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Prevalence of Oxyuriasis and its Influencing Factors in Elected Kindergartens in Ali Abad-e-Katoul, North of Iran

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Abstract

Background: Enterobius vermicularis (formerly Oxyuriasis vermicularis), is a prevalent parasitic infection especially in preschool children worldwide. The present study aimed to explore the prevalence of Oxyuriasis and its influencing factors in kindergartens.

Materials and Methods: A cross-sectional study was conducted on 175 children using multi-stage sampling method in Ali Abad-e-Katoul city- Iran in 2015 year. Data were collected using a three-part demographic questionnaire including personal characteristics, predisposing factor of infection, and clinical symptoms. Possibility of infection was tested by Graham method. Data were also analyzed using SPSS software (version 18). Significant level was also considered significant as <0.05.

Results: The mean age of students was 6.30 ± 0.46 years. In total, 175 samples including 96 (54.9%) female were explored, and 109 (62.3%) of samples were lived in the rural areas. Oxyuriasis prevalence was 34.9% in 61 children. Logistic regression model indicated that rural children had 2.62 times greater chance to infect by Oxyuriasis than children of the urban area (Odds Ratio [OR]: 2.62; Confidence Interval [CI]: 1.17 - 4.83, P<0.05). A history of bruxism increases chance of Oxyuriasis infection 2.02 times than children with no symptom (OR: 2.02; CI: 1.03 - 3.95, P<0.05).

Conclusion: Oxyuriasis vermicularis infection was more prevalent than most of studies conducted in the country (Iran) and in the rural children. Hence, appropriate interventions to reduce the infection especially among rural children through parents education and group treatment in the kindergartens seem likely lucrative.

Key Words: Bruxism, Children, Enterobiasis, Iran, Rural areas, Oxyuriasis.

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1- INTRODUCTION

Enterobius vermicularis is an intestinal worm infection that spreads through soil and contact especially and also is a prevalent parasitic infection in tropical and subtropical countries (1,2) with a prevalence of 4-28 % in children across the world (3). Mature pinworms lives in the mucosa of the cecum, ascending colon and intestine. After fertilization the male worm dies and the female worm migrates to the anus and hatches more than ten thousand eggs in the anal sphincter especially at night. Importantly, seeds have sticky surface that allow them to not only stick to the skin, but also stick to the toys and clothes (4, 5). Parasite infection begins with ingestion of eggs that might be likely caused by self-devouring eggs or transfer from one person to another (2) , hence parasite can be transferred directly or indirectly through hands, clothes, bed sheets, and toilet (2).

Infection with this worm is usually asymptomatic and anal itching is also a common clinical symptom; in addition, secondary bacterial infection may also be observed due to scratch. Insomnia, restlessness and irritability may be occurred because of scratch; moreover, great pinworms can migrate to the appendicitis or genitourinary tract and cause consequently the appendicitis and urinary as well as reproductive problems (2, 6, 7).

A remarkable number of children also suffer from anorexia and loss their weight. Other symptoms also occur including emotional instability, bed-wetting, nausea and vomiting, abdominal pain and bruxism (4). In some rare cases, parasite causes Extra-intestinal enterobius in the kidneys and fallopian tubes that seriously affects a person's health and even causes death (3, 4). This parasite is more prevalent in preschool age because of kid's activities and their close contacts with each other than adults, and also is more common in crowded places such as kindergartens (8).
The prevalence of parasite varies in different regions of Iran; in a review study conducted on 11,676 children reported prevalence of 1.2 to 66.1 %; in general, its prevalence estimated as 17.2% (9). In recent years, the prevalence of soil-transmitted parasites such as Ascaris, Hookworms and Trichuriasis has been remarkably dropped; while, Enterobius vermicularis is yet prevalent (5, 6).

A study conducted in China, stated that the most important factors for parasite prevalence in children (54.86 %) were low level of mother education and washing hands was not crucial before dinner that followed by other factors such as low education of fathers, pencil-chewing (toy-chewing) and play on the soil (7).

