was statistically significant *(p <0.05)* (Table 1).

Table 1: Prevalence of intestinal parasites infectious among children by socio demographic characteristics (age and sex)

	Group	Number examined	children infected (%)	uninfected children (%)	X^2	*P value*
Sex	Males	91	24 (26,4)	67 (73,6)		
	Females	109	45 (41,3)	64 (58,7)	**4.87**	***0,02****
Age	0-3 ans	25	6 (24)	19 (76)		
	4-10 ans	142	45 (31,7)	97 (68,3)	**7,58**	***0,02****
	11-15 ans	33	18 (54,5)	15 (45,5)		
Total		**200**	**69 (34,5)**	**131 (65,5)**		

** P < 0,05*

CORRELATIONS BETWEEN PARASITES AND SOCIO-ECONOMIC STATUS

In table 2, various socioeconomic factors are analyzed as risk factors associated with intestinal parasitic infections among children. Infrequent hand washing before meat was significantly associated with increased risk to infection 59, 7% of the child enrolled in the study washed rarely or sometimes their hands before eating were infected.

In addition, the family size was also a risk factor of the parasitic infection, the prevalence among the member of family more five person (56,4%) was a predict of the infection than the member of family less five person .

On the other hand, this survey revealed no significant association between the occurrence of intestinal parasitic infections and the housing conditions, number of room, house water source washing hand with shop, knowledge of the transmission, occupation of parents, presence of visible sewage near house, type of habitat and sewer type.

Table 2: statistical analysis between intestinal parasites and socio-economic status

Variables		Number of sample	Infected sample (%)	X^2	*Pvalue*
Type of residence	Rural	8 (53,3)			
	Suburban	35 (36,1)		3,41	0,18
	Urban	26 (29,5)			
Housing conditions	Under 2	26 (31)		0,80	0,36
	More 2	43 (73,1)			
Family size	under 5	38(26,2)		16,04	0,001
	More 5	31 (56,4)			
Type of house	Cermented	61 (33,3)			
	Uncermented	8 (47,1)		1,29	0,25
Sewer type	Septic tank	18 (43,9)			
	Municipal	51 (32,1)		2,01	0,15
House water source	Tap	59 (34,5)			
	well or others	10 (37)		0,08	0,76
Washing hand	Always	26 (20,3)			
	Sometimes /Rarely	43 (59,7)		31,6	0,001
Washing hand with shop	Always	10 (38,5)			
	Sometimes	47 (33,1)		0,43	0,80
	Rarely	12 (37,5)			
Knowledge of the transmission of disease	Yes	18 (43,9)			
	No	51 (32,9)		2,01	0,15
Fathers occupation	Employed	34 (33,3)			
	Commercial	24 (38,7)		0,81	0,36
	Functionary	9 (31)			
	others	2 (28,6)			
Mothers occupation	Employed	11 (42,3)		0,80	0,36
	Unemployed	58 (33,3)			
Presence of visible sewage near house	Yes	29 (34,9)		0,01	0,91
	No	40 (34,2)			

PREVALENCE OF INTESTINAL PARASITES

Of the 200 stool samples examined, intestinal helminthes or protozoa were found in 69 (34, 5%) cases. 49 protozoa and helminthes parasites were observed, 40 (57,97%) cases belonged to protozoa and 9 (13,04 %) to helminthes.

The overall prevalence of at least one parasite species in the study children's was 24,5% (n=49) and the prevalence of two and triple parasites was 10% (n=20).

A total of eight different intestinal parasite species were diagnosed. As shown in table 3, the most common protozoan species were *Blastocystis hominis* with 15 (7, 5%) pure, 9 (4, 5%) double and 5 (2,5%) triple infections. *Giardia intestinalis* with 14 (7%) pure, 8(4%) double and 3 (1,5%) triple infection. The helminthes parasite were *Enterobius vermicularis* with 4 (2%) pure, 2 (1%) double and 1(0,5%) triple infection. *Ascaris lumbricoides* with 2 (1%) pure 3 (1, 5%) double and 1 (0,5%) triple infections.

