International Journal of Innovation and Applied Studies
ISSN 2028-9324 Vol. 24 No. 2 Sep. 2018, pp. 453-458

http://www.ijias.issr-journals.org/

Prevalence of enterobiasis among urban school children in *Sidi-bel-Abbes,* Algeria

Yassine Merad[1], Amine Merbouh[2], Khadija Benallal[3], Soumia Belfodel[1], and Haiet Adjmi-Hamoudi[1]

[1]Department of Parasitology-Mycology,
UDL University, Hassani Abdelkader Hospital,
Sidi-Bel-Abbes, Algeria

[2]Department of Epidemiology and Preventive Medicine,
UDL University, Hassani Abdelkader Hospital,
Sidi-Bel-Abbes, Algeria

[3]Department of Pediatrics,
UDL University, Hassani Abdelkader Hospital,
Sidi-Bel-Abbes, Algeria

ABSTRACT: Entrobiasis is a nematode infection caused by *Enterobius vermicularis*, there have been no reports on the infection rates of enterobiasis in *Sidi-Bel-Abbes* city. A cross-sectional study among schools in 10 districts was conducted in order to estimate the prevalence of this infection among preschool and school children less than 8 years of age, between April and June 2017. A total of 300 samples were examined microscopically for the presence of worm eggs collected by touching transparent tape to anal area. The overall prevalence of enterobiasis was 17,67%, and girls (26,5%) showed more infection rate compared to boys (16,92%), the prevalence of infection with age of 5 and 6 years old (23,4% and 25% respectively) was more than 7 years old children (13,43 %), prevalence of sucking thumb or fingers was 41,51%. Prevalence of enterobiasis has decreased by increasing the daily hand-washing frequency, cleaning hands one time (36,84%), two times (23,96%), three times (17,07%). When analyzing the association between the presence of enterobiasis and each variable separately, the only one showing statistically significant association was sucking thumb (p=0,019) and the symptoms of pruritus ani, abdominal pain, enuresis and insomnia (p=0,0001 respectively). Prevalence of *E.vermicularis* is relatively high and should not be underestimated.

KEYWORDS: *Enterobius vermicularis*, *oxyuriasis*, prevalence, children, enterobiasis, pinworm, school, Algeria

1 INTRODUCTION

Enterobiasis is certainly one of the most common human helminth infections in the throughout the world caused by the pinworm, *Enterobius vermicularis*, particularly in temperate climates, with an estimate of 1000 million cases worldwide [1].

The principal mode of transmission is direct contact between infected and uninfected persons, from anus to fingers that normally happens in children. For this reason, this infection is prevalent among primary school children who are easily exposed to overcrowded conditions and inadequate sanitation, and who actively contact each other [2],[1]. Besides, disease is easily transmitted among family members via contaminated hands, fomites and inhalation of eggs is considered another route of infection [3].

The number of young children being cared for at preschool is increasing because their mothers may be employed, or parents want their children to play and be educated in a well-organized educational system. Nevertheless, the majority of *E. vermicularis* infections in children probably occur in overcrowded facilities and reinfection is frequent, so authors suggested that mass screening is effective for eradication of enterobiasis [4],[3]

Corresponding Author: Yassine Merad

However, we have not found any literature about the prevalence of enterobiasis in Algeria, especially there have been no reports on the infection rates of *E. vermicularis* in Sidi-Bel-Abbes city.

This study was designed to not only to determine the current status of enterobiasis among preschool and school children in Sidi-Bel-Abbes but also the associated risk factors with this infection.

2 MATERIAL AND METHODS

2.1 STUDY AREA AND POPULATION

Sidi-Bel-Abbes (35° 11' 38" north, 0° 38' 29" south), is a town on the west of Algeria. The total population is composed by 212935 inhabitants (2008). This area has a particular geographical condition, characterized by a semi-arid climate dry and cold.

A total of 10 districts of *Sidi-Bel-Abbes*, were involved in this study during October and December 2017, out of the 10 schools 300 preschool and school children less than 8 years of age, have been assessed for the presence of *E. vermicularis* (Fig. 1; Table 1).

2.2 QUESTIONNAIRE SURVEY

Before collecting samples, a questionnaire was performed among the students that involved in the study and 300 students were contributed, the questionnaire form included 10 questions about socio-economical features of students (low, average, good), behavioural characteristics (sucking thumb, hand-washing frequency), and clinical symptoms (abdominal pain, anal itching, enuresis, insomnia), class teachers had given support for the completion of this questionnaire.