Observing the mature worms in the stool or detecting the parasite eggs by scotch tape method are two definitive diagnosis ways of the parasite. Since parasite eggs cannot be seen in the stool in more than ten percent of cases, the scotch tape and Graham methods are the best and surest ways to diagnose the eggs of parasite. The best time to run aforementioned tests is in the morning before going to the toilet and defecation (10, 11).

Single parasitism and self-transition ability increase the prevalence of parasite. It is not easily possible to identify the parasite, because of its complications, portability, high infection, asymptomatic patients. Oxyuriasis screening in schools merely implements based on symptoms and not based on standard tests; furthermore, as the vast majority of cases infection with this parasite are asymptomatic, and then it necessitates us to plan for prevention, diagnosis and timely treatment of children especially in the overcrowded places such as kindergartens. Prior to any plan for prevention and control of parasitic infection, the regional pollution must be specified. To the best of our knowledge,

there is no survey in terms of parasite infection and factors affecting the transmission of the parasite in children in the Ali Abad-e- Katoul city. Thus the current study was carried out to test the parasite prevalence and its effective factors in the kindergartens.

2- MATERIALS AND METHODS

2-1. Study design and Procedure

A cross-sectional study was conducted on 175 kindergarten children in Ali Abad-e-Katoul city, North of Iran, during April and July 2015 year. The current protocol was confirmed by the Golestan University of Medical Science at Research Review Board (ID number: 394592122525).

Cluster sampling method was used such that each kindergarten considered as a cluster. At first, a number of clusters were randomly selected (nine kindergartens from rural area and five kindergartens from urban area); in final, samples were selected randomly from clusters. Prior to survey, parents of children were asked to participate in the study after coordinating with kindergartens authorities. Aims of the investigation were presented in a session and informed consent was obtained from all participants.

2-2. Study instrument

A researcher-made checklist comprising 17 items (including age, gender, educational and occupation status, education of parents, predisposing factors of Enterobiasis such as washing hands, thumb-sucking and nail-biting habits, using personal cups and clinical symptoms of children was completed by mothers.

Prior to education, all mothers were aware of sessions through telephone a week before education and educated by a student in the laboratory sciences to collect smear samples before defecating in the morning with a Scotch tape (Graham's test).

To run Scotch test, a piece of tape was placed around the anal area, and removed and placed again on a slide. In final, collected lams were transferred immediately to the laboratory of parasitology of Golestan University of Medical Sciences and tested by an optical microscope.

Predisposing factors and clinical symptoms were answered in the form of yes and no. Parents informed if the test was positive to visit a doctor for treatment. The Scotch test was free and there was no charge to the families.

2-3. Sample size

According to a related study (12), **P**=4.6, **d**=0.02, and **α**= 0.05 as well as the following equation, the sample size was calculated as 175 students.

In this equation: **α** is Type I error, Probability of rejecting the null hypothesis when it is true. **Z** is the value from the table of probabilities of the standard normal distribution for the desired confidence level (Z = 1.96 for 95% confidence). **P** is the proportion of successes in the population, the range of P is 0 to 1, and therefore the range of P (1-p) is 0 to 1.

$$N = \frac{Z^2(1-\frac{\alpha}{2})P(1-P)}{d^2} = \frac{3.84 \times 0.345(0.655)}{0.005} \cong 175$$

$$z1-\frac{\alpha}{2} = 1.96;\ P = 0.345;$$
$$1\text{-}p = 0.655 \text{ and } d^2 = 0.005$$

2-4. Data analysis

Descriptive methods (frequency, mean, and standard deviation) were utilized to present demographic characteristics. To test normality of data, shapiro-wilk test was used. Chi-square and Fisher's exact tests were used to study qualitative variables. To explore the effective factors on Oxyuriasis, logistic regression model

was also conducted. To run logistic regression model, variables such as location, ethnicity, maternal education, history of bruxism, history of unsanitary food and insomnia were included in the model as independent variables. Significant level was also taken significant as <0.05.

