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Salivary Antioxidents in Relation to Caries Severity Among a Group of Young Adults

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Abstract

Aim of the study: Saliva represents the body's stages of toxicological, hormonal, immunological, and markers of many infectious disease and disorders, so that it's an ideal tool for monitoring oral and systemic health.
Antioxidants help the body's defensive system by reducing oxidative stress. The study was directed to estimate the carious lesion experience (DMFS) in relation to salivary superoxide dismutase and total protein among adults by age and gender.

Materials and methods: Caries experiences was assessed according to DMFS index, after investigation eighty peoples of an age 19-22 years for both genders. Stimulated salivary samples were together and chemically assessed to detect selected salivary antioxidants (superoxide dismutase, total protein), under standardized condition. Total protein and superoxide dismutase were measured by spectrophotometric examination.

Results: With not-significant differences, total protein was found to be higher in the caries active group than in the caries free group, but salivary superoxide dismutase was the opposite. with statistically not-significant differences, females had a greater average of the salivary total protein than men, whereas men had a greater average of salivary superoxide dismutase than females. the first group (19-20 years) had a not-significant greater average salivary total protein and salivary superoxide dismutase than the second group (21-22 years).

Conclusion: Salivary superoxide dismutase is the important factor in dental caries prevention. As a result, alterations in salivary content are crucial in the development and progression of dental caries.

Keywords: Dental caries, salivary superoxide dismutase, total protein, young adults.

Introduction

Saliva is a clear, mixture viscous fluid that circulates in the oral cavity which discharges from the salivary glands and gingival crevicular fluid. It is 98 percent water, with the remaining 2% made up of electrolytes, hormones, proteins, and other things [(1,2)]. Saliva serves as a washing solution, lubricant, buffer, reservoir for calcium and phosphate ions, which are essential for reminerlization, and is constantly soaking the teeth and oral mucosa [(3)]. Antioxidants found in human saliva are important in the battle against reactive nitrogen species (RNS) and reactive oxygen species (ROS), which cause mutations to the DNA as well as oxidative stress. Albumin, ascorbic acid, uric acid, and enzymes are the chief salivary antioxidants. Antioxidants are important constituents of the body's defensive system due to their protection against oxidative stress. [(1).] According to a study, caries-affected children's salivary total antioxidant capacity increased as compared to caries-free children [(4)]. Many studies have shown that there are no significant variations in total protein and salivary total antioxidant levels between children with caries and children who do not have caries, regardless of age or gender, with

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little information about their effects on antioxidants [5,6].

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For all of the reasons described, this research was made on a group of people to investigate the effects of certain salivary antioxidants on caries experience.

Materials And Methods

This study included eighty volunteers (30 males and 50 females), who were between the ages of 19 and 22. This study was carried out at AL-Jameaa Heath Center and at Collage of Dentistry/ Baghdad University, Baghdad, Iraq as apart of MSc project (No.6944). Caries was diagnosed and recorded using the Decayed, Missing, and Filled Surface (DMFS) Index, which was developed using WHO criteria. [7]. A dental explorer and a plane mouth mirror were used to do the examination. Clinical examinations were performed to assess dentition status using a systematic method, beginning with the maxillary right second molar and progressing to the maxillary left second molar, then to the mandibular left second molar, and finally to the mandibular right second molar.

The collection of stimulated salivary samples was done under conventional conditions, according to Tenovuo and Lagerlof's recommendations [8]. Each individual was instructed to chew a uniform piece of Arabic chewing gum (0.5-0.7 gram) for one min before expectorating all saliva. We gave each person a tube and instructed them to spit out 5 mL of salivary. The samples were centrifuged at 3000 rpm for 5 min to separate the supernatant, which was then frozen at 20 c in plastic polyethylene tubes until analysis.

A UV visible recording spectrophotometer was used to perform biochemical analysis of antioxidants (total protein and superoxide dismutase).

Results

Despite that female had a greater mean of salivary total protein content than men, (66.8±2.5, 62.6±3.7 correspondingly), the difference was found to be statistically not significant. The first age group (19-20 years) had a greater mean of salivary total protein than another age group (21-22 years) (table1).

Table (2) displays the standard errors and means of salivary superoxide dismutase concentrations calculated in microliters in both females and males. For the first group, males had not-significant higher mean salivary superoxide dismutase levels than females, and vice versa for the second age group. The first age group (19-20 years) had a greater mean salivary superoxide dismutase than another age group (21-22 years).

table (3) shows the differences in salivary total protein and salivary superoxide dismutase between the caries-free and caries-active groups.

The findings revealed that the caries active group had greater mean of salivary total protein than the second group which is caries free group, and the verse versa for salivary superoxide dismutase, that caries active group had a lower value.

