



The Impact of Depression Status on Teeth Alignment in Relation to Salivary Growth Hormone among Internally Displaced People in Baghdad, Iraq

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ABSTRACT

Background: Changes in lifestyle like displacing place could cause depression which is a common mental disorder that changes general health including growth that affects tooth alignment. However, one of the growth biomarkers is a growth hormone that is secreted in saliva. The aim of this study was to assess the relation of depression status on teeth alignment in relation to salivary growth hormone secretion among internally displaced people. **Materials and methods:** The sample includes 121 internally displaced people aged from 13-17 years. Method for depression is measured by using children depression inventory (CDI2) questionnaire. The total sample was assessed for tooth alignment using the criteria of the World Health Organization of 1997. The unstimulated salivary sample was collected from 60 persons under standardized condition then analyzed for assessment of human salivary growth hormone. **Results:** Reported that the presence of crowding in one arch was higher among person with a low grade of depression while crowding in both arch was higher in high depression grade than low grade. For the spacing score, the spacing in one and both arches was higher in high depression grade than low grade. Concerning salivary growth hormone, the data of the present study revealed no significant difference between a low and high grade of depression. **Conclusion:** Depression among internally displaced people had an effect on teeth alignment that couldn't be screened by salivary growth hormone.

Keywords: Depression, Internally displaced people, Salivary growth hormone, Tooth alignment

INTRODUCTION

Depression is a significant contributor to the global burden of disease and affects people in all communities throughout the world [1]. It is a mental disorder that is characterized by depressed mood, interest loss or pleasure, energy is decreased, guilty feeling or low self-worth, upset in sleeping, disturbing of appetite, with low concentration. Additional, depression always come with symptoms of anxiety, furthermore, it can lead to suicide [2]. It results from a combination of many factors like genetic, biochemical, environmental, and psychological factors [3]. Many types of research in developing countries consider that maternal depression act as a risk factor for poor growth especially in young children [4]. Since the growth is a complicated process, it is largely affected by many factors like, environmental, genetic, and hormonal [5]. The growth during childhood is so sensitive to environmental factors which depend on hormonal, metabolic function, glucocorticoid either excess or deficiency which affects negatively on growth [6,7]. Growth hormone is a peptide hormone that stimulates growth, cell reproduction, and cell regeneration in humans and other animals. It is thus important in human development; it is a stress hormone that raises the concentration of glucose and free fatty acids [8]. A number of factors are known to affect GH secretion, such as age, gender, diet, exercise, stress, and other hormones [9]. There were a few studies about the relation of depression with growth hormone, Prodman, et al., in 2012 found adults with GH deficiency often have higher rates of depression than those without the deficiency. So its deficiency effect on quality of life and cognitive function [10,11].

Internally displaced people are groups of people or persons who have been obliged or compelled to escape from their homes or their habitation as a result of the war. However, the person has not passed internationally state or outer border of their country [12].

Adolescence is the period of rapid growth unrestraint of thought and behavior with the struggle between feelings of dependence and independence and they are not sure about their role in society. While the childhood dependence on parents is gradually given up; and personal identities are sought [13]. At the same time, adolescents are high in negative insistence, with high susceptibility to peer effectuation compared to adults [14]. Their anxiety is much more associated with depression [15].

Malocclusion is defined as either misalignment or incorrect, the relation between the teeth in two dental arches when they become in contact as the jaws close. This term was coined by Edward Angle, the "Father of modern orthodontics" [16]. Moreover, it has an esthetic concern, by having a strong psychosocial effect on the individual, including altered self-esteem, social and interaction responses, and increased awareness of people's perceptions lead to depression [17].

The aim of the present study was to assess the relation of depression status on salivary growth hormone and tooth alignment among internally displaced people as the hypothesis is that the internally displaced people suffer from depression that adversely affects their general health which affects the oral health.