3- RESULTS

The mean age of children was 6.30 ± 0.46 year with a range of 6 to 7 years. In general, 121(69.1 %) children were 6 years and the rest were 7 years old. Average number of children was 4.24 ± 0.79 years ranging from 3 to 7 children years old. In total, 96 (54.9%) of students were female and 109 (62.3%) was lived in the rural area; also, 168 mothers (96%) were housewives and most of parents had education less than diploma (**Table.1**).

Given 175 explored children, 61 children had Oxyuriasis with a prevalence of 34.9 %. The mean number of family in students with Oxyuriasis was 2.21 ± 0.77 and in healthy students was 4.26 ± 0.8. A significant relationship was not found between the two aforementioned groups (students with and without Oxyuriasis) (P=0.609). Furthermore, results showed that the prevalence of Oxyuriasis was greater in Turkmen ethnicity than non-Turkmen (P = 0.004).

Fisher's exact test showed a significant relationship prevalence of Oxyuriasis and parents education so that prevalence of parasite in children who had parents with university education were significantly lower than children those had parents with an academic education (P=0.006).

Although, the prevalence of Oxyuriasis was meaningfully higher in male than female children, but this difference was not significant (P= 0.07) (**Table. 1**).

The prevalence of the parasite was accordingly 38.8 and 25.9 % in 6 and 7 years old children that was not remarkable according to Fisher's exact test (P=0.099). In terms of personal hygiene, 165 (91.4%) of non-infected students and 10 (8.6%) of infected subjects washed their hands with soap. In addition, 63 (36%) and 28 (45.9%) of non-infected and infected students had unsanitary feeding, respectively **(Table. 2)**.

Chi-square test showed that bruxism was significantly higher in children who suffered from bruxism than healthy children (P = 0.027). Additionally, history of unhealthy nutrition was significantly higher in infected children than healthy children (P = 0.05). Infected children also experienced more insomnia than other children, but this difference was not considerable (P=0.068) (**Table.2**).

To find simultaneous effect of all questions on Oxyuriasis, logistic regression model was utilized. Logistic regression revealed that children living in the rural area had 2.62 times greater chance to infect by Oxyuriasis than children of the urban area (odds ratio [OR]: 2.62; confidence interval [CI]: 1.17 - 4.83, P= 0.018).

Students with bruxism experienced 2.02 times Oxyuriasis infection than children without symptom (OR: 2.02; CI: 1.03 - 3.95, P= 0.027).

Also, there was a significant relationship between the ethnicity (OR: 2.37; CI: 0.977- 5.790, P= 0.056) and consumption of unsanitary food (OR: 1.872; CI: 0.945- 3.709, P= 0.072) with Oxyuriasis prevalence.

The chance of infection was 2.37 times more in Turkmen children than non-Turkmen children; in addition, this chance was 1.87 times higher in children consumed unsanitary foods than other (**Table.3**).

Table-1: Frequency of demographic characteristics and infection with Oxyuriasis in children

Variables		Non-infected subjects		Infected subjects		P-value
		Number	Percent	Number	Percent	
Gender	Female	96	54.9	28	45.9	0.07
	Male	79	45.1	33	54.1	
Place of living	City	66	37.7	12	19.7	0.001
	Village	109	62.3	42	80.3	
Ethnicity	Fars	51	29.1	9	14.8	0.004
	Turkmen	84	48	37	60.7	
	Sistani	31	17.7	14	23	
	Other	9	5.1	1	1.6	
Mother's job	Housewife	168	96	60	98.4	0.424
	Employed	7	4	1	1.6	
Mother's education	Illiterate	4	2.3	4	6.6	0.006
	Primary school	29	16.6	25	41	
	Junior School	56	32	20	32.8	
	High school	54	30.9	11	18	
	Associate Degree	16	9.1	0	0	
	Bachelor	16	9.1	1	1.6	
Father's education	Illiterate	14	8	1	1.6	0.006
	Primary school	65	37.1	12	19.7	
	Junior School	46	26.3	19	31.1	
	High school	33	18.9	26	42.6	
	Associate Degree	9	5.1	2	3.3	
	Bachelor	8	4.6	1	1.6	

