Journal of the Egyptian Society of Parasitology, Vol. 53, No.1, April 2023
J. Egypt. Soc. Parasitol. (JESP), 53(1), 2023: 71 – 74
Online: 2090-2549

VITAMIN D ESTIMATION IN GIARDIA LAMBLIA INFECTED PATIENTS IN UPPER EGYPT

By
HESHAM EBRAHIM OSMAN[1]*, MUSTAFA ABDOU HASSAN[2], MOHAMMED SAYED FARRAG AHMED[2], and NOHA SAMMER AHMED[1]
[1]Department of Medical Parasitology, Faculty of Medicine, Sohag University, and
[2]Department of Medical Parasitology, Faculty of Medicine, Al-Azhar University (Assuit Branch), Egypt (*Correspondence: drhishame_ibrahim@yahoo.com)

Abstract

Giardia lamblia is one of the parasites affecting gastrointestinal tract causing diarrhea. Recurrent diarrhea may be associated with decreased serum level of vitamin D. The present study determined the vitamin D level in *Giardia lamblia* infected patients and the relation between *G. lamblia* infection and vitamin D deficiency among patients with acute or chronic diarrhea selected from those attended Sohag University Hospitals clinics, from February 2021 to February 2022. A total of 192 patients with acute and chronic diarrhea selected from both sexes, 96 patients (62 rural, 34 urban) were *G. lamblia* positive with ages ranged from 3 to 63 years. Of the cross-matched 96/204selected control (59 rural, 37 urban) were negative for *G. lamblia*. Serum 25-OH vitamin D estimated by ELISA showed significant decrease in mean level in patients than in controls.

Key words: Patients, *Giardia lamblia*, diarrhea, 25-OH vitamin D

Introduction

Giardia duodenalis (also known as *G. lamblia* or *G. intestinalis*) is a protozoan parasite causing sporadic or epidemic diarrheal illness, as an important cause of waterborne and food-borne disease, daycare center outbreaks, and illness in international travelers (Dixon, 2021). High-risk groups include infants, young children, international adoptees, immunocompromised individuals, and patients with the cystic fibrosis (Zylberberg *et al*, 2017). Globally, Lanata *et al.* (2013) reported that it was the third most common agent of diarrheal disease in children <5 (after rotavirus and cryptosporidiosis), with >300 million annual cases.

Giardiasis symptoms begin as 2 to 5 loose stools (poop) per day with an increasing fatigue, diarrhea, gas, foul-smelling, stomach cramps or stomach pain, nausea, and dehydration, less common ones include mild fever, itchy skin, hives, and swelling of eyes and joints. By time, infection can cause weight loss and mal-absorption of fat, lactose, vitamin A, and vitamin B12, but some people are completely asymptomatic (CDC, 2021). Chronic giardiasis causes irritable bowel syndrome, chronic fatigue, cognitive impairent, and extra-intestinal manifestations while parasite shedding (Bartelt and Sartor, 2015).

Giardiasis is transmitted by the fecal-oral route, frequently through ingestion of contaminated water and food or person-to person transmission (Huang and White, 2006).

This study aimed to find out any correction between Vitamin D deficiency and giardiasis *lamblia* among the outpatients attended Sohag University Hospitals suffering from unknown diarrhea

Patients and Methods

This cross-sectional case control study was done over one year from February 2021 to January 2022 on outpatients from attended Sohag University Hospitals. They were 300 patients with acute and/or chronic diarrhea with ages less than 3 years, without history of vitamin D supplement, no rickets, negative history of kidney or liver diseases, and had no other causes of chronic diarrhea as mal-absorption syndrome, celiac disease, and ulcerative colitis

Stool samples: Morning samples were collected in labeled covered containers, fixed, concentrated and microscopically examined for *G. lamblia* diagnostic agent (El-Badry *et al,* 2017). They were divided into patients 96 (positive), and control 96/204 (negative).

Serum: Blood 2ml. was aseptically taken

and sera were separated as usual to be examined for vitamin D levels by ELISA kits (25 OH Vita D, Dia. Metra-06038-Spello, PG, Italy) after Charoenngam and Holick (2020).

