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Evaluaion of Oral Mucosal Cells in Type II Diabetic Patients using Exfoliative Cytology Method

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INTRODUCTION

Type 2 diabetes mellitus is a chronic metabolic disorder that results from defects in both insulin secretion and insulin action. An elevated rate of basal hepatic glucose production in the presence of hyperinsulinemia is the primary cause of fasting hyperglycaemia; after a meal, impaired suppression of hepatic glucose production by insulin and decreased insulin-mediated glucose uptake by muscle contribute almost equally to postprandial hyperglycaemia. People with type 2 diabetes are at elevated risk for a number of serious health problems including cardiovascular disease, premature death, blindness, kidney failure, amputations, fractures, frailty, depression, and cognitive decline. (1)

The incidence of diabetes is increasing because of the raging and changing ethnic mix of the population and because of worsening obesity. On the basis of current trends, the prevalence of diabetes is expected to nearly double by 2030 (2) Further, diabetes damages tissue repair processes and causes stomatologic problems of dental interest (3). Several studies suggest a higher prevalence and severity of some pathologies in the oral tissues of diabetic patients, where gingivitis,

periodontitis, candidiasis, and other oral manifestations such as alterations of salivary flow and oral burning, among other signs and symptoms, take place (4,5). Diabetes often goes undiagnosed because many of its symptoms seem so harmless. Some common symptoms include frequent urination, excessive thirst and hunger, unusual weight loss, increased fatigue and blurry vision. (6)

Early diagnosis of the Diabetes mellitus is an important aspect of health care. Currently, a diagnosis of diabetes is achieved by evaluating the blood glucose levels. Either a random blood sugar estimation or analysis of fasting/post-prandial blood sugar levels is the commonest diagnostic test for diabetes. Recently, however, monitoring of glycosylated hemoglobin (GHb) levels has become much commoner. (7)

Exfoliative cytology is a relatively easy, simple and non-invasive clinical technique which has the potential to be developed as a routine investigation for screening of diabetes mellitus. It can be done chair-side during routine dental examination.

The objectives of this study were to investigate alterations in the morphology and cytomorphometry of buccal mucosal cells of type 2 diabetics using exfoliative cytology technique. The parameters used to measure cytomorphometric changes were nuclear area (NA), cytoplasmic area (CA) and cytoplasmic/nuclear ratio (C/N). Comparisons were made between type 2 diabetic group and normal healthy subjects.

MATERIALS AND METHODS:

We randomly selected 20 patients with a history of type 2 diabetes who came to Saveetha Dental College and Hospital. Only patients with a known history of diabetes at least for the past 6 months were included in the study group. Individuals with smoking and tobacco chewing habits, habitual alcohol intake, presence of oral sepsis, presence of other systemic diseases, and presence of clinically evident nutritional deficiencies were excluded from the study.

Control group included 20 normal healthy adult individuals with no history of diabetes or any other illnesses.

Smears were taken from clinically normal buccal mucosa of the patients using a wooden spatula moistened in distilled water. The scrapings were then transferred to clean glass slides previously marked with the patient's reference number, and spread thinly and uniformly over the middle third of the slide. The smears were immediately fixed in alcohol and stained by the Papanicolaou method for cytomorphometric analysis.

In each slide, 20 clearly defined cells with predominant staining were selected in a random fashion from different fields and in order to avoid measuring the same cell again, the microscope was moved from left to right and then down and across in a stepwise manner.

We carried out all cytomorphometric analysis by transferring sample images at 45x magnification and 10x eyepiece to a computer by means of a camera. We used photoshop software for cytomorphometric analysis.

RESULT

The cytomorphometric analysis showed that the cytoplasmic area(CA) is significantly larger in the diabetic group than in the control group. The nuclear area(NA) was also significantly larger in the diabetic than in control group.

