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Comparative Evaluation of Effect of Green Tea on Salivary pH And Flow Rate Amongst Dental Interns Batch of 2016-2021, KMSDCH - An Interventional Study

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Abstract

Introduction: Green tea (Camellia sinensis), a type of Chinese tea, is a famous herbal plant with abundant health benefits and also considered as one of the most popular beverages in the world. It contains polyphenols which are chemicals that act as powerful antioxidants. Green tea contains 35-52% catechins and flavanols combined. Several experimental studies suggests that green tea possess anti-inflammatory anticarcinogenic, antibacterial, anti-aging potential.

Aim: To evaluate and compare the salivary pH and Flow rate before and half an hour after intake of green tea and water amongst interns batch of 2016-2021, KMSDCH

Methodology: The sample size for the study consists of 40 interns of age group 21-23. Salivary samples were collected and evaluated based on pre and post salivary pH, and pre and post salivary flow rate of unstimulated saliva. Two agents were used i.e. Green Tea and water. All the participants were instructed to refrain from eating or drinking before 2 hours in the morning from 9-11 am. Salivary flow rate was calculated by using stopwatch over a period of 1 min and the amount was calculated. Salivary pH was calculated using pH meter.

Results: When comparing the data statistically, significant difference in the salivary flow rate of pre and post readings was observed. Statistically, significant association was observed between the salivary pH before and half an hour after consumption of green tea in comparison to water (p=0.001)

Conclusion: This study outcome pot rays the shift of pH towards alkaline range after green tea consumption and also elevated salivary flow rate among adolescents.

Keywords: green tea, salivary pH, salivary flow rate, dental interns

Introduction

The search for a much safer and unique range of naturally derived supplements has prompted academics to re-direct their research activities to natural resources,

such as medicinal herbs/plant derived chemicals, due to the continually increasing knowledge area and fresh trends. Consumption of green tea leaves is one such commodity that has gotten a lot of attention and awareness in this era of lifestyle changes.

In 2737 BC, Chinese Emperor Shen Nung popularised tea after he accidentally cooked few tea leaves in water, releasing a calming scent. Saliva is a fluid released by the glands. It plays an important function in the oral environment and is almost entirely made up of water, with the remaining 1% consisting of a mixture of molecules such as calcium, magnesium, potassium, chloride, bicarbonate, and phosphate. The pH of saliva is normally 6.7, and the buffering capability of saliva keeps the pH at 6.7-7.3 within the mouth fissure. According to the literature, drinking green or black tea raises the salivary pH and shifts it to an alkaline range. [2] Tea drinking has been shown to be useful in the prevention and healing of periodontal diseases in several trials. There were few research examining the specific effect of green tea on several salivary parameters such as pH and flow before and after half an hour of intake among dentistry college interns, as well as identifying the potential advantages of herbal tea intake among healthy persons.

Methodology

Dental interns of the college were enrolled in this double blinded cross-over study, if they met inclusion criteria. All 20-23 years old male and female dental interns, who agreed to participate in the study after signing informed consent form (40 participants), were included in this study. All patients were examined on the dental unit by the co-investigator under exact for the exclusion criteria. Finally, 40 dental interns were enrolled in this study. Inclusion criteria includes dental interns of age group 20-23 years old age group and who are ready for intake of green tea and those who willingly consented the form. Exclusion criteria for the selection of sample: Interns with known allergy to green tea, interns who are absent on the two consecutive days of study, history of systemic diseases and drug consumption during past 3 months and presence of Chronic or active periodontal or dental infections or salivary gland disorders.

A) For the two study days, all the participants were instructed to refrain from eating or drinking before 2 hours in the morning from 7-9 am. All the participants were called for collection of saliva from 9-11am and saliva samples were collected through spitting method. Every participant was asked to bend his head forward and spit his saliva without any stimulation into laboratory tube (No:1) for 1 minute observed on the stop watch. On the first day of study, after collecting the initial salivary samples, every participant was given 30 mL beverage (Group 1). After 5 minutes after consumption of beverage, saliva samples were collected again into laboratory tube (No:2) for 1 minute observed on the stop watch. Salivary pH for all samples were immediately assessed by digital pH meter (Isolab Laborgerate pH meter, Wertheim, Germany). For evaluation of pH, the electrode of pH meter was immersed into the samples and pH was reported. This test was repeated twice for each sample. The co-investigator, who assessed the salivary pH, was blind to the type of beverage. The amount of saliva collected in the laboratory tubes for a minute were measured in the calibrated tubes.