The distribution of monoparasitism in the positive sample shows that *Blastocystis hominis* was the most common pathogen isolated in 21, 7 % children, followed by *Giardia intestinalis* in 20,3 % and *Entamoeba coli* with 10,1 %. Others helminthes parasites included on the first *Enterobius vermicularis* with 5,8% cases, the second was *Ascaris lumbricoides* in 2,9% and the third one was *Taenia saginata* with 2,9% (Table 3).

Table 3: Prevalence of intestinal parasites and the distribution in the positive samples

	Species	Number of positive sample	Prevalence (%) (n= 69)	Prevalence (%) (n=200)
Monoparasitism	*Entamoeba coli*	7	10,1	3,5
Protozoa	*Entamoeba histolytica*	4	5,8	2
	Giardia intestinalis	14	20,3	7
	Blastocystis hominis	15	21,7	7,5
	Subtotal of protozoa	**40**	**57,97**	
Helminthes	*Ascaris lumbricoides*	2	2,9	1,0
	Enterobius vermicularis	4	5,8	2,0
	Strongyloides strercoralis	1	1,4	0,5
	Taenia saginata	2	2,9	1,0
	Subtotal of Helminthes	**9**	**13 ,04**	
Polyparasitisme	*B. hominis*, *A. lumbricoides*	1	1,4	0,5
Double	*B. hominis*, *E. coli*	2	2,9	1,0
	B. hominis, *G. intestinalis*	4	5,8	2,0
	E .coli, *E. vermicularis*	1	1,4	0,5
	B. hominis, *T. trichiura*	1	1,4	0,5
	Endolimax nana, *E. histolytica*	1	1,4	0,5
	B. hominis, *E. vermicularis*	1	1,4	0,5
	G. intestinalis, *E. nana*	1	1,4	0,5
	G. intestinalis, *A. lumbricoides*	2	2,9	1,0
	G. intestinalis, *E. vermicularis*	1	1,4	0,5
Triple	*B. hominis*, *E. coli*, *E. nana*	2	2,9	1,0
	B. hominis, *G. intestinalis*, *E. nana*	1	1,4	0,5
	B. hominis, *G. intestinalis A. lumbricoides*	1	1,4	0,5
	B. hominis, *G. intestinalis*, *E. vermicularis*	1	1,4	0,5
	Subtotal mixed infections	**20**		
	Total of positive sample	**69**		

4 DISCUSSION

In Morocco, despite of the fact that several studies have reported the prevalence of intestinal parasites among the children population **[7], [8], [9]**, this is still little information the correlation between the infection and the socioeconomic status as a risk factors among the children. Unfortunately, there is no recent published study concerning this prevalence within general population in our country.

In the present study, intestinal parasites were detected in 34,5% of all the stool samples examined. Other Moroccan studies have reported prevalence ranging from 23% in Marrakech province **[9]**, 57% in Tiflet province **[7]** and 68% in Kénitra province **[8].** Compared to other north African Mediterranean countries, the prevalence remains higher than those observed in Algeria (28,84%) **[12]** and in Tunisia 25,09% **[13].** Nevertheless, prevalence rate reported for countries must be taken with caution since a standardized assay as sampling procedure and diagnostic methods were not used in each study and the rates of infection may vary **[14]**. Furthermore, the variation in the prevalence rate depends upon various geographic condition and socioeconomic factors related to the population **[15]**.

Indeed in this survey, the impact of the age on the prevalence of intestinal parasites is statically significant. Similar results were reported by **[16], [17].** Whereas, others studies have indicated the opposite finding. The reference **[8]** and reference **[18]** reported there is no significant associated between the age and the parasitic infections. However, the high proportion was found in the age more 11 years. This could be due to more outdoor activities (playing) in this age group compared to younger children playing inside the house and depending for latrine care **[19]**.

