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Total Antioxidant Capacity of Saliva and Its Relationship with Early Childhood Caries and Rampant Caries

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Abstract: ***Objective: to evaluate the correlation between the total antioxidant capacity of saliva and caries. Methods: 100 children who reported to the Gujarat Adani institute of medical science were included in the study. The dental caries status was assessed using the WHO Oral Assessment Form. The total antioxidant capacity was evaluated using spectrophotometric assay. Results: In a sample size of 100 children, the mean TAC of saliva among both the control groups were much lower when compared with the study groups, which was statistically very highly significant hence suggesting the fact that with the presence of caries TAC of saliva increased. Conclusion: The TAC of saliva increases in children with ECC. The TAC of saliva increases in children with Rampant caries. The TAC of saliva increases as the dft and DMFT indices increase (caries severity). The TAC of saliva increases as the age increases.***

Keywords: Caries. Children, DMFT, saliva

1. Introduction

The science of dentistry has existed for long, ever since there has been theorizing about the cause for dental caries. Today, all experts on dental caries generally agree that it is an infectious and communicable disease and that multiple factors influence the initiation and progression of the disease.[1] Apparently it is still not possible to embrace the science and fully implement it to reduce the level of dental caries in the population or even try to implicate a particular cause for the same.[2]

The reduction of molecular oxygen to water is accompanied by a large free energy release that can give rise to Free Radicals (FR) and/or Reactive Oxygen Species (ROS). The most important FR in biological systems are radical derivatives of oxygen.[3, 4] Although saliva has not been used as much up to this point as a sampling media, it does have a strong potential to do the same kinds of tests that are done currently in blood.[5]

Recently saliva has been used in various studies as an important lab adjunct for diagnosis and other purposes. As for the literature available very little has been discussed about dental caries and antioxidants. Especially no relation has been found between the total antioxidant capacity of saliva with Early Childhood Caries and Rampant Caries. Hence, the need for a study to evaluate the correlation between the total antioxidant capacity of saliva and caries.

2. Methodology

Study Design

100 children who reported to the **Gujarat Adani institute of medical science** were included in the study. The dental caries status was assessed using the WHO Oral Assessment Form.[6]

The total antioxidant capacity was evaluated using spectrophotometric assay.[7]

Inclusion criteria:

- Patients with ECC and rampant caries were included in the study;
- Informed Consent from the parents and the children were taken.

Exclusion criteria:

Patients who are physically and medically compromised and who had arrested carious lesions.

3. Method of Collection of Saliva

Method of collection of saliva- as Prieto suggested the patient was seated, head slightly down and was asked not to swallow or move his tongue or lips during the period of collection. The saliva was allowed to accumulate in his mouth for 2 minutes and he or she was asked to spit the accumulated saliva into the receiving vessel.[8]

2ml of unstimulated saliva was collected and stored at a temperature of 4°C in plastic or glass vials. Thus, the collected saliva was subjected to analysis using Spectrophotometer.[9]

Statistical analysis

Statistical analysis was done using student's unpaired *t* test.

4. Results

Table 1: ECC Control Group (below 71months of age)

As seen in Table 1 the TAC of saliva levels range from 9.6-24.0µmol/l.

Sl no	Age(yrs)	Sex(m/f)	TAC(µmol/l)	dft
1	3	M	12.0	0
2	4	F	14.4	0
3	4	F	12.0	0

4	4	M	12.0	0
5	4	M	12.0	0
6	4	F	19.2	0
7	4	M	24.0	0
8	4	F	14.0	0
9	4	M	12.0	0
10	4	M	12.2	0
11	4	F	14.4	0
12	4	M	11.0	0
13	4	M	9.6	0
14	5	F	14.4	0
15	5	F	12.0	0
16	5	M	9.6	0
17	5	M	19.2	0
18	5	M	21.6	0
19	5	F	24.0	0
20	5	F	14.2	0
21	5	F	13.2	0
22	5	F	15.6	0
23	5	F	9.6	0
24	5	F	12.0	0

Table 2

ECC Study Group Group (below 71months of age)

The levels in this group range from 12-48 µmol/l.

Sl no	Age(yrs)	Sex(m/f)	TAC(µmol/l)	dft
26	3	F	26.2	2
27	3	f	19.0	2
28	3	M	28.2	4
29	4	M	21.6	3
30	4	F	26.6	4
31	4	M	48.6	6
32	4	M	42.6	7
33	4	M	21.6	3
34	4	M	28.0	4
35	4	F	12.0	2
36	4	M	14.0	2
37	4	F	21.6	3
38	4	M	32.4	5
39	5	F	21.6	2
40	5	M	19.0	2
41	5	M	15.0	2
42	5	F	67.2	8
43	5	M	26.4	2
44	5	F	24.2	3
45	5	M	28.6	5
46	5	F	17.0	1
47	5	M	18.6	2
48	5	F	12.0	2
49	5	F	21.6	3
50	5	M	26.0	4

Table 3

Rampant Caries Control group (6-12yrs)

As observed in the table, the TAC levels range from 14.4-36.2 µmol/l.