2.3 PARASITOLOGICAL SURVEY

After obtaining informed consent, 300 children in these schools were examined using the cello-tape anal swab technique (one smear per child), for the presence of *E. vermicularis* eggs. Skilled laboratory technicians collected samples. Anal swabs were transported to the Department of Parasitology of "*Hassani Abdelkader*", *Sidi-Bel-Abbes* (Algeria), and were examined immediately using a light microscope at 10X-40X magnifications.

Detection from the perianal region is significant, because egg positivity indicates a high probability of infection in the intestine [5]. The children with enterobiasis were notified to their teacher.

2.4 STATISTICAL ANALYSIS

Data were managed and analysed using statistical software SPSS 17.0 (SPSS, Inc., Chicago, IL). Rates were compared by the Chi-square test with respect to locality, age, sex and behavioural characteristics. A p Value<0,05 was considered to be statistically significant.

3 RESULTS

A total of 53 (17,67%) of the 300 samples were positive for *E. vermicularis* eggs. To determine the difference, the localities (schools) were compared individually. The egg positive rate ranged from 3,6% to 34,5% by location (Table 1; Fig. 1).

The prevalence in girls (26.5%) was higher compared to boys (16.92%), but there was not significant relation between eggs presence and gender (P = 0.02) (Table 2). No significant differences in egg positive rates according to age were observed in boys and girls (Table 2).

The only risk factor showing statistically significant association with enterobiasis was sucking thumb (p=0,019) and the symptoms of pruritus ani, abdominal pain, enuresis and insomnia were linked to enterobiasis as depicted in the tables 2 and 3.

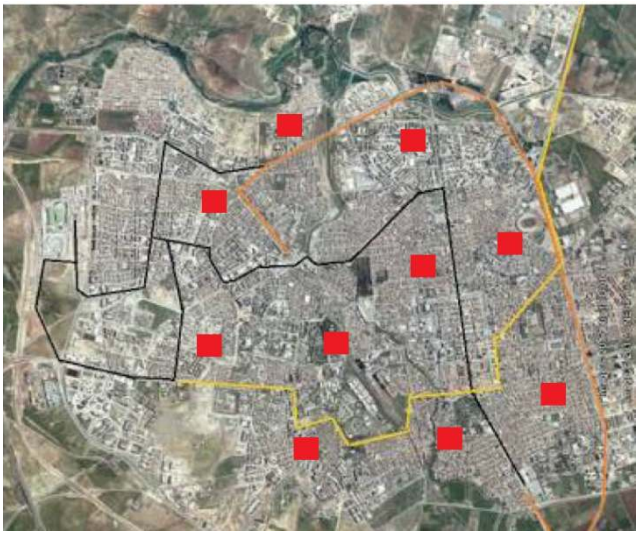

Fig. 1. Map of Sidi-Bel-Abbes city showing the 10 schools surveyed

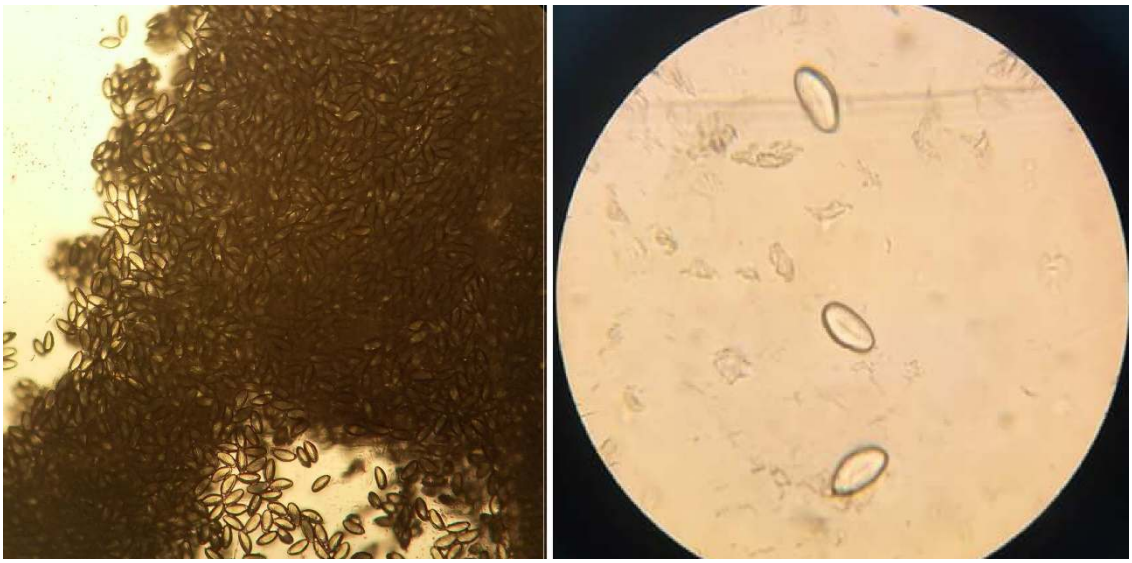

Fig. 2. Enterobius vermicularis eggs microscopy from school children detected by scotch-tape technique (X10 and X40)

