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Assessment of salivary flow rate and some important trace elements in saliva sample of Iraqi primary school children with aggressive behavior

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Abstract

Nutrition elements or trace elements Zn, Cu, Mg and Fe in children and adolescent are involved in behavior and social relation, thus recent studies in the world suggest that these elements may linked and regulate their behavior by acting as a cofactors for many neurotransmitters such as dopamine. This work aimed to assess the concentration of each of these nutrients elements altered among primary school normal and aggression boys for evaluation the role of these essential elements in saliva in addition to flow rate and pH. The study subjects consisted of 60 boys with age of 10-13 years old. Aggression behavior was diagnosed by Rutter Child Behavior Questionnaire (RCBQ), stimulated saliva was collected from the pupils between 8-10 Am under standardized condition, Zn, Cu, Fe, Mg were analyzed by Atomic Absorption Spectrophotometer measured in ppm unit. The average salivary flow rate was measured from total volume(ml/min) and salivary pH was determined using digital pH meter, then data were statistically analyzed using SPSS. The results showed that salivary Zinc and Copper levels were highly significant decreased aggressive pupils group when compared to control group. Also salivary Magnesium level was decrease significantly in aggressive group as compared control. While didn't find significant differences in the mean of salivary Fe level between the two groups.

Keywords: Aggression, Saliva, Zinc, Copper, Magnesium, pH, Salivary flow rate.

Introduction

Aggression is considers a problem of important clinical and social concern, but it doesn't constitute as separate diagnostic entity itself in psychiatry, because it is appear in many psychopathological conditions, the most significant are conduct disorder, substance use disorder, neurological disorders that involved frontal and temporal lobes, also the personality disorders such as borderline and antisocial personality disorders(American Psychiatric Association, 1994).

Two forms are found in human: the first an impulsive reactive hostile-affective and the second is a controlledproactive-instrumental-predatory, these subtypes are different from each other according to their phenomenology and neurobiological features (Vitiello and Stoff, 1997).Conduct disorder is considered as one of psychiatric syndromes which occur in early age and adolescence, and the symptoms include longstanding pattern of violations of rules and

antisocial behavior. Also the symptoms include aggression, Aggression may occur in a broad spectrum of human behaviors that range from episodic, to higher generalized, pervasive manifestations in strong psychopathologies (Moyer,1968).

There is an increasing in the number of studies in the world that are related to psychiatric disorders and nutritional elements with the neurotransmitter differences, specifically zinc and iron with the changing in dopamine and serotonergic activity (Montoya et al, 2012).

Children specifically at the school age are increased risk of trace elements and nutrient deficiency with the increased the energy expenditure, addition to lowered meal and maternal attention, also the pathogen infections specially parasites which cause anemia that result from iron deficiency, anemia is affect half of the school age children in developing countries as recorded by previous study, in addition to iron deficiency that is consider as disadvantageous to the achievement of school children (Gleason and Schrimshaw , 2007).Also Fisher et al (2009) showed that zinc deficiency contributes to substantial morbidity and mortality. Because of zinc deficiency ranging between 800,000 children each year deaths.

Zinc is play role in many neuropsychiatric disorders and it is one of the important micronutrient elements in metabolism that related to dopamine, many hormones, and immune system function (Corbo and Lam, 2013), and play role in the function of brain, that affect many neurotransmission pathways, this may explained when zinc deficiency lead to important impact on attention, motor activity, cognition, and behavior.

Iron level is commonly studied in children have neuropsychiatric disorders because of its role as a cofactor in many neurotransmitter metabolism, and the researches showed that iron concentration or status must be test for choosing the best treatment(Youdim,2000; Calarge et al,2010).

Similarly, magnesium is one of the most important mineral and it is enter as a cofactor in many of the enzymatic reactions in the body(Lord et al, 2008). Some of the metabolic processes in the body have important role in neuronal functions and neurotransmitter metabolism(Volpe, 2013). Magnesium acts as a neuroprotectant from excessive excitatory neurotransmitters, such as glutamate (Clerc et al, 2013).