Table-2: The frequency of healthy behaviors, clinical symptoms and Oxyuriasis infection in children

Variables		Non-infected subjects		Infected subjects	
		Number	Percent	Number	Percent
Personal hygiene	Yes	165	94.3	56	91.8
	No	10	5.7	5	8.2
Parasitic infections	Yes	46	26.3	12	19.7
	No	129	73.7	49	80.3
Bruxism	Yes	80	45.7	35	57.4
	No	95	54.3	26	42.6
Anal itching	Yes	62	35.4	25	41
	No	113	64.6	36	59
Unsanitary feeding	Yes	63	36	28	45.9
	No	112	64	33	54.1
Washing hands with soap	Yes	165	91.4	55	90.2
	No	15	8.6	6	9.8
Using personal glass	Yes	122	69.7	43	70.5
	No	53	30.3	18	29.5
Fatigue	Yes	53	30.3	20	32.8
	No	122	69.7	41	67.2
Nail biting and sucking fingers	Yes	21	12	7	11.5
	No	154	88	54	88.5
Insomnia	Yes	18	10.3	10	16.4
	No	157	89.7	51	83.6

Table-3: Binary Logistic regression results for selected variables

Variables	Wald	S.E	B	Exp(B)	P-value	95%C.I for Exp(B)	
						Lower	Upper
Residency	5.563	0.408	0.963	2.620	0.018	1.171	5.831
Ethnicity	3.642	0.414	0.866	2.378	0.056	0.977	5.790
Bruxism	4.253	0.342	0.704	2.023	0.039	1.036	3.950
Unhealthy feeding	3.230	0.349	0.637	1.872	0.072	0.945	3.709
Constant	26.281	0.490	-2.512	0.081	<0.0001		

Wald: Wald test; SE: Standard Error; B: Beta; Exp: Odds Ratio; CI: Confidence interval.

4- DISCUSSION

At present, the prevalence of infection with E. vermicularis was 34.9 % in children that is beyond the most studies conducted in Iran. The infection rate was 7.8, 14.7, and 7.1 % in kindergarten of Dezfool (13), Kermanshah (14), and Amol (15) cities, respectively that are significantly less than the current survey. While, a study implemented in Babol city reported 33.3 % of infection (16) similar to the present investigation. The prevalence of infection varies in different parts of the globe. Adwan and Bdir study carried out in Palestine indicated 15.6-28.9 % of infection (17). Also, nine explorations in China showed the prevalence infection of 17.8% (18). The aforementioned infection in Myanmar (19), Sri Lanka (20) , and Malaysia (21) was accordingly 47.2, 6.2, and 12.5 %; moreover, in South Korea in 2008 and 2009 years was correspondingly 4.1 and 4.5 % among children aged 5-7 years (22).

However, the infection can be different across the world based on health facilities and socio-economic status. Therefore, it is recommended that necessary interventions and education implement to decrease the prevalence of infection. Conducting the group treatment among other members of family and children in the kindergarten appeared to be beneficial to prevent from re-infection that is well-documented as an appropriate treatment technique (23).

Parents must also be provided by necessary education for preventing infection and quick treatment. An interventional survey accomplished in South Korea revealed that the parasite infection decreased from 9.9 to 3 % three months after intervention and also diminished in 2.7% after six months (23, 24). In the current study, lodging and symptoms of bruxism were the most important predictors of the E. vermicularis infection. This means that children living in the rural area were 2.62 times more at risk of E. vermicularis city than children living in the urban region that may be likely caused by the fact that rural children play freely in the alleys with close contacts; therefore, parasite transfers easily from soil to them and among them. In many studies, prevalence in children living in the rural area was more than children living in the urban area. Rashid et al. study conducted in Bangladesh showed that prevalence was 25 and 4 % in the villages and cities, respectively. They attributed this difference to poor sanitation, poor life standards, low income and poor education of parents as well as early cessation of breastfeeding (25).