Table 1. Prevalence of enterobiasis among preschool and school children in the 10 districts of Sidi-Bel-Abbes

Location	Number of positive cases	Prevalence
rue de Soleil	10	34,5%
Labrimère	9	30,0%
village bira	6	20,0%
Sidi-Djilali	6	19,4%
Adim fatiha	5	16,7%
Lamacta	6	14,6%
Faubourgs thiers	4	13,3%
Sorecor	4	13,3%
Rocher	2	9,5%
Wiam	1	3,6%
Total	53	17,6%

Table 2. Children's socio-economical background and behavioral practices in relation with enterobiasis

Variable		number of positive	number of examined	egg positive rate (%)	P value
Sex	**female**	31	148	20,95%	0,412
	male	22	152	14,47%	
Age	**5**	22	94	23,40%	0,413
	6	21	84	25,00%	
	7	9	67	13,43%	
Hygiene	**poor**	15	57	26,32%	0,055
	average	27	145	18,62%	
	good	11	98	11,22%	
Number of siblings	**0**	3	27	11,11%	0,397
	1	17	75	62,96%	
	2	11	76	40,74%	
	>3	22	121	18,18%	
Number of hand wash/day	**1**	14	52	26,92%	0,135
	2	23	119	19,33%	
	3	14	96	14,58%	
	4	2	31	6,45%	
Sucking thumb	**No**	31	215	14,42%	0,019
	Yes	22	85	25,88%	

Table 3. Clinical symptoms observed in school children and their relation with enterobiasis

Symptoms		number of positive	number of examined	egg positive rate (%)	P value
pruritus ani	No	7	222	3,15%	0,0001
	Yes	46	78	58,97%	
Enuresis	No	18	203	8,87%	0,0001
	Yes	35	97	36,08%	
abdominal pain	No	24	227	10,57%	0,0001
	Yes	29	73	39,73%	
Insomnia	No	21	222	9,46%	0,0001
	Yes	32	78	41,03%	

4 DISCUSSION

The present survey was performed to determine the status of *E. vermicularis* infection among preschool and schoolchildren living in *Sidi-Bel-Abbes*, and the study demonstrates a relatively high prevalence (17,67%) of *E.vermicularis*, in agreement with other reports from Korea (18,5%) and Turkey (22,2%) [3],[6].

Furthermore, researchers from different countries revealed the prevalence of parasite as 5.2% in Greece, 10,5-22,2% in Turkey [7],[6], 12.15% in Poland and 13.4% in Italy [8],[9]. Besides that, the studies from eastern countries revealed the rates were 7,8-17,5% in Korea, 22,2-33.8% in Iran, 35.7% in China and 41.6% in Thailand [10],[11],[12],[13],[14].

Regarding gender of examined individuals, girls (26,5%) showed more infection rate compared to boys (16,92%), in accordance with other studies conducted in Irak and Mongolia [15],[16], the high rate of infection between the female is likely to be connected with their daily housework, contact with bed sheet and cloth for infected persons of family. The infection rate for boys was not statistically different than girls (p>0,05), in agreement with the studies of Chen et *al.* [17] and Amiri et *al.* [12], In contrast, Park et *al.* found that the egg positive rate for boys (21.3%) was significantly higher than that of girls (15.4%) (*P* = 0.02) [3].

The prevalence of infection with age of 5 and 6 years old (23,4 and 25% respectively) was more than 7 years old children (13,43 %), this high percentage of infection in younger children indicates the fact that younger children do not have enough knowledge about preventing infection. Usually, children are considered as the main targets, because of this fact that children's behaviours contribute more to the development of *E. vermicularis* infection compared to adults [3]. Children in this age group

contact each other more frequently in primary schools than children of other ages, and are also exposed to unsatisfactory sanitary environments [14].

However, positive rates were not significantly dependent on age, this result is in accordance with those recorded in schools from Nepal and Turkey [18],[3], suggesting similar risk conditions for all individuals [19], in another hand, Requena et *al.* [20] in Venezuela and Li et *al.* [21] in China reported significant associations between age and enterobiasis.