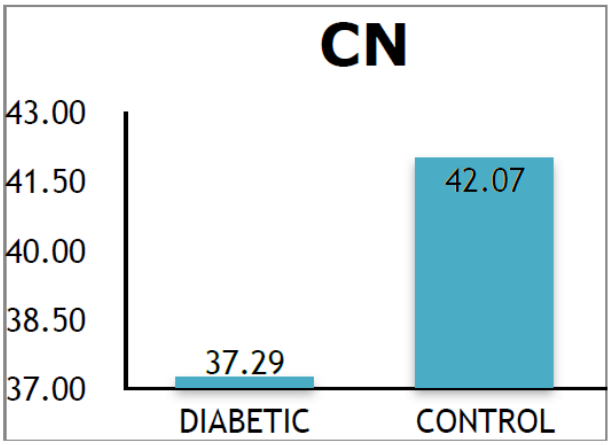
The nuclear cytoplasmic ratio(C/N) was found to higher in the control group than in the diabetic group.

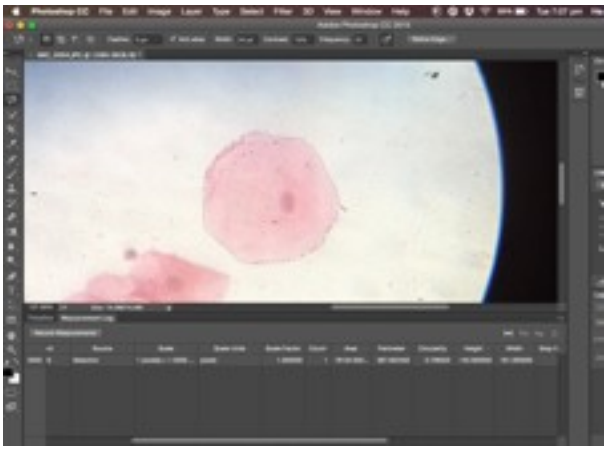
The nuclei of epithelial cells of healthy subjects were small and compact. Whereas the nuclei of oral epithelial cells of diabetic patients were comparatively larger.

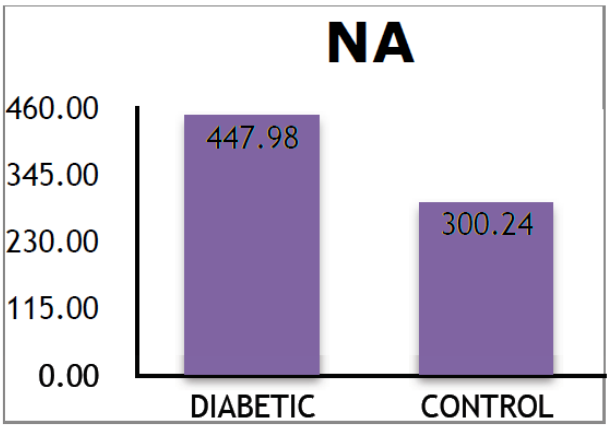
This is found to be similar to the results obtained by Ban Tawfeek Shareef et al (8)

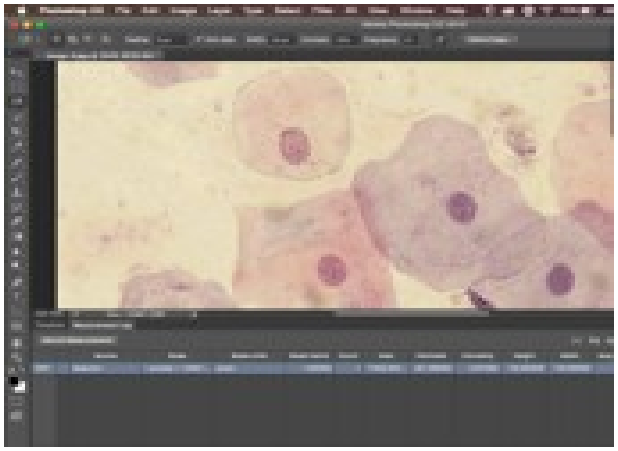
Table 1 : Mean values of CA,NAC/N ratio in Diabetic and Control group