A study conducted by Norouzian et al. in Babol city (North of Iran) stated that children in the rural area were significantly more infected by parasite than children in the urban area (16). At present, bruxism

increased 2.02 times the chance of infection in E. vermiculari parasite. Of course, bruxism is a common and specific clinical symptom for infection that increases considerably the probability of infection. Then, bruxism is known as the outcome of infection with E. vermicularis parasite and not as the reason of infection. Unsanitary feeding and Turkmen ethnicity were other variables that increased significantly the infection in parasite.

Hence, parents must be provided by adequate information in terms of healthy diet of children. Ethnicity has been less studied in other studies, but the present Turkmen children were more inclined in infection compared with non- Turkmen children. It can be justified by the fact that the majority of Turkmen ethnicity lives in the rural area of Ali Abad-e- Katoul city; additionally as mentioned before, infection rate was higher in the rural areas.

4-1. Limitations of the study

The limitation of the current survey were as follow; cross-sectional results, collected data by self-report method (no observation of symptoms), no review of hand washing before eating food as well as income status, and disposal of domestic sewage and toilet that must be taken into account for generalizing of the results.

5. CONCLUSION

Findings presented that the prevalence of infection with E. vermicularis was higher than most of studies in the country and in the rural children. Additionally, infection was strongly higher in Turkmen children that necessitate us to consider this ethnicity more accurately. Thereupon, designing, implementation and evaluation of intervention to reduce the infection especially among rural children through parents education and group treatment in the kindergartens seem likely useful.

6- CONFLICT OF INTEREST: None.

7- ACKNOWLEDGMENT

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8- REFERENCES

1. Farrar J, Hotez P, Junghanss T, Kang G, Lalloo D, White NJ. Manson's tropical diseases: Elsevier Health Sciences; 2013.

2. Van Weyenberg S, De Boer N. Enterobiasis vermicularis. Video Journal and Encyclopedia of GI Endoscopy. 2013;1(2):359-60.

3. Bethony J, Brooker S, Albonico M, Geiger SM, Loukas A, Diemert D, et al. Soil-transmitted helminth infections: ascariasis, trichuriasis, and hookworm. The Lancet. 2006;367(9521):1521-32.

4. Knopp S, Steinmann P, Keiser J, Utzinger J. Nematode infections: soil-transmitted helminths and Trichinella. Infectious disease clinics of North America. 2012;26(2):341-58.

5. Kucik CJ, Martin GL, Sortor BV. Common intestinal parasites. American family physician 2004; 69(5):1161-1168.

6. Arca MJ, Gates RL, Groner JI, Hammond S, Caniano DA. Clinical manifestations of appendiceal pinworms in children: an institutional experience and a review of the literature. Pediatric surgery international. 2004;20(5):372-5.

7. Burkhart CN, Burkhart CG. Assessment of frequency, transmission, and genitourinary complications of enterobiasis (pinworms). International journal of dermatology. 2005;44(10):837-40.

8. Cook GC. Enterobius vermicularis infection. Gut. 1994;35(9):1159.

9. Moosazadeh M, Abedi G, Afshari M, Mahdavi SA, Farshidi F, Kheradmand E. Prevalence of Enterobius vermicularis Among Children in Kindergartens and Primary Schools in Iran: A Systematic Review and Meta-Analysis. Osong Public Health and Research Perspectives. 2016.

DOI: http://dx.doi.org/10.1016/j.phrp.2016.04.002.

10. Mandlle J, Bennett J, Dolin R. Principle and practice of infections disease. Philadelphia: Churchill–Livingstone; 2005.