MATERIALS AND METHODS

The selected sample was composed of 121 internally displaced people, which involve both males and females aged from 13-17 years. The participants were informed about the aim of the study and were freely allowed to accept the examination. Informed consent and approval had been obtained. The participants were selected and examined in 3 camped areas in Baghdad city. By using children depression inventory (CDI2) as a measuring tool for depression [18]. The CDI2 questionnaire was used to describe the major depressive disorder. It consists of 28 items; each item contains 3 answers from 0-2. The total score will give the grades of depression according to graduated scale depending on age and gender. For more confirmation for both validity and reliability, CDI2 test was done and retest after 14 days, it was also translated into the Arabic language to be accommodated in using it in Iraq.

The collection of unstimulated saliva from 60 persons was chosen with high and low depression grade, it was done by drooling passively to the tube of collection by using a timer for 5 minutes according to University of Southern California School of Dentistry guidelines for saliva collection [19]. The instruction was given to them not to eat or drink at least for 1-hour before the test session. The salivary samples were centrifuged for approximately 20 minutes at (2000-3000 rpm), then all samples were stored at a temperature about -20°C. The clear supernatant was separated by micropipette and then stored in a deep freeze at -20°C till further assessment for HGH level in saliva by Human Growth Hormone ELISA Kit; its Catalog Number HGH0015BA, by using Enzyme Linked-Immuno-Sorbent Assay (ELISA) machine. Malalignment of teeth was assessed according to WHO 1997 which include both spacing and crowding of anterior teeth from canine to another canine for both upper and lower jaw [20].

- For the spacing score, if interproximal surface without interdental contact the segment there is a space
- Space due to exfoliated primary tooth shouldn't record as space if it appears then the permanent replacement will soon erupt

Scoring for Spacing

- 0=No space for anterior teeth in both jaw
- 1=Space in one jaw for anterior segment
- 2=Space in both jaw for anterior segment

Scoring for Crowding

- Mean, the space that is available to accommodate 4 incisor teeth is insufficient to be in proper alignment
- Crowding is not recorded if the 4 incisors are in proper alignment but either or both canines are displaced

0=No crowding in both jaw for anterior segment

1=Crowding in one jaw for anterior segment

2=Crowding in both jaw for anterior segment

Statistical Analysis

Statistical analysis that was done in this study were data description, analysis presentation by using Statistical package for social sciences (SPSS) version 20. The descriptive analysis involved frequency, the percentage used for nominal variables while meaning, the standard error for the numeric variable. Also, one-way analysis of variance (ANOVA) was used for testing quantitative dependent variable by a single factor. Two independent sample T-test was done to test the significant differences of mean between two samples. The level of significance was measured, which can be non-significant ($p > 0.05$), significant ($p \leq 0.05$), or highly significant at ($p \leq 0.01$).

RESULTS

The data of the present study showed that 56.2% were with high depression grade and only 24.8% were with low depression grade and 19% with medium depression grade as shown in Table 1.

Table 1 The distribution of sample according to depression grade by gender

Gender	Depression Grade					
	Low		Medium		High	
	N	%	N	%	N	%
Male	15	23.80%	11	17.40%	37	58.70%
Female	15	25.80%	12	20.60%	31	53.40%
Total	30	24.80%	23	19.00%	68	56.20%

Concerning salivary growth hormone, the mean value for salivary growth hormone was higher among low depression grade than high depression grade as shown in Table 2.

Table 2 Growth hormone according to depression grade by gender

GH	Depression Grades								F	Sig	T-test
	Low				High						
	N	Mean	S.D	S.E	N	Mean	S.D	S.E			
Male	16	1.13	0.24	0.06	17	1.11	0.15	0.03	0.05	0.82	5.28
Female	14	1.21	0.85	0.22	13	1.05	0.04	0.01	0.47	0.47	3.95
Total	30	1.17	0.60	0.11	30	1.08	0.12	0.02	10.54	0.46	6.58

In Table 3 for tooth alignment, the crowding and spacing score in both arch (score 2) in high depression grade was higher than low depression grade, the same result was found for a spacing score in one arch (score 1) and the opposite result was found for crowding score in the same score.