The comparison of salivary parameters among DMFS subgroups is shown in table (4).

ANOVA revealed statistically non-significant differences in total protein and salivary superoxide dismutase levels among DMFS subgroups.

Table (5) shows the differences in salivary total protein and salivary superoxide dismutase between the caries-free and caries-active groups (DS groups).

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Despite the result shows statistically not-significant difference at p>0.05, the caries active group (DS class) had a greater mean of total protein than the caries free group, while caries active group had lesser salivary superoxide dismutase mean than the group with caries free.

The comparison of salivary parameters between ds subgroups is shown in table (6).

Statistically non-significant variations in salivary total protein and salivary superoxide dismutase were discovered using ANOVA among DS subgroups.

Table 1: Mean salivary total protein by age and gender

Age groups/year	Gender	No.	**Mean**(umg/dl)	± SE	d.f.	Student t-test	Sig.
19 - 20	Males	12	63.0	5.3	27	1.15	0.26
	Females	17	72.4	5.7			
	Both	29	68.5	4.0			
21 - 22	Males	18	62.4	5.2	49	0.33	0.74
	Females	33	64.0	2.3			
	Both	51	63.4	2.3			
Both	Males	30	62.6	3.7	78	-0.97	0.33
	Females	50	66.8	2.5			
	Both	80	65.3	2.1			

Table 2: Mean salivary superoxide dismutase by age and gender

Age groups/year	Gender	No.	**Mean**(u/ml)	± SE	d.f.	Student t-test	Sig
19 - 20	Males	12	20.0	4.1	27	0.82	0.42
	Females	17	18.4	1.4			
	Both	29	19.0	0.9			
21- 22	Males	18	16.8	1.5	49	0.22	0.83
	Females	33	17.3	1.2			
	Both	51	17.1	0.9			
Both	Males	30	18.1	1.1	78	0.31	0.97
	Females	50	17.6	0.9			
	Both	80	17.8	0.7			

Table 3: Salivary variables in caries free and active groups

Salivary parameters	DMFS index	No.	Mean	± SE	Student t-test	Sig
Total protein(umg/dl)	0	9	62.2	3.8	0.51	0.60
	≥ 1	71	65.6	2.3		
Salivary superoxide dismutase (u/ml)	0	9	17.8	1.7	0.13	0.89
	≥ 1	71	17.5	0.7		

Table 4: Salivary variables in relation to DMFS subclasses

Salivary parameters	DMFS subclasses	No.	Mean	± SE	ANOVA test	Sig
Total protein (umg/dl)	0	9	62.2	3.8	0.86	0.47
	1 - 5	28	61.7	4.0		
	6 - 11	21	69.8	4.2		
	≥ 12	22	66.7	3.7		
Salivary superoxide dismutase (u/ml)	0	9	17.5	1.7	0.25	0.86
	1 - 5	28	18.6	1.3		

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	6 - 11	21	17.2	1.4		
	≥ 12	22	17.5	1.1		

Table 5: Salivary variables in caries free and active groups (DS)

Salivary parameters	DS	No.	Mean	± SE	Student t-test	P-value
Total protein	0	21	62.5	3.6	0.77	0.44
	≥ 1	59	66.2	2.5		
salivary superoxide dismutase	0	21	18.3	1.4	0.42	0.66
	≥ 1	59	17.6	0.8		

Table 6: Salivary variables in relation to DS subclasses

Salivary parameters	DS subclasses	No.	Mean	± SE	ANOVA test	Sig
Total protein	0	21	62.5	3.8	0.64	0.58
	1 - 3	32	64.1	4.0		
	4 - 6	13	66.3	4.2		
	≥ 7	14	71.1	3.7		
Salivary superoxide dismutase	0	21	18.3	1.7	0.44	0.72
	1 - 3	32	17.1	1.3		
	4 - 6	13	19.2	1.4		
	≥ 7	14	17.3	1.1		

Discussion

Eighty young adults between the ages of 19 and 22 were chosen for this study (females 50 and males 30). Seventy-one of them had active caries, whereas the others were caries-free.

Saliva includes various of the similar biomolecules that are widely assessed in many additional body fluids, for example, roughly 30% of the proteins that had been noticed in saliva are found as well as in blood, demonstrating saliva's diagnostic potential [9]. The salivary antioxidant system contains a number of chemicals and enzymes that are comparable to those found in other biological systems.

It was decided to collect stimulated salivary samples in order to acquire more saliva, and it was revealed that stimulated salivary samples were more than unstimulated saliva samples due to smaller sample variance [11].

The caries active group had a greater mean total protein level than the group with caries free.