11. Norhayati M, Noor Hayati M, Oothuman P, Azizi O, Fatmah M, Ismail G, et al. Enterobius vermicularis infection among children aged 1-8 years in a rural area in Malaysia. Southeast Asian journal of tropical medicine and public health. 1994;25:494-97.

12. Hazrati tapeh K,Salari S, Alavi S, Tankhai b.Prevalence of Enterobius vermicularis and its distribution factors among Urmia Kindergardens .Urmia Medical Journal . 2006;17(4):9-15.

13. Feiz Haddad MH, Kord E, Rafiei A, Feiz Haddad R. A Study on the Prevalence of Enterobius vermicularis in Kindergartens of Dezful City (Khuzestan Province, Iran), 2013. Journal of Medical Microbiology and Infectious Diseases. 2014;2(2):76-9.

14. Sha-Mohammadi Z, Ghahramani F, Mahboubi M, Jalilian F, Neiakane-Shahri M, Mohammadi M. Prevalence of Enterobius Vermicularis (pinworm) in Kermanshah city nurseries, using Graham: 2014. J Biol Today's World 2014;3:28-32.

15. Afrakhteh N, Marhaba Z, Mahdavi SA, Garoosian S, Mirnezhad R, Vakili ME, et al. Prevalence of Enterobius vermicularis amongst kindergartens and preschool children in Mazandaran Province, North of Iran. Journal of Parasitic Diseases. 2015:1-5.

16. Nourozian MB, Youssefi MR. Investigation of Oxyuriasis (Enterobios vermicularis) prevalence in kindergarten and primary school children of Babol city, Mazandaran, Iran 2009. Annals of Tropical Medicine and Public Health. 2013;6(1):20.

17. Bdir S, Adwan G. Prevalence of intestinal parasitic infections in Jenin Governorate, Palestine: a 10–year retrospective study. Asian Pacific Journal of Tropical Medicine. 2010;3(9):745-7.

18. Chen Y, Wang J, Zhu H, Zhu T, Zang W, Qian M, et al. Enterobius vermicularis infection status among children in 9 provinces/autonomous regions/municipalities of China. Zhongguo ji sheng chong xue yu ji sheng chong bing za zhi= Chinese journal of parasitology & parasitic diseases. 2013;31(4):251-5.

19. Chai J-Y, Yang SK, Kim JW, Choi S-L, Song G-Y, Jung B-K, et al. High Prevalence of Enterobius vermicularis Infection among Schoolchildren in Three Townships around Yangon, Myanmar. The Korean journal of parasitology 2015;53(6):771.

20.Gunawardena S, Gunatilleke H, Ismail M. Prevalence of Enterobius vermicularis infection among schoolchildren attending four selected schools in the Hambantota district of Sri Lanka. Sri Lankan Journal of Infectious Diseases. 2013;3(2).

21. Anuar T, Jalilah L, Norhayati M, Azlin M, Fatmah M, Al-Mekhlafi H. New insights of Enterobius vermicularis infection among preschool children in an urban area in Malaysia. Helminthologia. 2016;53(1):76-80.

22. Hong S-H, Jeong Y-I, Lee J-H, Cho S-H, Lee W-J, Lee S-E. Prevalence of Enterobius vermicularis among preschool children in Muan-gun, Jeollanam-do, Korea. The Korean journal of parasitology. 2012;50(3):259-62.

23. Kang I-S, Kim D-H, An H-G, Son H-M, Cho MK, Park M-K, et al. Impact of health education on the prevalence of enterobiasis in Korean preschool students. Acta tropica. 2012;122(1): 59-63.

24. Kim Y-H. Adolescents' smoking behavior and its relationships with psychological constructs based on transtheoretical model: A cross-sectional survey. International journal of nursing studies. 2006; 43(4):439-46.

25. Rashid AM, Rashid AS, Rahman A. Prevalence of intestinal parasitoses in urban and rural children of a developing country. Asian Pacific Journal of Tropical Biomedicine. 2011;1(2): S268-S70.