Materials and Methods

Subjects

The subjects selected for this study include 60 Iraqi pupils, from primary schools from class 3 th,4 th,5 the and 6th in Baquba city, randomly selected in a systematic random sample, with age ranged between 9- 13 years. This study was carried out during a period from April 2012 to end of September 2014.

Assessment and scoring the child ADHD behavior

Rutter Child Behavior Questionnaire (RCBQ) was used as a scale for diagnosis of behavioral disorders having ADHD, versus prosaically behavior. Rutter Child Behavior Questionnaire for completion by teacher in its original version was developed by Rutter et al.(1967), it consist of 59 items, 39 items for total difficulties (conduct, Emotional, and hyperactivity) and 20 items for prosaically trait (Rutter et al,1997).

Sample Collection

Stimulated saliva was collected from the pupils between 8-10 AM. The child should sit in relaxed position, each pupil was asked to chew apiece of gum for one minute then to remove all saliva by expectoration. Then saliva was collected in sterile screw capped bottle. The pH of saliva was measured by using a digital PH meter. Salivary volume was estimated and the rate of secretion was expressed as milliliter per minute. Then each salivary sample centrifuged at 3000 r.p.m. for ten minutes. The salivary supernatant was stored at -20 ^{0}C (Tenovuo and Lagerlof, 1994).

Chemical analysis was carried out at poisoning consultation center, Medical city. Salivary Zn, Cu, Fe, Mg concentrations were measured by Atomic Absorption Spectrometer. SPSS version 18 (statistical package for social sciences) was used for statistical analysis.

Results

Salivary trace elements levels in aggression and normal control groups are presented in table 1.Measured in unit ppm In the present study as determined by t-test, the mean salivary Zn levels was highly significant decreased ($p<0.001$) in the aggressive behavioral pupils (0.59±0.13) than control group (0.83±0.19).

It was found as appear in the same table; there were no significant differences in the mean salivary Fe levels (0.56±0.04, 0.59±0.05) between aggression and control groups respectively. The mean Cu level in saliva of aggression pupils (0.71±0.22) was highly significant decreased ($p<0.000$) than that in control group (0.84±0.20).

The results of the present study also showed that the mean salivary Mg level was significantly ($p<0.05$) lower in aggression pupils (0.73±0.17) than in normal behavior pupils (0.76±0.18).The range of salivary flow rate was recorded in aggressive pupils to be 0.67 to 1.90 and the range in control group between 0.58---1.50, with the mean reach to 0.98±0.37 and 0.78±0.24 respectively. While the range of salivary PH was recorded to be 5.20—7.40 in aggressive pupils with the mean 6.24±0.70, and 6.00—8.30 range with mean reach to 7.28±0.76 in control group.

Table 1: Salivary trace elements levels in aggression and normal control groups

Trace elements	groups	N	Range	Mean±Std. Deviation (ppm)
Fe	Normal	30	0.50- 0.65	0.59 ± 0.05
	Aggressive	30	0.50- 0.61	0.56 ±0.04
Zn	Normal	30	0.70-1.50	0.83 ±0.19
	Aggressive	30	0.50-1.00	0.59±0.13
Cu	Normal	30	0.60-1.30	0.84 ±0.20
	Aggressive	30	0.53-1.40	0.71 ±0.22
Mg	Normal	30	0.60-1.30	0.76±0.18
	Aggressive	30	0.50-1.10	0.73±0.17
Flow rate	Normal	30	0.58-1.50	0.78±0.24
	Aggressive	30	0.67-1.90	0.98±0.37
pH	Normal	30	6.00-8.30	7.28±0.76
	Aggressive	30	5.20-7.40	6.24±0.70