Sl no	Age(yrs)	Sex(m/f)	TAC(µmol/l)	DMFT
51	6	M	26.2	0
52	6	F	14.4	0
53	7	M	24	0
54	7	F	24.0	0
55	7	F	16.0	0
56	7	M	24.0	0
57	7	F	28.6	0
58	7	F	20.0	0
59	7	M	21.0	0
60	7	M	36.2	0
61	7	F	19.2	0
62	7	F	22.6	0
63	7	F	21.8	0
64	7	F	22.0	0
65	7	M	21.6	0
66	8	F	26.2	0
67	8	M	22.0	0
68	8	M	21.6	0
69	8	F	28.6	0
70	8	M	28.2	0
71	8	M	26.0	0
72	9	M	21.6	0
73	9	M	14.4	0
74	10	F	24.2	0
75	10	M	19.6	0

Table 4

Rampant Caries Study group (6-12yrs)

The TAC levels as observed range from 21.6-69.6 µmol/l

Sl no	Age(yrs)	Sex(m/f)	TAC(µmol/l)	DMFT
76	7	F	23.5	5
77	7	M	34.6	7
78	7	M	28.6	5
79	7	F	28.0	5
80	7	M	57.6	6
81	7	M	51.2	7
82	7	F	46.6	6
83	7	M	42.4	6
84	7	M	31.2	5
85	7	M	69.6	7
86	7	M	96.0	7
87	8	M	23.6	5
88	8	M	21.6	6
89	8	F	26.2	5
90	8	M	29.0	6
91	8	F	29.6	6
92	8	M	45	5
93	8	F	67.2	8
94	8	F	67.2	7
95	9	M	32.6	7
96	9	F	30.0	5
97	9	M	67	8
98	9	F	66.6	7
99	9	F	67.2	6
100	9	M	71	7

Table 5

	Group	N	Mean TAC (µmol/l)	Std. Deviation	Sig. P value
TAC (µmol/l)	Control	25	14.152	4.246	.000 (vhs)
	ECC	25	25.584	12.123	
	Control	25	22.96	4.76	.000 (vhs)
	RC	25	46.12	.99	

Comparison of mean scores of TAC of saliva among study and control groups

P < .05 SIGNIFICANT (s)

In a sample size of 100 children, the mean TAC of saliva among both the control groups were much lower when compared with the study groups, which was statistically very highly significant hence suggesting the fact that with the presence of caries TAC of saliva increased.

5. Discussion

The sample of 100 were divided into different age groups does show a significant difference between them suggestive that as the age increases TAC also increases.

In our study we have tried to prove the importance of saliva as an important adjunct for diagnosis. In this study, special care was taken to standardize the factors affecting the subjects in so far as one is able, in order to simplify the discussion and conclusion of the results.

Additionally, it was decided to take unstimulated saliva samples as it is preferred in determination of antioxidant defense parameters to stimulated saliva and it is claimed that TAC is higher in unstimulated saliva.[10,11,12] Recently, it has been claimed that the imbalances in the levels of FR/ROS and antioxidants may play an important role in the onset and development of several inflammatory oral pathologies.[13]

We took up TAC in our study as it is suggested that FR/ROS and antioxidant system appear to act in concert rather than alone, investigations of individual antioxidant activity may be misleading, and the measurement of any individual antioxidant may be less representative of the whole antioxidant status. [14]

6. TAC Levels in the Control Groups

As observed in our study the control groups had significantly lower levels of TAC when compared to the study groups. The results are suggestive of the fact that TAC is lower in children who have a good oral hygiene status and also that TAC levels increase with age.

TAC AND CARIES

In our study when we compared the TAC of saliva in children with ECC and rampant caries (RC), the results suggest an increase in the TAC of saliva in children with caries be it ECC or RC indicating a linear correlation between TAC of saliva and caries. Recent clinical trials have found that antioxidant supplementation can significantly improve certain immune responses. Supplementation with the antioxidant vitamins also protected immune responses in individuals exposed to certain environmental sources of free radicals. [15]

TAC AND OTHER FACTORS

The relationship between TAC and gender of the children could not be established as the samples were picked up at random and moreover since the objective of the study was to establish the relationship between TAC and caries per. Another potential factor that may potentially alter the levels of TAC with respect to age and gender is that as the child approaches and goes through the pubertal growth spurts where there occur significant hormonal changes there could be a change in the TAC also. As seen in our present study the TAC of saliva has a linear relation with caries, also with the increasing caries indices i,e., as the severity of caries increases it was observed that the TAC levels also increase. We also observed that the TAC levels increased with age. But all these findings need to be confirmed using larger sample sizes.

7. Conclusion

Based on our results we can conclude that,

The TAC of saliva increases in children with ECC. The TAC of saliva increases in children with Rampant caries. The TAC of saliva increases as the dft and DMFT indices increase (caries severity). The TAC of saliva increases as the age increases. Though in our study we have found statistically significant results, we need to understand that there are various other factors or parameters which may predispose to ECC and RC. Therefore, future investigations are suggested with larger samples so as to draw absolute conclusions.

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