RESEARCH PAPER

Clinical Assessment of Salivary pH and Buffering Capacity in Relation to Dental Caries Susceptibility

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ABSTRACT
Saliva is crucial in the maintenance of oral health by buffering action, enamel remineralization and antimicrobial activity. Dental caries is a numerous multifactorial disease affected by salivary elements, oral hygiene, dietary habits and systemic physiological states. This paper aimed to evaluate salivary pH, buffering capacity and chosen blood physiological parameters with regards to dental caries vulnerability. A number of 60 subjects were employed in the study and separated into caries-active and caries-free groups. Blood and salivary specimens were examined, and statistical assessment was conducted with the use of independent t-tests and descriptive statistics. The findings showed significantly lower salivary pH, weaker buffering capacity in the caries-active group, indicating that both salivary and systemic factors are associated with dental caries susceptibility.

Keywords: Salivary pH, Buffering capacity, Dental caries, Saliva, Oral health, Caries susceptibility
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Introduction

Dental cavity is one of the most common chronic diseases universally and still remain one of the major public health issues. It may result from difficult interface between acid-engaging bacteria, fermentable carbohydrates, time and host factors. Among host-inclined relative factors and time. Form these factors, saliva serves an essential role through the dilution and clearing dietary buffering organic acids, dietary sugar and supply the basic vital minerals like calcium and phosphate for enamel remineralization (Edgar, 2012).
Buffering capacity can be seen as the main indicators of oral environmental steadiness. A sort of protracted reduction in slavery pH may favour enamel demineralization and improves the development cariogenic bacteria. Additionally, other parameters like salivary issues and psychological tenets such as calcium, hemoglobin, vitamin D, and blood glucose levels may affect tooth mineralization, metabolism and immune defense and consequently affect the dental cavity susceptibility (Fejerskov & Kidd, 2017) .

The Aim of Study

This paper aims to evaluate the clinical salivary pH and buffering capacity with regards to dental cavity and to assess the connected blood physiological parameters that may add to cavity clinically

Literature Review

Many studies have indicated a potent connection between salivary elements and dental cavity growth. Salivary pH below the crucial threshold that enhances enamel dissolution and supplements cavity risk (Ten Cate, 2015). Protecting capacity, basically, mediated by bicarbonate ions, is important to neutralize acids produced through oral bacteria following carbohydrate consumption.

Universal factors similarly, play an important function in oral health. Sufficient calcium and vitamin D levels are important for appropriate enamel mineralization and management. Inadequacy in these items have been connected to increased cavity prevalence. In addition, it can elevate blood glucose concentration, to provide a favorable domain for acidogenic bacteria. (Edgar, 2012; Fejerskov & Kidd, 2017).

Despite wide research on salivary aspects, limited research has significantly assessed blood physiological parameters. Thus, an integrated assessment and it may offer better insight into cavity possibility.

Materials and Methods

The design of the study is outlined below:
The study is cross-sectional which comprised of 60 subjects which range from 18-35 years. The subjects were categorised into two groups Design and Sample Selection

Cavity-active group (n) = 30
Cavity-free
group (n) = 3

Individuals with universal diseases affects the salivary flow and those medical conditions may influence saliva and they were omitted

Saliva Collection and Analysis

Unstimulated saliva specimens were gathered in the early morning under consistent situations. The subjects abstained from drinking, eating or brushing teeth for almost an hour before the collection of the sample. Salivary pH was assessed with the use of a calibrated digital pH meter. Buffering capacity was assessed through acid titration and characterized as high, modest, or low (Dawes, 2008).

Blood Sample Collection

Venous blood specimen were composed to evaluate:

Hemoglobin (g/dL)
Serum calcium (mg/dL)
Vitamin D (ng/mL)
Fasting blood glucose (mg/dL)

Statistical Analysis

The data were examined utilizing mean ± standard deviation. Independent t-tests were applied to compare constraints of the two groups. A p-value less than 0.05 was measured statistically important.