Table 3 Distribution of crowding and spacing score according to depression type by gender

Tooth Alignment	gender	Depression Grade											
		Low (1)				Medium (2)				High (3)			
		Grade of malalignment				Grade of malalignment				Grade of malalignment			
		1	%	2	%	1	%	2	%	1	%	2	%
Crowd score	Male	7	46.6%	1	6.7%	2	18.2%	2	18.2%	14	37.8%	6	16.2%
	Female	6	40.0%	4	26.7%	4	33.3%	1	8.3%	12	38.7%	5	16.1%
	Total	13	43.3%	5	16.7%	6	26.1%	3	13.0%	26	38.2%	11	16.8%
Space score	Male	6	40.0%	4	26.4%	6	54.5%	3	27.3%	17	45.9%	6	16.2%
	Female	4	26.7%	0	0.0%	4	33.3%	4	33.3%	9	29.0%	6	19.4%
	Total	10	33.3%	4	13.3%	10	43.5%	7	30.4%	26	38.2%	12	17.6%

DISCUSSION

The prevalence of high depression grade more than low grade is explained by many factors that affect the development of depression in adolescent specially with displacing condition like, parental death or divorce, low socio-economic condition, body dissatisfaction, the presence of psychiatric disorders including depression among family members, fears, low self-esteem, obesity, exposure to natural disasters, unsuccessful relationships with friends, teachers or family members, and environmental risk factor in spite of causes and suffering of internally displacing [21,22].

For the alignment of teeth, the data of the present study showed that malalignment in both arches (score 2) was higher

in high depression grade than low depression grade. Since the growth can be expressed by growth hormone, so the growth hormone has a direct effect on both body structure and function just like regulating trophic hormone that stimulates the production and secretion of insulin-like growth factor (IGF-1) [23,24]. Since IGF-1 act as a mediator of growth hormone which is essential for growth and development so the growth will be impaired when IGF-1 level is low [25]. Many studies have analyzed both dental and skeletal development with growth hormone deficiency, who demonstrate skeletal delay [26]. That will result in un-development of maxilla and mandible that will have an effect on occlusion [27,28]. This result is also confirmed by the result of the present study that illustrates lower salivary growth hormone among person with high depression grade. The decrease in the growth hormone secretion has been reported in children and adolescents with major depressive disorder [29,30]. Similarly, a decrease in GH secretion has been reported in most studies of an adult with MDD and since saliva is the mirror of general health in the mouth, it reflects the serum [31,32]. On the other hand, growth hormone deficiency will result in a delay in dental development [26,28,33]. Many studies found that low GH will result in either small sized teeth or high prevalence of crowding [27,34,35]. Another study found that malocclusion was present in approximately 40% of GHD patients [28].

Depending on the direct relationship between depression and human growth hormone, the secretion of salivary growth hormone affects the tooth alignment, as a result of that the depression will affect the tooth alignment directly and this agrees with our finding.

The decrease of growth hormone among high depression grade can be explained by the neurotransmitter systems that have been associated with the pathogenesis of MDD, which have been implicated in the regulation of GH and pathogenesis of depression system [36-40]. Exposure to stress and depression show abnormal basal GH secretion and decrease GH secretion in response to stimulation which appears to be partially mediated by central serotonergic and noradrenergic mechanism [38-40]. Many studies have also shown that children and adolescent with high-risk MDD present with biological abnormalities including a change in cortisol and prolactin secretion, sleep electroencephalographic abnormalities, low cerebrospinal fluid 5-hydroxy in-indoleacetic acid level, altered hypothalamic pituitary adrenal response [19-24,41-44]. Acetylcholine is the neurotransmitter that has been implicated in the pathophysiology of major depression. This is supported by the enhanced growth hormone released in response to pyridostigmine (PYD) challenge in a depressed subject relative to a healthy one.

There is no previous Iraqi study about the relation of depression and salivary human growth hormone therefore it is difficult to compare the salivary HGH of the present study with those studies which is measured in the serum because of the wide variation in the design of the study, inclusion criteria, numbering of the patients, children's age, in addition to that, there was no agreement on the best testing method of HGH levels in children, different immunoassay kits are used in different methods to measure the serum levels therefore, this will produce different results [45].

CONCLUSION

The result from the current study revealed that tooth alignment and secretion of salivary growth hormone affected by increasing grades of depression among internally displaced people which have an adverse effect on oral health and general health.

DECLARATIONS

Conflict of Interest

The authors declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

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