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RESEARCH ARTICLE

STUDY OF LEPTIN CONCENTRATIONS IN CHILDREN INFECTED WITH *ENTAMOEBA HISTOLYTICA\DISPARE* AND *GIARDIA LAMBLIA* PARASITES

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ABSTRACT

Background: Leptin, a 16-kDa protein secreted from white adipocytes, has been implicated in the regulation of food intake, energy expenditure, and whole-body energy balance in humans, therefore may be a mediator of anorexia associated with acute and chronic inflammation. In all parasitic infections there is loss of appetite and anorexia.
Objective: The aim of the present study is to analyze serum leptin concentration in children infected with intestinal parasites (Entamoeba histolytica\dispare and Giardia lamblia) and compare them with healthy controls.
Patients and methods: A total of 70 males and females patients infected with intestinal parasites presented to the Central Teaching Hospital for Pediatric in Baghdad city - Iraq, during the period from April to September, 2013. The age of patients ranged from 5 to 15 years. Thirty healthy parasite-free individuals consider to be a control group. Stool samples were collected from patients for direct microscopic examination, then body weight, height and body mass index (BMI) were measured for all patients and controls. Serum leptin concentrations were detected by immunoenzymometric assay using the DRG Company Leptin ELISA kit. Statistical analysis was made by Chi-Square test using SAS version 9.1.
Results: In this study 70 Patients infected with intestinal parasites, 40 patients confirmed to be positive for E. histolytica\dispare and 30 patients for G. lamblia. The results showed serum leptin levels were not statistically significant between patient: 2.234±0.13ng/ml and control: 2.171±0.23; $p > 0.05$, at the same time, highly differences noticed between two age groups of patients with concentration of leptin, related to that leptin levels are increased in aged paralleling changes in fat mass. In addition, we found significant differences between age, weight and BMI with concentration of leptin. but the height of patients were not statistically significant with concentration of leptin.
Conclusion: We need further investigations with the different parasites for analyze the role of leptin in parasitic infections.

Keywords: Leptin, Entamoeba histolytica\dispare, Giardia lamblia

INTRODUCTION

Leptin is a 167amino acid product of the *ob* gene, which is produced primarily by adipocytes [1], and acts on hypothalamus to regulate feed intake [2] and energy balance [3]. Leptin is also associated with other biological processes such as reproduction, hematopoiesis, immune response and bone formation . It has been reviewed that an increase in the circulating leptin concentration is involved in regulation of the metabolic rate, the macrophage function and the induction of immune cell proliferation or differentiation [4].

Up to now, few studies in human concerning serum leptin concentration in parasitic infections.Parasitic infection contribute significantly to the burden of infectious diseases worldwide. While most infections and death from parasitic diseases affect people in developing countries, they also cause significant illness in developed countries [5]. The WHO reported that diarrheal disease affected far more individuals than any other illness, even in regions that include high-income countries [6]. *Giardia lamblia* and *Entamoeba histolytica* are important intestinal parasitic infection that causes public health problems in most developing countries. Both parasites causing diarrhea with the majority of patients being children.

Infections with these intestinal parasites causes anorexia, A reduction in appetite is a common characteristic of many diseases. Several inflammatory cytokines such as the tumor necrosis factor (TNF) and interleukin (IL1) are associated with inflammatory conditions and can induce anorexia and loss of lean body mass [7], administration of TNF and IL1 in mice increases serum levels of the hormone leptin, which inhibits both appetite and adiposity. This suggests that leptin levels may be one mechanism by which disease anorexia is induced during acute inflammatory conditions [8].

Leptin is mainly produced by white adipose tissue and circulates in the blood in levels proportional to the fat mass. Both central and peripheral administration of leptin inhibits appetite and adiposity [9].

Leptin levels are acutely increased by inflammatory and infectious stimuli such as lipopolysaccharide (LPS), turpentine, and cytokines. Thus, the overall increase in leptin during infection and inflammation indicates that leptin is part of the immune response and host defense mechanisms, a role for leptin in the anorexia of infection and inflammation was proposed [10].

Leptin, which is involved in a range of physiological processes, could be an important factor in the pathogenesis of parasitic infections [11].