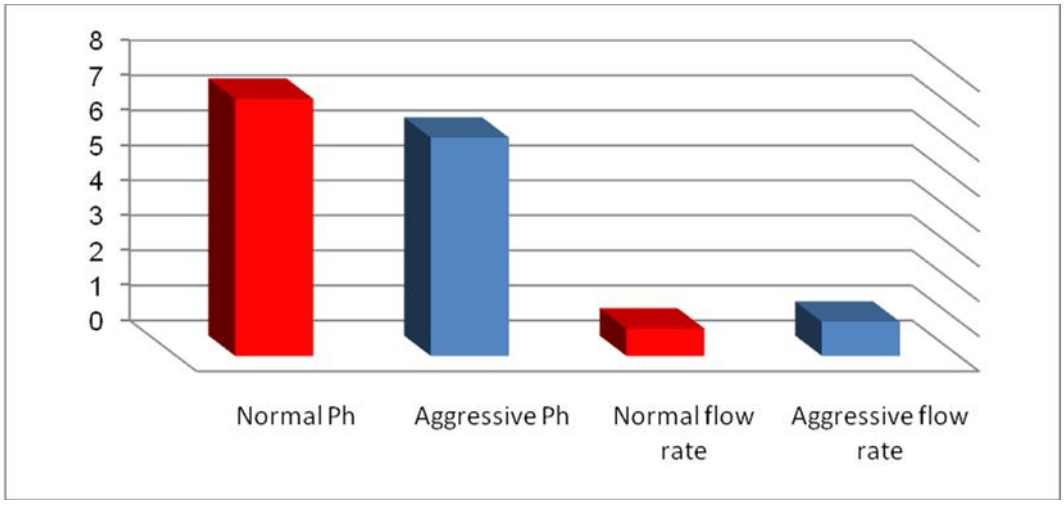

Figure 1: Difference between normal and aggressive children in pH and flow rate

Table 2: Significance difference between normal and aggressive children in concentration of salivary essential elements

	groups	t-test	P-value	Sig. Level
Fe	Normal Aggressive	1.561	0.135	NS
Zn	Normal Aggressive	4.120	0.001	HS
Cu	Normal Aggressive	4.573	0.000	HS
Mg	Normal Aggressive	2.093	0.050	S
Flow rate	Normal Aggressive	0.573	0.573	NS
pH	Normal Aggressive	-2.123	0.047	S

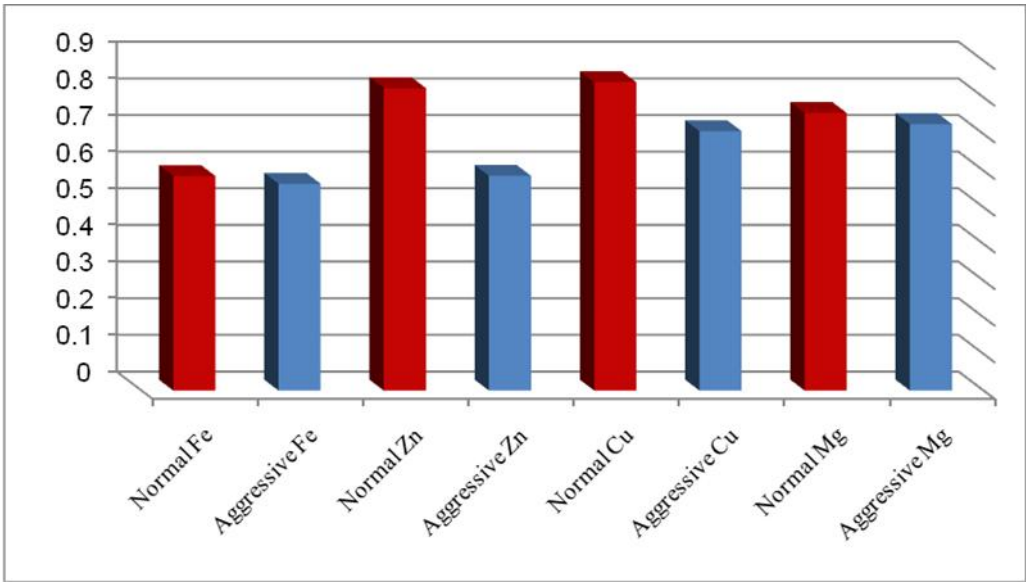

Figure 2: Difference between normal and aggressive children in concentration of salivary essential elements

Discussion

The number of pupils involved in this research were60 boys with an age range from 9 to 13 years old, girls were not involved due to different causes such as the changes in the behavior and the volume of salivary glands that lead to change or variation in the volume and size of salivary flow rate, also the time of adolescent is different between them according to hormonal with life stages and the environmental conditions differences.