This finding agrees with the study done by Ahmadi-Motamayel et al [12] on adolescences aged 15 - 17 years and Tulunogluo et al [13] investigation of adolescences aged 7-10 and 11-15 years, but this finding disagreement with another study done by Dodds et al study of adolescences with age groups of 7-10 years and 11-15 years. [14] In young adults, the Kadoum study [6] was conducted, while in children, the Kadoum study [6] was conducted.

This finding could be explained by the activity of specific proteins, as total salivary proteins can have both beneficial and harmful effects.

As a result, salivary proteins can be thought of as "two-edged" words.

The location or place of action of salivary proteins may influence their functions.

Some proteins, such as antibacterial and pH-modulating proteins, protect the oral cavity, whereas adhesins and agglutinins harm the oral cavity by promoting microbe colonization [15].

In the current study, there were no statistically significant changes in total

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protein levels based on age. This finding differs from that of Vibhakar et al [16], which could be due to the small age group in the current investigation.

The current study discovered that the protein profile in females was more concentrated than that in males, taking total protein levels in saliva and gender into account, which is consistent with research done among young adults [14, 17]. Another study [18] was conducted among dentistry students, and it differ levels in saliva from Vibhakar et al [16] in that they did not provide an explanation, and this point of contention requires additional inquiry.

There were no statistically significant differences in total protein concentration between men and women. This finding among young people coincides with certain studies [16,18] but contradicts with others [14, 17].

In the current investigation, the mean of salivary superoxide dismutase was found to be greater in the group with caries-free than in the group with caries-active, which contradicts the findings of Hedge et al. [19].

Antioxidants in saliva are the body's first line of defense against oxidative stress caused by free radicals [19].

Many studies have found that decreased saliva antioxidant capacity plays a key role in the onset and progression of a variety of oral disorders, including oral lichen planus [20], periodontal disease [21], and dental caries, all of which are caused by oxidative stress [12]. These situations, which are attribute to a decrease in TAC of saliva, that acts as a defense mechanism, can have a major part in tooth cavities due to damaging elements such as non-radical oxygen derivatives or free radicals, according to this study.

Improved action of neutrophils as well as monocytes, that induce reactive oxygen species (ROS) in the company with germs, could potentially be linked to lower salivary TAC among dentistry students. In other meaning, decrease of TAC of saliva due to enhanced production of ROS [22].

The amount of SALIVARY SUPEROXIDE DISMUTASE in males was found to be greater than in females. This finding is consistent with Ahmdi-Motamayel et al [12] and disagreement with another study [13]. This suggested that lower saliva TAC levels were unaffected by gender, with statistically insignificant variations between females and males.

The efficacy of the total antioxidant system in saliva in males could be due to a variety of factors including individuals genetic background, antioxidant level and potency, dietary consumption, hormones ,smoking, stress and physical activity [23].

Conclusion

Antioxidants in saliva and serum have a direct link [24, 25]. As a result, more research into the preventive effect of antioxidant-containing medications can be done in order to discover novel approaches to preventing dental caries..

Conflicts of Interest

The authors declare that they have no conflicts of interest.

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Data Availability Statement

Data are available from the authors upon reasonable request.

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References

1. Lima DP, Diniz DG, Moimaz SA, Sumida DH, Okamoto AC. Saliva: reflection of the body. Int J Infect Dis. 2010;14(3):184-188. https://doi.org/10.1016/j.ijid.2009.04.022
2. Humphrey SP, Williamson RT. A review of saliva: normal composition, flow, and function. J Prosthet Dent. 2001;85(2):162-169. https://doi.org/10.1067/mpr.2001.113778
3. Brostek AM, Bochenek AJ, Walsh LJ. Minimally invasive dentistry: a review and update. Shanghai Kou Qiang Yi Xue. 2006;15(3):225-249.
4. Dodwad R, Betigeri AV, Preeti BP. Estimation of total antioxidant capacity levels in saliva of caries-free and caries-active children. Contemp Clin Dent. 2011;2(1):17-20. https://doi.org/10.4103/0976-237X.79296
5. Zahir S, Sarkar S. Study of trace elements in mixed saliva of caries free and caries active children. J Indian Soc Pedod Prev Dent. 2006;24(1):27-29. https://doi.org/10.4103/0970-4388.22832
6. Kadum N. Selected salivary constituents, physical properties, nutritional status in relation to dental caries among (4-5) years old children. J Bagh College of Dentistry. 2014;26(2). https://doi.org/10.12816/0015213
7. World Health Organization. Oral health surveys basic methods. Geneva, Switzerland; 1987.
8. Tenovuo J, Lagerlöf F. Saliva. In: Thylstrup A, Fejerskov O. Textbook of clinical cariology. 2nd ed. Copenhagen: Munksgaard; 1994:17-43.
9. Pfaffe T, Cooper-White J, Beyerlein P, Kostner K, Punyadeera C. Diagnostic potential of saliva: current state and future applications. Clin Chem. 2011;57(5):675-687. https://doi.org/10.1373/clinchem.2010.153767
10. Ozmeric N. Advances in periodontal disease markers. Clin Chim Acta. 2004;343(1-2):1-16. https://doi.org/10.1016/j.cccn.2004.01.022
11. Gu F, Lux R, Anderson MH, Del Aguila M, Wolinsky L, Hum W, Shi W. Analyses of Streptococcus mutans in saliva with species-specific monoclonal antibodies. Hybrid Hybridomics. 2002;21(4):225-232. https://doi.org/10.1089/153685902760213822
12. Ahmadi-Motamayel F, Goodarzi M, Hendi S, Abdolsamadi, Rafieian N. Evaluation of salivary flow rate, pH, buffering capacity, calcium and total protein levels in caries free and caries active adolescence. J Dent And Oral Hyg. 2013;5(4):35-39.
13. Tulunoglu O, Demirtas S, Tulunoglu I. Total antioxidant levels of saliva in children related to caries, age, and gender. Int J Paediatr Dent. 2006;16(3):186-