On other hand data on relationship between leptin and infection with intestinal parasites, which are considered one possible cause of illness and death especially in children, are available only from limited study. More data about leptin role to parasitic infections are needed in our country especially in children, so this study aims to analyze serum leptin concentration in children infected with intestinal parasites (*Entamoeba histolytica\dispare* and *Giardia lamblia*) and compare them with healthy controls.

MATERIAL AND METHODS

Subjects

The study was conducted from April to September 2013 at Central Teaching Hospital for Pediatrics in Baghdad, Iraq. Included this study 40 patients with *Entamoeba histolytica\dispare* infection and 30 patients with *G. lamblia* infection. The age of patients ranged from 5 to 15 years and 30 healthy, sex and age- matched parasite-free consider to be a control group, laboratory diagnosed by direct microscopic stool examination for detection parasitic infections. Body weight, height and body mass index (BMI) were measured.

Blood Collection

Venous blood samples were collected from children and separated by blood centrifugation at 3000 rpm for 5 minutes and stored at -20 °C until use.

Serum leptin: The patient serum had been tested for leptin by using Enzyme linked immune sorbent assay was measured using DRG leptin ELISA kit (Cat. No: 45 K122; GmbH Germany).

Statistical analysis: The Statistical analysis system-(SAS, 2010) was used to effect of different factors in study parameters. Chi-square test was used to significant compare between percentage at least significant differences – LSD test was used to significant compare between means in this study [12].

RESULT

In this study, 40 patients infected with *E.histolytica**dispare* and 30 infected with *G.lamblia* out of 70 patients confirmed to be positive for the most clinically important protozoa and 30 healthy sex and aged matched parasite-free consider to be a control group detected by microscopic examination, their ages range from 5 to 15 years. The levels of leptin was Increased in studied group when comparing with healthy control group, but statistical analysis shows no significant difference (P **>** 0.05) between both of them as show in Table 1.

According to age groups highly differences noticed between two groups of patients, More than 11 years had a high concentration of leptin when compared to age less than or equal 11 years had a lower concentration as shown in Table 2.

In Table 3 show correlation between concentration of leptin and some variables, showed significant differences between Leptin level and age (P **<** 0.01 : R=0.33), weight (P **<** 0.01 :R=0.26) and body mass index BMI (P **<** 0.01:R 0.22).

Table 1: Level of concentration of Leptin in patients and control group.

Patient Group	No.	Mean ± SE of Con. Leptin
E. histolytica\ *dispare*	40	2.193 ± 0.12
G. lamblia	30	2.275 ± 0.14
Patients	70	2.234±0.13
Control	30	2.171 ± 0.23
T-test value	---	0.518 NS

NS: Non-significant. (P< 0.05)

Table 2: Effect of age group in concentration leptin of patients.

Age group (year)	No.	Mean ± SE of Con. Leptin
5 – 10	44	1.97 ± 0.13
11 – 15	26	2.68 ± 0.26
T-test value	---	0.527 *

*** Significant (P<0.05).**

Table 3: Correlation coefficient (r) between concentration leptin and some variables.

Variable	Correlation coefficient (R)	Level of sig.
Age & Con. Leptin	0.33	**
Weight & Con. Leptin	0.26	**
Height & Con. Leptin	0.14	NS
BMI & Con. Leptin	0.22	**

**** Significant (P<0.01), NS: Non-significant**

DISCUSSION

Leptin is a 167amino acid cytokine synthesized and secreted from adipose tissue which functions as a signal of sufficiency of energy stores, and plasma leptin level is controlled by nutritional status. Several factors have been identified as regulators of leptin synthesis and release including the sympathetic nervous system, insulin and proinflammatory cytokines as well as glucocorticoids [13]. The critical role of Leptin in regulating energy metabolism and reducing dry matter intake [14]. Leptin is also associated with other biological processes such as reproduction, hematopoiesis, immune response and bone formation [15].

In all parasitic infections there is loss of appetite and anorexia. Anorexia is seen in Amoebiasis and Giardiasis [16]. Increased leptin levels could be contribute to the pathological effects, through the influence of leptin on the wasting syndrome and through its role in causing a positive feedback loop in the inflammatory process [17]. leptin is involved in the regulation of food intake and anorexia is a prominent feature of the acute phase response, a role for leptin in the anorexia of infection and inflammation was proposed. Despite its role in the control of food intake. Increased leptin levels could be linked with anorexia induced by parasite infection [18].