Statistical analysis: Data were tabulated and analyzed by SPSS version 23.0 windows program. Variables were presented as mean ±SD, as well as frequencies and percentages. Chi square test compared vitamin D levels between groups. ANOVA and independent T tests determined association between patients and controls. Correlation co-efficient (r) test determined correlation between Vitamin D. level and socio-demographic & clinical variables. A p-value of < 0.05 was considered statistically significant.

Ethics approval: This study was approved by the local Ethics Committee, Faculty of Medicine, Sohag University, which agreed the Helsinki Rules (2008). IBR Registration Number: Soh-Med-21-02-17

Results

Participants' ages ranged from 3-63 years (34.95±17.87) without significant difference ($P > 0.05$). Most of patients were <10 years old, in rural areas, with significant male predominance in cases ($P < 0.05$), but without significance as to diarrhea. However, there was significant decrease in mean Vitamin D in cases than in controls ($P < 0.05$), particularly with low ages ($P< 0.05$). Also, there was significant difference between sexes as well as living areas.

Details were in tables (1, 2, 3, 4 & 5).

Table 1: Diagnosis of vitamin D deficiency.

Deficiency	<20 ng/mL = <50nmol/L
Insufficient	20-29 ng/mL = 50-75nmol/L
Normal	30-50 ng/mL = 75-125nmol/L

Table 2: Comparison between patients and controls as regard demographic data.

Variations	Patients (96)	Control (96/204)	P. value
(Range) Mean ± SD	(3-63) 34.95±17.87	(6-64)36.33±16.08	0.338
Ages: ≤10 years	56 (58.3%)	49 (51%)	0.122
11-29 years	29 (30.2%)	28 (29.2%)	
≥30 years	11 (11.5%)	19 (19.8%)	
Male	67 (69.8%)	45 (46.9%)	0.035*
Female	29 (30.2%)	51 (53.1%)	
Residence: Rural	62 (64.6%)	59 (61.5%)	0.414
Urban	34 (35.4%)	37 (38.5%)	

Table 3: Comparison between patients and controls as to Vitamin D level (ng/mL)

Patients	Patients (96)	Control (96)	P. value
(Range) M± SD	(5.7-32.2) 18.15±7.08	(9.2-39.6) 23.08±7.36	0.001*
Sufficient	15 (15.6%)	38 (39.6%)	0.021*
Insufficient	26 (27.1%)	27 (28.1%)	
Deficient	55 (57.3%)	31 (32.3%)	

Table 4: Correlation between vitamin D and ages

Vitamin D level	R	P. value
Patients ages	0.220	0.036*

Table 5: Relation between vitamin D level, and residence of patients

Vitamin D level	Rural	Urban	P. value
	(Range) Mean ± SD		
Patients	(6.2-28.3) 18.25±7.76	(7.9-32.2) 22.98±7.14	0.013*
Control	(9.2-38.1) 22.82±7.13	(9.7-39.6) 23.22±7.14	0.654

Discussion

Vitamin D is essential for overall health and strong as an important for bones, muscles, heart, lungs, and brain as a major impact on growth, and development of infants, children, and adolescents or into adulthood (El-Tawdy *et al,* 2017).

Saki *et al.* (2018) reported that chronic giardiasis decrease vitamin D levels, but increase liver enzymes. Bivona *et al.* (2019) reported that although vitamin D may influence malaria onset and progression, but without evidence on preventive or therapeutic efficacy. Tayeb *et al.* (2019) in Iraq found significance between toxoplasmosis and vitamin D deficiency. Martori *et al.* (2021) in Italy reported that vitamin D can be useful as a clinical marker, and decrease parasite load.

In Egypt giardiasis was documented in pediatric patients (El Shazly *et al,* 2006); zoonotic transmission from ruminants (Helmy *et al,* 2014) and cysts in water canals (El Shazly *et al,* 2007). Ahmad *et al.* (2020) reported that assemblage-specific amplification of genotypes (A, B & zoonotic E strains) led to predominantly *G. duodenalis* Assemblage A (45.7%), but Assemblage B and mixed A, & B infections were 31.4% & 22.8% of children, respectively, without E. They added that assemblage A was in children with diarrhea and abdominal cramps, but asymptomatic ones with positive stools had high frequency of assemblage B and mixed infections.