B) After 7 days, salivary samples were collected again (No:3) for 1 minute noted on the stop watch (Group 2). After 5 minutes after consumption of 30 ml of beverage, saliva samples were collected again into laboratory tube (No: 4) for 1 minute observed on the stop watch. For

making the subjects blind to which beverage they are drinking, they were served in the dark glasses.

Observation and Result

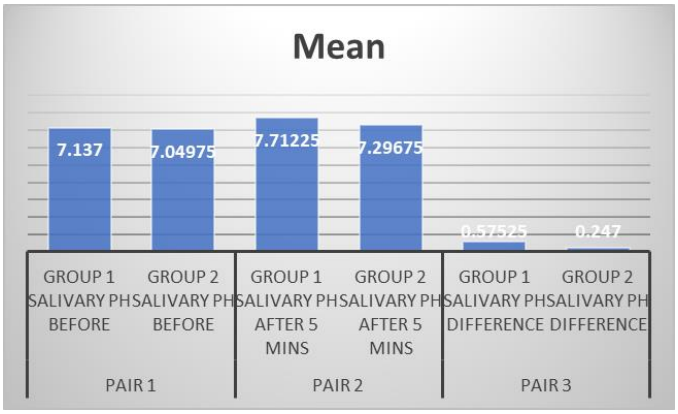
The study was performed among a total of 40 participants over a span of 7 days; who willingly followed the study instructions and gave their salivary samples for evaluation in both the test groups.

a) Assessment and evaluation of Salivary pH of Group1 (Green Tea) and Group 2 (Water)

Table 1: Salivary pH recordings before and after consumption of test groups and their difference

		N	Mean ± SD	Mean difference ± SD	t	P value
Pair 1	Group 1 Salivary pH Before	40	7.14±0.72	0.09±0.94	0.59	0.559
	Group 2 Salivary pH Before	40	7.05±0.64			
Pair 2	Group 1 Salivary pH After 5 mins	40	7.71±0.54	0.42±0.76	3.45	0.001
	Group 2 Salivary pH After 5 mins	40	7.3±0.52			
Pair 3	Group 1 Salivary pH Difference	40	0.58±0.69	0.33±0.81	2.57	0.014
	Group 2 Salivary pH Difference	40	0.25±0.4			

Figure 1: Salivary pH recordings before and after consumption of test groups and their difference

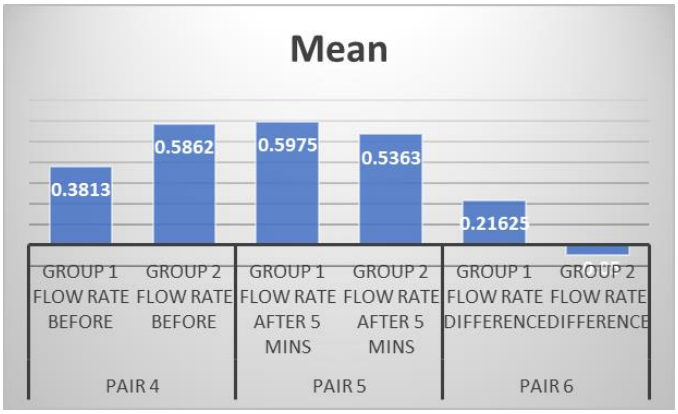


b) Assessment and evaluation of Salivary flow rate of Group1 (Green Tea) and Group 2 (Water)

Table 2: Salivary flow rate recordings before and after consumption of test groups and their difference

		N	Mean ± SD	Mean difference ± SD	t	P value
Pair 4	Group 1 Flow rate before	40	0.38±0.21	-0.21±0.41	-3.18	0.003
	Group 2 Flow rate before	40	0.59±0.3			
Pair 5	Group 1 Flow rate after 5 mins	40	0.6±0.3	0.06±0.41	0.96	0.345
	Group 2 Flow rate after 5 mins	40	0.54±0.27			
Pair 6	Group 1 Flow rate difference	40	0.22±0.39	0.27±0.62	2.73	0.009
	Group 2 Flow rate difference	40	-0.05±0.41			

Figure 2: Salivary flow rate recordings before and after consumption of test groups and their difference



Discussion

Saliva is a transparent and slightly acidic mucoserous exocrine fluid. The fluids generated from the main and peripheral salivary glands, and GCF, which contains germs and food debris, make up whole saliva. [3,4]

Salivary flow

Salivary flow rates differ significantly from one individual to the next. For unstimulated saliva, anywhere above 0.1 mL/min is termed normal output. When saliva is induced, the bare necessity recognised standard rises to 0.2 mL/min. The critical range distinguishing persons with adequate glandular function from others with hypofunction is 0.12 to 0.16 mL/min unstimulated total saliva flow rates.[5,6]