In contrast, anorexia and loss of lean body mass are hallmark manifestations of acute or chronic disease, including infection or cancer. The role of tumour necrosis factor (TNF), interleukin (IL1), and IL6 as endogenous mediators of the host response to infection or malignancy has been extensively studied. It has also been reported that multiple cytokines and inflammation raise leptin levels. Leptin regulates feeding behavior and therefore may be a mediator of anorexia associated with acute and chronic inflammation. Several studies have shown the involvement of cytokines in the pathogenesis of gastric inflammation [19]. Crabtree *et al* detected higher levels of TNFα, IL6, and IL8 in the culture supernatants of *H pylori* infected gastric biopsy specimens than in specimens from uninfected patients [20]. Noach *et al* also detected increased levels of IL1β, IL8,and TNFα in culture supernatants of antral biopsy specimens from *H pylori* infected patients [21].

Patients with infectious diarrhea a significant correlation between concentrations of leptin and concentrations of TNF-a, IL-1b and IL-6 were observed [22]. These results confirm a correlation between the inflammatory activity reflecting the concentrations of proinflammatory cytokines and serum leptin levels in this group of patients. found that the secretion of leptin is regulated by TNF-a at the post-translational level. They concluded that TNF-a exerts a direct effect on adipocytes resulting in release of leptin by these cells

In children malnutrition contributes to an increase in the risk of enteroparasite infections which are causally associated with a chain of events involving anorexia, digestive problems, malabsorption and losses of nutrients and inflammatory reaction. Intestinal parasitic infections may cause damage in intestinal mucosa such as inflammation, ulceration, and pathological changes in the villi of epithelial cells in the acute period of infection. During the chronic period of the pathology, epithelial cell damage and intestinal abscesses have also been reported [16].

There are limited studies in human concerning leptin levels and parasite-induced anorexia but most of the studies are about children. The experimental studies demonstrated that anorexia frequently accompanies parasitic infections. The observations suggest that increased leptin production could be found as a normal component of inflammatory response in malaria infection. It could also contribute to the development and outcomes of malaria [11].

In our study, no significant differences were found in leptin concentrations between patient group and control groups. This result was agreement with the finding of Aslihan K. *et al*.,(2009) which showed no significant differences [23]. May be related to the similarity of age group for the two studies, or the nature of the social and geographical conditions.

Also this study showed statistical differences between the age categories for the groups of patients, More than 11 years had a high concentration of leptin when compared to age less than or equal 11 years had a lower concentration. Interestingly, leptin levels are increased in aged paralleling changes in fat mass but fail to decrease in response to fasting, suggesting that hyperleptinemia may contribute to this energy balance dysregulation and play a causative role in the poor tolerance of aged individuals to catabolic conditions. Also, leptin resistance has been proposed as one of the alterations seen in the elderly [24].

Result also showed that there were significant correlation between Age, weight and BMI with concentration of leptin, because some intestinal parasite produce adverse effect on weight gain which may lead inadequate food intake which in turn may cause poor appetite, metabolic and clinical disturbance [25].

Up to now, few studies concerning leptin levels of human in parasitic infections. the leptin levels were statistically not significant, in children patients with(*Entamoeba histolytica**dispare* and *Giardia lamblia*), compared to their age-matched control groups and showed statistical differences between the age categories for the groups of patients with leptin concentration. In conclusion; we need further investigations with the different parasites for analyze the role of leptin in parasitic infections.