On the other hand, our works reveal a higher prevalence of infection in females compared with male's prevalence. This result is statically significant; it's in agreement with previous study reported by **[20]**. In contrast, to previous study reported in south of Togo **[21]**; in Pikine **[22]** and in Nepal **[23]**. The presence of this association would be explained to equal exposition

to environmental or behavioral factors **[23]** . In general, the female have more soil contact during growing vegetables and eat raw vegetable with prepared food more often than males.

The identification of the intestinal parasites among the positive samples showed the High prevalence of protozoan 57,97% compared to helminthes 13,05%. This result endorses the previous report from others regions of Moroccan, it showed the predominant of Protozoa with 57.7% than Helminthes which were present in 26% among schoolchildren **[24].** Studies conducted in Algeria and Tunisia, countries neighboring Morocco, have found also the higher prevalence of protozoa compared to helminthes parasites infections **[25, 12]**. However**, [26]** reported the high prevalence of helminthes (72,3%) compared with protozoan infections (27,7%). This result may be explained by the weather conditions which have a positive impact on biological cycle of the helminthes species and more the auto infestation lead to longevity of these parasites.

Among **200** stool sampled, the most common parasitic infection in this study was *B. hominis* followed by cyst of *Giardia intestinalis*. This is in line with other studies conducted by **[12]** among children aged between 0 to 15 years. The same results was reported by reference**[8]**.. This is also in line with other studies conducted from other parts in Morocco like Kénitra province which reported a higher prevalence of *Giardia intestinalis* and cyst of *Entamoebe histolytica* as the commonest isolate within school children **[8]**. These protozoa are transmitted by the faecal-oral route and both are environmental contaminants of the water supply **[27].**

The most helminthes infection in our study was *Ascaris lumbricoides* followed by *Enterobius vermicularisan* and *Taenia saginata*. The low prevalence in this latest parasite may be due to the practice or habit of eating cooked meat in Morocco. Furthermore, the presence of *Enterobius vermicularis* worm or children reflects the risk of direct transmission through dirty hands or by indirect objects and / or contaminated food.

In the current survey, hand washing before meals or after defecation was found to be significantly linked to the prevalence of parasitic infection (p<0,05). Similar findings showed by the study done in Iran **[19]** and in Nepal **[23]**. In contrast, Wondemann's reported in Cuban a negative association between hand washing and infections **[28].** This may be due the lack of the knowledge of the transmission of the parasites or the lack of awareness regarding health and hygiene habits among mothers.

Our findings revealed that there was statistically significant between intestinal parasitic infection and the family size. These results are in agreement with previously published report **[29], [8].** The relationship between the prevalence of intestinal parasitic and the family size with higher prevalence not always significant in others countries such as in south Africa and in Brazil where the family size is not statically significant **[30], [31].** Many authors reported that increased number of household members and overcrowded conditions are associated with higher frequency of parasitic infection, presence of five members or more in the family increased the risk of infection may be attributed to the close contact within the crowded houses and lead to increasing risk of intra-family transmission **[29], [30], [32].**

The major limitation of the current study was a low sample. The assessment would have been more valuable if a higher child sampled could have been obtained. But, it was thought that the results were still important because there is little knowledge on the data of the region. However, this is the first study in the region to provide comprehensive information related the prevalence of intestinal parasites with the socio-economic factors among children, suggest the necessity for further study to investigate in large sample allowing a better understanding of the risk factors associated with intestinal parasites should allow the effectiveness of control measures to be improved.

5 CONCLUSION

The prevalence of overall intestinal parasitic infestation was high among children in salé province in Morocco. Poor hygiene and sanitary condition are supposed to play important role in establishing intestinal parasitic infections. The Health education regarding hygienic practices in the school at primary levels can have substantial effect in prevention of intestinal parasites among the children.

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