DOI: 10.32828/mdj.v19i2.986

191. https://doi.org/10.1111/j.1365-263X.2006.00733.x
14. Dodds MW, Johnson DA, Mobley CC, Hattaway KM. Parotid saliva protein profiles in caries-free and caries-active adults. Oral Surg Oral Med Oral Pathol Oral Radiol Endod. 1997;83(2):244-251. https://doi.org/10.1016/S1079-2104(97)90012-3
15. Deshpande R, Panval PS, Kulkarnn AA, Gadkari TV. Age-Related Changes of the Human Salivary Secretory Total Protein Complex and Trace Elements in Children between the Age Group of 3-16 Years. J Biomed Sci and Res. 2011;3(1):362-367.
16. Vibhakar P, Patankar S, Yadav M, Vibhakar P. Salivary total protein level and their correlation to dental caries. Intern J Oral and Maxillo Patho. 2013;4(3):13-16.
17. Roa NS, Chaves M, Gomez M, Jaramillo L. Association of salivary proteins with dental caries in a Colombian population. Acta Odontol Latinoam. 2008;21(1):69-75.
18. Banderas-Tarabay J, Zacarías-D'oleire I, Garduño-Estrada R, Aceves-Luna E, González-Begné M. Electrophoretic analysis of whole saliva and prevalence of dental caries. A study in Mexican dental students. Arch Med Res. 2002;33(5):499-505. https://doi.org/10.1016/S0188-4409(02)00395-8
19. Hegde MN, Hegde A, Ashok A, Shetty S. Biochemical indicators of dental caries in saliva: an in vivo study. Caries Res. 2014;48(2):170-173. https://doi.org/10.1159/000355580
20. Shirzad A, Pouramir M, Seyedmajidi M, Jenabian N, Bijani A, Motallebnejad M. Salivary total antioxidant capacity and lipid peroxidation in patients with erosive oral lichen planus. J Dent Res Dent Clin Dent Pros. 2014;8(1):35-39.
21. Azizi A, Sarlati F, Parchakani A, Alirezaei S. Evaluation of whole saliva antioxidant capacity in patients with periodontal diseases. Open Journal of Stomatology. 2014;4:228-231. https://doi.org/10.4236/ojst.2014.44031
22. Krawczyk D, Sikorska-Jaroszynska MH, Mielnik-Blaszczak M, Pasternak K, Kapec E, Sztanke M. Dental caries and total antioxidant status of unstimulated mixed whole saliva in patients aged 16-23 years. Adv Med Sci. 2012;57(1):163-168. https://doi.org/10.2478/v10039-012-0015-9
23. Pereslegina IA. The activity of antioxidant enzymes in the saliva of normal children. Lab Delo. 1989;(11):20-23.
24. Reznick AZ, Shehadeh N, Shafir Y, Nagler RM. Free radicals related effects and antioxidants in saliva and serum of adolescents with Type 1 diabetes mellitus. Arch Oral Biol. 2006;51(8):640-648. https://doi.org/10.1016/j.archoralbio.2006.02.004
25. Malekirad A, Shariatzadeh SM, Fans A, Ranjbar A. The comparison of total antioxidant capacity of serum and saliva between patients with type-2 diabetes mellitus and control. J Shahrekord Univ Med Sci. 2005;7(3):69-74.