The results of current study indicated that there were no significant differences in the salivary flow rate between the pupils with aggression behavior and the normal behavior pupils. Aggression or conduct disorder is one of the very common psychiatric syndromes that are commonly diagnosed in children in word wide with highly variable rates (Montoya et al,2012).

Many studies in the world showed that some diseases such as sjogren′s syndrome and diabetes, in addition to treatment or taking some drugs can leads to hypo salivation (Leone and Oppenherm,2001). But other studies considered salivary flow rate and PH an indicator of caries susceptibility, and the decreasing in salivary flow rate may causes reduction of the protective constituents that are found in saliva and the functions that include salivary buffer system, which may changes or increase weakness and susceptibility for dental caries (Fink et al.,2008; Chiras,2012).

Current results about the salivary differences of trace elements concentrations such as zinc, copper and magnesium between aggression pupils and control groups came in agreement with the study of Villagomez and Ramtekker (2014) who found that, possible level changes of these nutrients in patients with psychiatric disorders, and demonstrated the role of these nutrients in the brain, may explained for the concentration variations in children with hyperactivity and suggested that part of children with hyperactivity disorder are at risk to the deficiencies in nutrient. Zinc is act as a cofactor for many enzymes in the body and it enter in pathway of the body production of neurotransmitters such as dopamine and others, also is play an important role in the functions of many nervous system elements, and it is essential element forB6 and active form metabolization.

Queimado et al, 2008 found that the levels of these elements in saliva were changed continuously, which depend on the presence of these trace elements in the systemic environment that affected by many factors such as the type life style and the food. Saliva as other body fluids become one of the most effective factor in test trace elements status in human, that it can help in identification the presence of deficiency or any abnormality.

In accordance, Swardfagar et al,(2013) and Kiddie et al,(2010) revealed that the magnesium levels were lower in children with combined type of hyperactivity and depression, when compared to healthy controls, and explained that by many causes include, different dietary intake between pupils and the methods of magnesium assessment (Wikowski et al,2011).

The results of the present study about salivary Fe levels of the pupils in both aggressive and normal pupils indicated that, the incidence of anemia was high, due to increase the number of pupils that have lower Fe level than the normal range, 19 of 30 and 21 from 30 in aggressive and control groups respectively. Fe or iron and zinc are present or the source for these elements is meat and the meat intake by those pupils that included in this study was very low because many difficult conditions that surrounded each child and poor family may explained why we observed low or decreased levels of Zn, Fe and Mg as found among the sample of primary school children in Iraq.

Conclusion

The information about the concentration of important trace elements in serum or saliva in school aged children is not completely available or poor especially in Iraq. The deficiency of Zn, Fe, Mg and Cu is occur as appear in this study, thus need further studies and nutritional education in primary school children to correct the nutrition deficiency and to elimination of aggressive behavior in children.

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References

1- American Psychiatric Association. 1994.Diagnostic and Statistical Manual of Mental Disorders. 4th ed. Washington, DC: American Psychiatric Association.

2-Vitiello, B.; and Stoff, D. M. (1997). Subtypes of aggression and their relevance to child psychiatry. Journal of the American Academy of Child and Adolescent Psychiatry, 36, 307–315.

3-Moyer K. (1968). Kinds of aggression and their physiological basis. In: Buglass R, Bowden P, eds. Principles and Practice of Forensic Psychiatry. Community and Behavioral Biology- A. Edinburgh: Churchill Livingstone.

4-Montoya,E.R.; Terburg,D.; Bos,P.A.; Van Honk,J. (2012). Testosterone, cortisol, and serotonin as key regulators of social aggression: A review and theoretical perspective. Motiv Emot. 36:65–73.