REFERENCES

1. Wolk R, Johnson BD and Somers VK. Leptin and the ventilatory response to exercise in heart failure. J Am Coll Cardiol 2003; 42: 1644-1649.
2. Kim KS and Baik MG . Production of leptin in E. coli and its effect on glucose and acetate transport and expression of uncoupling protein-2 gene in adipose tissues of Korean cattle (Hanwoo). Asian- Aust. J Anim Sci 2004; 17: 1062-1068.
3. Koh KK, Park SM and. Quon MJ . Leptin and cardiovascular disease: response to therapeutic interventions. Circulation 2008; 117: 3238-3249.
4. Momenah MA. Some Blood Parameters of One Humped She-Camels (Camelus Dromedaries) In Response To Parasitic Infection. Life Science Journal 2014;11(5):118-123.
5. Ortega YR, Eberhard ML and Kris H. Protozoan diseases: cryptosporidiosis, giardiasis and other intestinal protozoan diseases, International encyclopedia of public health. Academic Press, Oxford, United Kingdom 2008; 354–366.
6. WHO. The global burden of disease: 2004 update. WHO Press, Geneva, Switzerland 2008.
7. Sarraf P, Frederich RC, Turner EM MG, Jaskowiak NT, Rivet DJ, Flier JS, Lowell BB,Fraker DL and Alexander HR. Multiple cytokines and acute inflammation raise mouse leptin levels: potential role in inflammatory anorexia. J Exp Med 1997; 185:171–175.
8. Lõhmus M, Moalem S and Björklund M. Leptin, a tool of parasites? royalsocietypublishing.org 2012.
9. Havel PJ. Peripheral signals conveying metabolic information to the brain: shortterm and longterm regulation of food intake and energy homeostasis. Exp Biol Med 2001; 226: 963–977.
10. Faggioni R, Feingold KR and Grunfeld C. Leptin regulation of the immune response and the immunodeficiency of malnutrition. The FASEB Journal 2001; 15 (14): 2565-2571.
11. Al-Fadhli MA, Saraya MA and Qasem JA. Evaluation of leptin, interleukin-1 beta and tumor necrosis factor alpha in serum of malaria patients as prognostic markers of treatment outcome. Asian Pac J Trop Biomed 2014; 4(6): 441-445.
12. SAS. 2010. Statistical Analysis System, User's Guide. Statistical. Version 9.1th ed. SAS. Inst. Inc. Cary. N.C. USA.
13. Schulze PC and Kratzsch J. Leptin as a new diagnostic tool in chronic heart failure. clin chim acta 2005; 362: 111.
14. Ronchi BG, Stradaioli A, Verini supplizi U, bernabuci N, lacetera, and accorsi PA. Influence of heat stress or feed restriction on plasma progesterone, oestradiol-17 beta, lh, fsh, prolactin and cortisol in holstein heifers. Livest Prod Sci 2001; 68: 231–241.
15. Olusi SA, Al-awadhi C, Abiaka M, Abraham, and George S. Serum copper levels and not zinc
16. are positively associated with serum leptin concentrations in the healthy adult population. Biol Trace Elem Res 2003; 91: 137-144.
17. Markel EK, Voges M and Jhon DT. Medical parasitology, 9th edition, wb saunders co philedelphia. 2006.
18. Engineer DR and Garcia JM. Leptin in anorexia and cachexia syndrome. Int J Pept 2012; 287457.
19. Roberts HC, Hardie LJ, Chappe LH and Mercer JG. Parasite induced anorexia: Leptin, insulin and cortisone responses to infection with the nematode, nippostrongylus brasiliensis. parasitology 1999; 118: 117-123.
20. Azumaa T, Sutoa H, Itoa Y, Ohtania M, Dojoa M, Kuriyamaa M and Katob T. Gastric leptin and Helicobacter pylori infection. gut 2001;49 (3):324-329.
21. Crabtree JE, Shallcross TM and Heatley RV. Mucosal tumour necrosis factor alpha and interleukin6 in patients with Helicobacter pylori associated gastritis. Gut 1991; 32:1473–1477.
22. Noach LA, Bosma NB and Jansen J .Mucosal tumor necrosis factor alpha, interleukin1 beta, and interleukin8 production in patients with Helicobacter pylori infection. scand j gastroenterol 1994; 29:425–429.
23. Biesiada1 G, Czepiel J, Ptak-belowska A, Targosz A, Krzysiek-maczka G,Strzalka M, Konturek SJ, Brzozowski T and Mach T. Expression and release of leptin and proinflammatory cytokines in patients with ulcerative colitis and infectious diarrhea.Journal of physiology and pharmacology 2012; 63(5): 471-481.
24. Aslıhan K, Hatice E, Eylem K and Sema E. Serum leptin concentrations in patients with intestinal parasites. türkiye parazitoloji dergisi 2009;33
25. Kmiec Z. “Central regulation of food intake in ageing,” journal of physiology and pharmacology 2006; 57(6): 7–16.
26. Garba CMG and Mbofung CMF. Relationship between Malnutrition and Parasitic Infection among School Children in the Adamawa Region of Cameroon. Pak J Nutr 2010; 9(11):1094-1099