Remarkable differences in egg positive rates were observed in different localities as shown in the Table 1, generally pinworm infection is the predominant disease in areas and communities where environmental conditions, socio-economic, and hygiene practice levels are low. Such results can be attributed to poor public sanitation in some localities, and the exposure to a contaminated environment, particularly among children playing on the floor [14],[5],[22], [23]. However, our results showed that the prevalence of enterobiasis with hygiene was statistically insignificant, in agreement with Amiri et *al.* [12]. In contrast, Degerlli et *al.* reported a high significant correlation between hygiene and enterobiasis [6], and Chen et *al.* found a significantly higher egg positive rate in children with low educational level [17].

Other risk factors among children include a failure to wash hand correctly before meal or after using toilet facilities, or a lack of hand washing [23],[17],[22], we found that the prevalence of enterobiasis has decreased by increasing the daily frequency of hand-washing but there were no statistically significant association with enterobiasis as shown in Table 2.

Infection may occur in the family through their school-age sibling [17]. However, we didn't found a significant relation between egg positive rates and number of sibling. Furthermore, Afrakhteh et *al.* found that enterobiasis was more important in larger families than small ones, but in the analytic study no relation was seen between infection rates and sibling [23],[12]

When analyzing the association between the presence of enterobiasis and each variable separately, the only one showing statistically significant association was sucking thumb (p=0,019), pinworm eggs have been reported from fingers, bedclothes and briefs [25], nail-biting or sucking thumb or/and fingers is a major risk factor for enterobiasis, these finding indicate that finger-oral route remains the most important avenue for enterobiasis contamination [23],[17].

Usually, the majority of infections are asymptomatic, enterobiasis is a disease with mild symptoms such as, perianal itching and dermatitis; it is asymptomatic in most individuals who have low worm burdens. However, in children, particularly who have heavy worm burdens, neurological symptoms including nervousness, restlessness, and irritability, along with enuresis are reported [2],[1],[3], Very rarely, pinworms will penetrate into the wall of the colon, in the retrocaecal tissues, and on the peritoneum. In the present study anal itching was the most important symptom, followed by insomnia, abdominal pain and enuresis, there were a very significant association between those symptoms and enterobiasis (p=0,0001 respectively). Moreover, enuresis in primary school children was found to be a significant risk factor for enterobiasis in Turkey [6].

5 CONCLUSION

The findings indicated that the prevalence of *E. vermicularis* in preschool and primary school children is relatively high in the surveyed areas of *Sidi-Bel-Abbes*, and may pose an important health problem and should not be underestimated due to being highly contagious infection. Therefore, educational programs should be carried out in order to reduce infection incidence in this area and regular parasitological test and attention to personal hygiene preschool is of great importance.

Thus, school-based mass control activities are likely to be more effective than individual treatment. Moreover, sucking thumb is a real risk factor of enterobiasis in school population and indicates the need for efforts to prevent this highly contagious infection.

ACKNOWLEDGMENT

We would like to thank all the staff of all schools and the parents of students for their cooperation in this work.

REFERENCES

[1] Cook GC. "*Enterobius vermicularis* infection". *Gut.* 1994 Sep; 35(9):1159-1162

[2] Beaver PC, Jung RC, Cupp EW (1984) *Clinical Parasitology 9th ed*. pp302-306, Lea & Febiger, Philadelphia, USA

[3] Park JH, Han ET, Kim WH, Shin EH, Guk SM, Kim JL and Chai JY. A survey of *Enterobius vermicularis* infection among children on western and southern coastal islands of the Republic of Korea.*The Korean Journal of Parasitology* Vol. 43, No. 4. 129-134, December 2005

[4] Yang YS, Kim SW, Jung SH, Huh S, Lee JH (1997) Chemotherapeutic trial to control enterobiasis in schoolchildren. *Korean J Parasitol* 35: 259-265

[5] Cho SY, Kang SY. Significance of scotch-tape anal swab technique in diagnosis of Enterobius vermicularis infection. *Kisaengchunghak Chapchi.* 1975 Dec;13(2):102-114

[6] Değerli S, Malatyali E, Ozçelik S, Celiksöz A. Enterobiosis in Sivas, Turkey from past to present, effects on primary school children and potential risk factors. *Turkiye Parazitol Derg* 2009;33:95-100.

[7] Gurses N, Ozkan Y, Peksen Y, Uysal S, Aydin M. Intestinal parasites in primary schools of different socioeconomic status and environmental conditions. *Mikrobiol Bul* 1991;25:57-62

[8] Bitkowska E, Wnukowska N, Wojtyniak B, Dzbeński TH, 2004. Occurrence of intestinal parasites among first grade students in Poland in years 2002/2003. *Przegl Epidemiol,* 58(2):295-302.