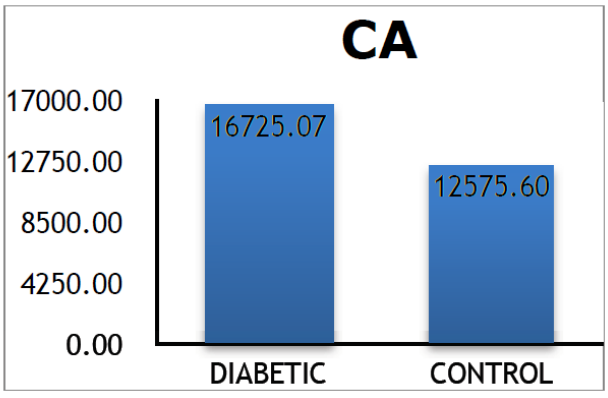
DC		N	Mean	Std. Deviation	Std. Error Mean
CA	DIABETIC	200	16725.07	3580.504	253.180
	CONTROL	200	12575.60	3088.771	436.818
NA	DIABETIC	200	447.98	91.024	6.436
	CONTROL	200	300.24	76.546	10.825
CN	DIABETIC	200	37.29	1.76	0.12
	CONTROL	200	42.07	2.72	0.38

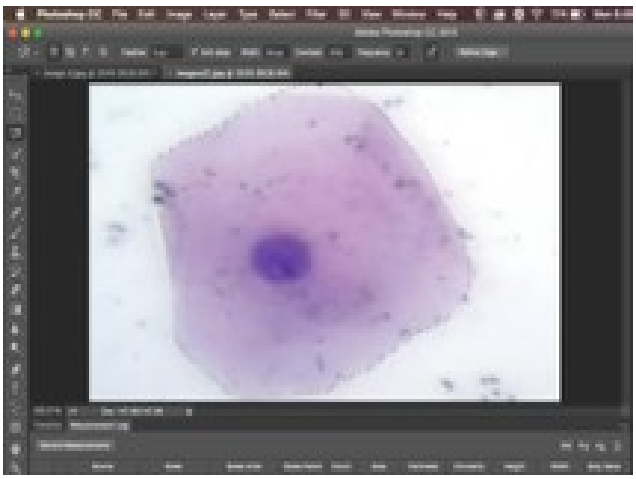












DISCUSSION

In this study, we compared the cytomorphometric analysis of smears taken from patients with Type 2 diabetes and compared it with that of the normal healthy individuals. Our results showed increased cytoplasmic area and nuclear area in the diabetic group. The C/N ratio was significantly lower in the diabetic group compared to the control. This was found to be similar to the results obtained earlier by various researchers. (8,9)

The possible hypothesis for explaining the increase in mean NA is as follows: An increased glucose level directly favours cell growth because of its pivotal role in metabolic processes. An actively growing cell is characterised by a prominent and large nucleus. Another factor that causes an increase in the nuclear area in diabetic patients is the increased susceptibility to trauma of oral mucosa, for which xerostomia also may play a role. (12)

The nuclear and cytoplasmic changes found in the diabetic group may also be related to the increased cellular age in patients with diabetes. Decreased cellular turnover might be a secondary reaction to ischemia caused by atherosclerosis in diabetic patients.(10)

Although the qualitative and quantitative changes found in the oral smears of type 2 diabetic patients are features that point to malignancy, it can be differentiated from the latter by the diminished C/N ratio and uniformity in the nuclear configuration (11).

Based on our cytomorphometric results, we can say that these alterations in the nuclear and cytoplasmic area are found in association with patients having diabetes. Therefore, detection of these qualitative and quantitative cellular changes by exfoliative cytology can help in the diagnosis of diabetes mellitus. (8)

CONCLUSION

We found that the noteworthy alteration in the cytomorphometry of oral mucosal cells in the diabetic patients gives clinician a more accurate image of what actually happens during diabetes. We can also conclude that exfoliative cytology is easily accepted by the patient as it is a non-invasive procedure and can be helpful for the dentists to in detection of diabetes and in referral of those in doubt to a proper medical care for a thorough analysis

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