For approximately 16 hours of unstimulated flow, the average rate of flow is 0.3 mL/min, with a total of 300 mL. (During awake hours). 7 mL/min is the greatest stimulated flow rate. On a daily basis, stimulated saliva is reported to account for 80 percent to 90 percent of total salivary secretion. [5] Salivary flow rate drops as salivary acidity rises, providing a perfect environment for mouth diseases, particularly periodontal bacteria. According to one study, green tea increases glandular flow rate and decreases acidity as opposed to coffee and black tea. This research suggests that regular consumption may aid in the prevention and treatment of periodontal disease.[7]

Commercially available black and green teas have a bitter taste. Bitterness is processed on the surface of the tongue. Taste 2 Receptor sites (TAS2R) proteins are bitter taste receptors.[8] According to the study, when the subjects drink tea, taste receptors are activated, causing salivation to increase. The salivary glands are nourished by a dense capillary network. Owing to parasy mpathetically driven vasodilation, that could contribute to a 20-fold boost in glandular blood flow, secretory cells produce large amounts quantities of saliva over a long period of time. The salivary glands' vasodilation is increased by sipping hot tea. [9]

In our study, on comparison of the mean values of Group 1 Flow rate before and Group 2 Flow rate before the mean values of Group 2 Flow rate before is higher with a difference of 0.205 is statistically significant with a p value of 0. 003.On comparison of the mean values of Group 1 Flow rate difference and Group 2 Flow rate difference the mean values of Group 1 Flow rate difference is higher with a difference of 0.26625 is statistically significant with a p value of 0.009.

Salivary pH

Saliva's pH ranges from 6.2 to 7.6, with 6.7 being the average. The pH of the mouth does not dip below 6.3 during rest. Saliva keeps the pH in the mouth cavity close to neutral (6.7-7.3). Saliva has a pH of 6 to 7, indicating that it is mildly acidic. Salivary flow pH can

range from 5.3 (low flow) to 7.8 (high flow) (peak flow).[10]

S. Shamala Ravikumar [11] had observed30 healthy female subjects between 18 and 25 years of age when given commercially available tea products such as green tea, lemon tea, and ginger tea and evaluated pH at baseline and at regular intervals after the consumption of tea (immediately, 5 min and 10 min) depicted that green tea was found to cause a statistically significant increase in salivary pH, which was followed by ginger tea. These findings were comparable to Sangamesh war et al [12], Shalal et al (2017) [9], and Ahmed MA et al. (2017)[13]. Green tea, according to Demir et al., has the least influence on shifting salivary pH to an acidic range when compared to other beverages such as Coca-Cola, and has a greater effect on changing salivary pH to an alkaline range than other beverages.[14]

S. Shamala Ravikumar (2020)[11] discussed thata hike in salivary pH over the whole period of 10 min time interval after green tea consumption could be possible because of the abundance of catechins. In our study, on comparison of the mean values of Group 1 Salivary pH Difference and Group 2 Salivary pH Difference the mean values of Group 1 Salivary pH Difference is higher with a difference of 0.32825 is statistically significant with a p value of 0.014. On comparison of the mean values of Group 1 Salivary pH Difference and Group 2 Salivary pH Difference the mean values of Group 1 Salivary pH Difference is higher with a difference of 0.32825 is statistically significant with a p value of 0.014.

Limitations

The sample used in this analysis was easy and small; thus, the research findings cannot be generalized because participation in this study was limited to the region where the study was conducted. As the research was performed among the interns only, the sample size does not reflect the actual dental fraternity. Hence, it is advisable to conduct studies that could include the Dental practitioners, post-graduate students of all the branches of Dentistry and also Under-graduate Dental students.

Recommendations

A study on suitable sample size should be undertaken in order to have reliable and generalizable suggestions. This pilot study will be valuable in alerting and beginning larger-scale research projects. Can be extensively used in patients with established xerostomia. Addition of essential oils along with green tea enhances chances of good periodontal health.

Conclusion

Green tea appears to induce a considerable rise in salivary flow rate and pH, and appears to be a safe and effective adjunct treatment for periodontitis, according to the findings. The current study's findings show that the components in specific tea products raise salivary pH. Its daily consumption helps to improve the overall status of periodontal tissues by reducing microbial load, inflammation, and increasing anti-oxidants, and appears to be a safe and effective adjunct treatment. Additionally, the pH of plaque and saliva can be used as a diagnostic sign for periodontal disease.

More research into the effects of individual components in the beverage, as well as more precise salivary sample tests, are needed to draw firm conclusions. Studies should be done in this area to encourage the usage of herbal products in everyday life. If the scope of this study is broadened to include salivary flow rate and Streptococcus mutans count after consumption of tea products, it may offer more value to the body of research.

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