Results

Table 1. Salivary pH Levels

Standard Deviation	Mean PH	N	Group
0.28±	7.02	30	Caries - Free
0.35±	6.41	30	Caries - Active

Table 2. Salivary Buffering Capacity

Low	Moderate	High	Group
10	30	20	Caries - Free
45	35	60	Caries - Active

Table 3. Blood Physiological Parameters

Caries - active (Mean± SD)	Caries – Free (Mean± SD)	Parameter
8.60±.6	9.40±.5	Serum Calcium
22.5 ± 5.3	31.24±.1	Vitamin D
11.9±1.4	13.61±.2	Hemoglobin
8.5±96.1	88.47±.2	Fasting Glucose

Table 4. Salivary Flow Rate

Standard Deviation	Mean (ml/min)	Group
0.09±	0.42	Caries - Free
0.07±	0.28	Caries - Active

Table 5. Bicarbonate Concentration

Standard Deviation	Mean (mmol/L)	Group
3.1±	22.3	Caries - Free
2.8±	14.7	Caries - Active

Table 6. Phosphate Levels in Saliva

Standard Deviation	Mean (mmol/L)	Group
1±.2	6.8	Caries - Free
1.1±	4.9	Caries - Active

Table 7. Total Salivary Protein

Standard Deviation	Mean (g/L)	Group
0±.25	1.42	Caries - Free
0±.33	1.91	Caries - Active

Table 8. Plaque Index

Standard Deviation	Mean Score	Group
0±.4	0.9	Caries - Free
0.6±	2.1	Caries - Active

Table 9. DMFT Index

Standard Deviation	Mean DMFT	Group
0±.7	1.3	Caries - Free
1.4±	5.8	Caries - Active

Table 10. Summary of Key Parameters

Higher in Caries - Active	Higher in Caries - Free	Parameter
-	yes	Salivary PH
-	yes	Buffering Capacity
-	yes	Salivary Flow Rate
yes	-	Total Salivary Protein
yes	-	Plaque Index
yes	-	DMFT

In addition, tables (4–10) comprised some constraints which include, bicarbonate concentration, salivary flow rate phosphate level, DMFT scores and total protein content, plaque index. All the constraints indicated less favorable values in the caries-active group

Discussion

The present study shows a potent connection between salivary pH, buffering capability, systemic physiological constraints, and dental cavities susceptibility. Cavities-free persons showed significantly lower salivary pH values in comparison with the cavities-free subjects, to indicate a persistent enamel demineralization demonstrates (Ten Cate, 2015).

Salivary pH is a crucial factor to determine the enamel stability. When pH levels drop below the threshold, the mineral ions are then released from the enamel surface, and leads to developing tooth decay. The results of this study is in consonance with lower salivary pH are at greater danger to develop dental cavities (Dawes, 2008).

Buffering size plays a greatly complementary function to neutralize acids produced by cariogenic bacteria. The maximum prevalence of less buffering size as observed in cavity-inclined subjects to counteract acid challenges. The long and bacterial colonization to increase vulnerability (Ten Cate, 2015).

Furthermore, to salivary features, systemic physiological constraints may have significant influence on variety risks. Lower serum calcium and vitamin D stages may lessen enamel mineralization and decrease the resistance to acid attacks. These results are in line with the prior studies on the adequacy of mineral and vitamin levels in the maintenance of tooth integrity (Fejerskov & Kidd, 2017)

Hemoglobin levels were similarly lower in caries-inclined persons. The decreased hemoglobin can affect oxygen transport and immune system of defense within the oral tissues, to contribute to the increase on vulnerability and infections as well as delayed tissue repair. (Edgar, 2012)

Moreover, slight elevation in fasting blood glucose levels in the cavities-inclined group may improve the availability of fermentable substrates in saliva to promote bacterial growth and the production of acid (Edgar, 2012).

The collective assessment of the salivary and blood parameters will offer a detailed perception of dental cavities as a multifactorial disease. These results stress the vitality of the integration of systemic health assessment into common dental assessments. c nutritional status.

Notwithstanding its strengths, this study set to face some limitations which include a very small specimen size and cross-sectional paradigm. In future, a set of longitudinal research comprising of larger population should be carried out to explore the interaction between salivary and universal factors.

Conclusion

Salivary pH and protecting capacity are some of the major indicators of dental cavities vulnerability. Alterations in blood physiological parameters, especially calcium and vitamin D can contribute to the cavities risk. The combination of salivary diagnostics with universal evaluation can improve early recognition and avoidance

of dental cavities.

Recommendations

1- Usual monitoring of salivary
pH and buffering capacity.
Evaluation of calcium and vitamin D levels in high-risk individuals.
-Integration of salivary diagnostics into protective D a dental plans

References

Edgar, 2012
Ten Cate, 2015
Dawes, 2008
Fejerskov & Kidd, 2017