5-Gleason,G.I. and Schrimshaw, N.S. (2007). "An Overview of Functional Significance of Iron Deficiency, Nutritional Anaemia," Swiss Federal Institute of Technology.: 46-57.

6-Fisher, W.; Ezatti,M.; and Black,R.E.(2009). "Global and Re-gional Child Mortality and Burden of Disease Attribute to Zinc Deficiency," European Journal of Clinical Nutrition. 63(5) : 591-597.

7- Corbo, M.D.; Lam, J. (2013). Zinc deficiency and its management in the pediatric population: A literature review and proposed etiologic classification. J. Am. Acad. Dermatol. 69 :616–624..

8-Youdim, M.B. (2000). Iron deficiency effects on brain function. Public Health Rev. 28:83–88.

9- Calarge,C.; Farmer,C.; DiSilvestro, R.; Arnold, L.E. (2010). Serum ferritin and amphetamien response in youth with attention-deficit/hyperactivity disorder. J. Child Adolesc. Psychopharmacol. 20:495–502.

10-Lord, R.S.; Brailey, J.A. (2008). Laboratory Evaluations for Integrative and Functional Medicine, 2nd ed.; Metametrix Institute, Duluth, GA.

11-Volpe, S.L.(2013). Magnesium in disease prevention and overall health. Adv. Nutr. 1:378s–383s.

12- Clerc, P.; Young, C.A.; Bordt, E.A.; Grigore, A.M.; Fiskum, G.; Polster, B.M. (2013). Magnesium sulfate protects against the bioenergetic consequences of chronic glutamate receptor stimulation. PLoS One. 8, e79982.

13-Rutter, M.; Hogg, C. and Richman, N. (1997). Manual of child psychology. Protfolio:1-7.

14- Tenovuo,J. and Laagerlof,F. (1994). Salivs. In: Thylstrup,A. and Fejerskov,F. Textbook of clinical cariology.2 ed ed. Munksgaard, Copenhagen.

15-Montoya,E.R.;Terburg,D.;Bos,P.A.;van Honk,J. (2012).Testosterone, cortisol, and serotonin as key regulators of social laggression: A review and theoretical perspective. Motiv Emot .36:65–73.

16- Leon,C.W. and Oppenheim, F.G.(2001). Physical and chemical aspects of saliva as indicators of risk for dental caries in humans.J. Dent. Educ. 65(10):1054-1062.

17-Flink,H.; Bergdahi,M.; Tegelberg, A.; Rosenblad, A.; Lagerlof, F. (2008). Prevalence of hyposalivation in relation to general health, body mass index and remaining teeth in different age groups of adult. Community Dent Oral Epidemiol.36(6):523-31.

18-Chiras,D. (2012). Human Biology.7 th ed. London: Jones and Barlett Learning International.

19-Villagomez,A.;Ramtekkar, U.(2014).Iron, Magnesium, Vitamin D, and Zinc Deficiencies in Children Presenting with Symptoms of Attention-Deficit/Hyperactivity Disorder.Children.1, 261-279.

20-Queimado, L.;Obeso, D.;Hatfield, M. (2008). Dysfunction of Wnt pathway Component in human salivary gland tumors. Arch Otolaryngolo Head Neck Surg. 134(1): 94-101.

21-Swardfager, W.; Herrmann, N.; Mazereeuw, G.; Goldberger, K.; Harimoto, T.; Lanctôt, K.L. (2013). Zinc in Depression: A Meta-Analysis. Biol. Psychiatry . 74, 872–878.

22-Kiddie, J.Y.; Weiss, M.D.; Kitts, D.D.; Levy-Milne, R.; Wasdell, M.B. (2010). Nutritional Status of Children with Attention Deficit Hyperactivity Disorder: A Pilot Study. Int. J. Pediatr.

23- Witkowski, M.; Hubert, J.; Mazur, A. Methods of assessment of magnesium status in humans: A systematic review. Magn. Res. 2011, 24, 163–180.

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