[9] Crotti D, D'Annibale ML, 2006. Enterobiosis during 2002 2003 in Perugia Province: Beyond diagnostics. *Infez Med,* 14(2): 92-98.

[10] Heidari A, Rokni M, 2003. Prevalence of intestinal parasites among children in day-care centers in Damghan – Iran. *Iranian J Publ Health,* 32(1):31-34.

[11] Rim HJ, Chai JY, Min DY, Cho SY, Eom KS, Hong SJ, Sohn WM, Yong TS, Deodato G, Standgaard H, Phommasack B, Yun CH, Hoang EH, 2003. Prevalence of intestinal parasite infections on a national scale among primary school children in Laos. *Parasitol Res,* 91(4): 267-272.

[12] Amiri SAN, Rahimi MT, Mahdavi SA, Moosazadeh M, Ramzani O, Koshk AF, Rosbehan R, Siyadatpanah SA. Prevalence of *Enterobius vermicularis* infection among preschool children, Babol, north of Iran. J Parasit Dis (Oct-Dec 2016) 40(4):1558-1562

[13] Wiwanitkit V, Suyaphan A, Thiamtip S, 2004. Very high prevalence of Enterobiosis among the hilltribal children in rural district "Mae Suk," Thailand. *Med Gen Med*, 6(2): 5.

[14] Kim BJ, Lee BY, Chung HK, Lee YS, Lee KH, Chung HJ, Ock MS. Egg positive rate for Enterobius vermicularis of primary school children in Geoje island. *The Korean J of Parasitol,* Vol 41, No. 1, 75-77, March 2003

[15] Ali AA, Almayah QS, Abdul Razak MS, Al-Saadi MAK. Impact of enterobiasis on some physical & hematological indices among children in Irak-Babylone province. *International Journal of Current Microbiology and Applied Sciences,* Volume 3, No.2 (2014) pp.81-87

[16] Lee DS, Chung BH, Lee NS, Nam HW, Kim JH. A survey of helminthic infection in the resident of rural areas near Ulaanbaatar, Mongolia. *Korean J Parasitol.,* 1999, 373:145-147

[17] Chen KY, Yen CM, Hwang KP, Wang LC. Enterobius vermicularis infection and its risk factors among pre-school children in Tapei, Taiwan. *J of Microbiol, Imm and Infect* (2018) 51, 559-564

[18] Khadkha K, Maharjan M. Pinworm (Enterobius vermicularis) infection among primary level government school children of Chhampi, Lalitpur district, Nepal. *National Journal of Health Sciences*, 2018, 3, 46-50

[19] Acosta M, Cazoria D, Garvett M. Enterobiasis among schoolchildren in a rural population from Estado Falcon, Venezuela, and its relation with socioeconomic level. *Invest Clin.* 2002 Sept ;43(3) :173-61

[20] Requena I, Jiménez Y, Rodríguez N, et al. [Enterobius vermicularis in preschool children from a suburban area in San Félix, Bolívar State, Venezuela]. *Invest Clin* 2007;48:277-86. In Spanish.

[21] Li HM, Zhou CH, Li ZS, et al. Risk factors for *Enterobius vermicularis* infection in children in Gaozhou, Guangdong, China. *Infect Dis Poverty* 2015;4:28.

[22] Moosazadeh M, Abedi G, Afshari M, Mahdavi SA, Farshidi F, Kheradmand E. Prevalence of *Enterobius vermicularis* among children in Iran: A Systematic Review and Meta-analysis. *Osong Public Health Res Perspect* 2017;8(2):108–115

[23] Sung JF, Lin RS, Huang KC, Wang SY, Lu YJ (2001) Pinworm control and risk factors of pinworm infection among primary-school children in Taiwan. *Am J Trop Med Hyg* 65:558-567

[24] Afrakhteh N, Marhaba Z, Mahdavi SA, Garoosian S, Mimezhad R, Eshkevar Vakili M, Ahmadi Shahraj H, Javadian B, Rezaei R (2015) Prevalence of *Enterobius vermicularis* among Kindergartens and preschool children in Mazandaran province, north of Iran. *J Parasit Dis* 39(2);1-3

[25] Wu CG, Xie J, Luo XJ, Lei QJ, Liu QR, Xiao BZ, et al. Influence factors of Enterobius vermicularis infection among pupils in Chongqing city. *Chin J Parasitol parasit Dis* 2012 ;30:382-6.