In the present study, of the 300 patients, 96 (32%) were positive for *G. lamblia* and a total of cross-matched 96 negative subjects were the controls. Patients' ages ranged from 3-63 (34.95±17.87) years, majority of them were 10 years or less, with significant difference between vitamin D level and ages (P< 0.05). This agreed with Dyląg *et al* (2014) in Poland who reported a high prevalence rate of vitamin D deficiency in children < 5 years old, and that children aged 1-5 must be monitored as to their vitamin D status. Besides, Thornton *et al*. (2013) in USA and Abed *et al*. (2014) in Egypt reported that Vitamin D deficiency increased in the school-aged children.

In the present study, there was significant male predominance (P= 0.035). This agreed with Hassam *et al*. (2019) in Dar esSalaam they reported that vitamin D associated with diarrhea was higher among males (70.2%) than females (29.8%). However, Abed *et al*. (2014) in Lower Egypt didn't find significant difference between males and females as to vitamin D status in children suffered from recurrent acute diarrhea. Dyląg *et al.* (2014) reported that children aged 1-5 (obese and non-obese) were at risk of vitamin D deficiency, as a consequence of its insufficient intake and that lack of appropriate supplementation mainly during autumn and winter than other seasons

In the present study, the majority of the patients were from rural areas, with significant decrease in vitamin D level among residents there than in urban patients (P< 0.05). This agreed with Al-Horani *et al*. (2016) in Jordan who found significant decrease in vitamin D level in patients from rural areas with poor socioeconomic levels. El-Desouky *et al*. (2020) in Egypt reported that most vitamin D deficiency cases were more in rural areas (85.3%) with low social class (55.9%) due to the low maternal education, low socio-economic status, lack of medical support and vitamin supply behavior. Nevertheless, Mogire *et al*. (2020) in African Countries reported that the urban life style patterns caused less amount of vitamin D absorption by the less in sun-light exposure in miserable hot days or less amount of the dietary vitamin D they took due to their feeding habits.

In the present study, there was significant decrease in mean levels of vitamin D between the patients and controls (P< 0.05). This agreed with Saki *et al.* (2018) in Iran, they reported that the plasma level of vitamin D in patients with giardiasis was significantly lower than in the healthy subjects (P <0.05). They concluded that chronic giardiasis significantly decreased in vitamin D level. Also, Hassam *et al*. (2019) reported that among the 53.7% vitamin D deficient (34%) were insufficient and (12.2%) had sufficient levels. Moreover, El-Desouky *et al.* (2020) reported that among 34/60 (56.7%) children suffered from the acute giardiasis diarrhea 13 (21.7%) of them with recurrences.

Conclusion

Vitamin D deficiency was more significant among giardiasis patients with recurrent acute and/ or chronic diarrhea. Young aged males in rural areas were at the risk of Vitamin D deficiency and giardiasis.

References

Abed, NT, Aly, NSM, Abdel-Gawad, ER, Ibrahim, SG, 2014: Vitamin D status in children with recurrent acute diarrhea. Int. J. Curr. Microbiol. App. Sci. 3, 11:858-68.

Ahmad AA, El-Kady AM, Hassan TM, 2020: Genotyping of *Giardia duodenalis* in childrden in Upper Egypt using assemblage-specif-

ic PCR technique. PLoS One 2020; 15 (10): e 0240119. doi: 10.1371/

Al-Horani, H, Abu Dayyih, W, Mallah, E, 2016: Nationality, gender, age, and body mass index influences on the Vitamin D concentration among elderly patients and young Iraqi and Jordanian in Jordan. https://www.ncbi.nlm. nih.gov/ pmc/articles/PMC4823503/

Bartelt, LA, Sartor, RB, 2015: Advances in the understanding of *Giardia*: Determinants and mechanisms of the chronic squeals. F1000Prime Reports 7:62-8.

Bivona, G, Agnello, L, Lo Sasso, B, Scazzone, C, Butera, D, *et al*, 2019: Vitamin D in malaria: Mo-re hypotheses than clues. Heliyon 2019 Feb. 6; 5(2):e01183. doi:10.1016/j.heliyon

CDC, 2021: Parasite - Giardia: General Information. https://www.cdc.gov/parasites/giardia/index. Html.

Charoenngam, N, Holick, MF, 2020: Immunologic effects of vitamin D on human health and disease. Nutrients 12:2097-104.

Dixon, BR, 2021: *Giardia duodenalis* in humans and animals: Transmission and disease. Res. Vet. Sci. 135:283-7.

Dyląg, H, Rowicka, G, Strucińska, M, 2014: Assessment of vitamin D status in children aged 1-5 with simple obesity. Rocz. Państwowego Zakładu Hig. 65, 4:325-30.

El-Badry, AA, Ghieth, MA, Ahmed, DA, Ismail, MAM, 2017: *Giardia intestinalis* and *Helicobacter pylori* co-infection: Estimated risks and predictive factors in Egypt. J. Egypt. Soc. Parasitol. 47, 1: 19-24.

El-Desouky, AI, El Shaffi, MM, Sharaf, SM, 2020: Association between vitamin D deficiency and recurrent acute diarrhea in children. Egypt. J. Hosp. Med. 79:538-43.

El Shazly, AM, Awad, SE, Sultan, DM, Sadek, GS, Khalil, HH, Morsy, TA, 2006: Intestinal parasites in Dakahlia governorate, with different techniques in diagnosing protozoa. J. Egypt. Soc. Parasitol. 36, 3:1023-34.

El Shazly, AM, Elsheikha, HM, Soltan, DM, Mohammad, KA, Morsy, TA, 2007: Protozoal pollution of surface water sources in Dakahlia Governorate, Egypt. J. Egypt. Soc. Parasitol. 37, 1:55-64.

El-Tawdy, AHF, Hemdan, MSA, Isa, WEA, Morsy, TA, 2017: A mini-overview of vitamin D. J. Egypt. Soc. Parasitol. 47, 3:493-504.

Hassam, I, Kisenge, R, Aboud, S, Karim-Manji, K, 2019: Association of vitamin D and diarrhea in children aged less than five years at Muhimbili National Hospital, Dar esSalaam: An unmatched case control study. BMC Pediatr. 19: 237-42.

Helmy, YA, Klotz, C, Wilking, H, Krücken, J, Nöckler, K, *et al,* 2014: Epidemiology of *Giardia duodenalis* infection in ruminant livestock and children in the Ismailia province of Egypt: Insights by genetic characterization. Parasit. Vectors 2014 Jul 11;7:321. doi: 10.1186/

Huang, DB, White, AC, 2006: An updated review on *Cryptosporidium* and *Giardia*. Gastroenterol. Clin. North Am. 35, 2:291-314.

Lanata, CF, Fischer-Walker, CL, Olascoaga, AC, *et al,* 2013: Global causes of diarrheal disease mortality in children <5 years of age: a systematic review. PLoS One 8:e72788.

Martori, C, Velez, R, Gállego, M, Mesa, I, Ferreira, R, *et al,* 2021: Vitamin d and leishmaniasis: Neither seasonal nor risk factor in canine host but potential adjuvant treatment through cbd103 expression PLoS Negl Trop Dis. 2021 Aug 16; 15(8):e0009681. doi: 10.1371/ journal

Mogire, RM, Mutua, A, Kimita, W, Kamau, A, Bejon, P, *et al,* 2020: Prevalence of vitamin D deficiency in Africa: A systematic review and meta-analysis. Lancet Global Hlth. 8, 1:e134-42.

Paul, S, 2011: Infectious Diarrhea from Wilderness and Foreign travel. In: Wilderness Medicine, 6th edition.

Saki, J, Arjmand, R, Etebar, H, 2018: Effect of chronic giardiasis on the status of vitamin D and risk of development type2 diabetes in patients referring to the clinical laboratory of Educational Hospitals of Ahvaz Jundishapur University of Medical Sciences. Jundishapur Sci. Med. J. 17, 5:457-65.

Tayeb, FA, Salman, YJ, Ameen, KM, 2019: The impact of *Toxoplasma gondii* infection on vitamin D3 levels among women in childbearing age in Kirkuk Province-Iraq. Open J. Med. Microbiol. 9, 4, DOI: 10.4236/ojmm.2019.94015

Thornton, KA, Marín, CA, Mora-Plazas, M, 2013: Vitamin D deficiency associated with an increased incidence of gastrointestinal and ear infections in school-age children. Pediatr. Infect. Dis. J. 6:585-93.

Zylberberg, HM, Green, PH, Turner, KO, Genta, RM, Lebwohl, B, 2017: Prevalence and Predictors of Giardia in the United States. Dig. Dis. Sci. 62, 2:432-40.