INTRODUCTION

Diabetes mellitus is progressing at an alarming rate worldwide. It is associated with several micro- and macro-vascular complications [1]. Interestingly, periodontal infections are more commonly observed in diabetic individuals [2]. Diabetes negatively affects the salivary gland function and immune function which further increases the risk of oral infections in these individuals [3,4]. Oral infections including hyposalivation, parotid enlargement, burning sensation of mouth, taste alterations, salivary gland enlargement, and microbial lesions than controlled diabetes patients.

METHODS

Among 150 Type 2 diabetic patients from various tertiary care hospitals present in and around Vijaypur, Karnataka, a total of 100 patients were randomly selected with no other severe health problems. They were divided into two groups. Group I consists of 50 controlled diabetic patients who were stabilized on insulin, oral hypoglycemic or controlled diet. Group II consists of 50 patients with uncontrolled diabetes without dietary control. Special care is taken for maintaining medical records with previous medical history and habits. Before conducting the study, ethical clearance was obtained from Ethics Committee. The official permission for examination was obtained from all the concerned authorities. Voluntary written informed consent was obtained from patients participating in the study before the clinical examination.

Proper oral examination of the oral cavity was done with adequate natural light using plain mouth mirror and WHO probe. Examination of dental caries, periodontal problems, oral infective lesion such as candidiasis, herpes, glossitis, cheilitis angular, other benign neoplastic lesion, and proliferative lesion such as leukoplakia erythroplakia, and autoimmune lesion such as lichen planus.

Examination for the parotid enlargement, hyposalivation, taste alterations, and burning sensations of mouth. The oral swab sample is taken from buccal mucosa, dorsum of the tongue using sterile cotton swabs. The samples are sent to microbiology lab for culture. The sabouraud dextrose agar medium is taken for the cultural growth of the candida. Subculturing is done to differentiate morphological colonies.

RESULTS

Analysis of medical records indicated that high blood pressure was observed in uncontrolled diabetic group compared to the controlled once.

Sialadenosis is an asymptomatic bilateral parotid gland enlargement commonly seen in the diabetes patients compared to the other salivary glands, in diabetic sialosis the increased volume of the glands both in acinar as well as ductal cells. This study shows that uncontrolled diabetic patients are more compared to the controlled. Hyposalivation or sialostasia, the term for the subjective sensation of the dry mouth is a common symptom in diabetics. The sensation of oral dryness is related to a reduced flow rate of both unstimulated and stimulated whole saliva. This study shows that hyposalivation is the major finding in the uncontrolled patients than controlled (Table 1).

Taste impairment the ability to detect and recognize sweet, salty, and bitter taste is impaired in both Type 1 and 2 diabetics. Many diabetics complain of burning sensation in the oral cavity. BMS have been related to increased stimulation of the capsaicin receptor by candida metabolites. Our study shows relatively more results finding for the uncontrolled once (Table 1).

A higher caries incidence is seen among diabetics as compared to nondiabetics. Both advanced periodontal diseases and dental caries...
may lead to the loss of teeth. The autonomic neuropathy can reduce salivary flow rate, which can reduce salivary flow rate which can lead to dental caries and tooth loss. This study shows relatively more results finding for the uncontrolled once (Table 2).

In both the groups on oral examination, the presence of oral mucosal lesions such as lichen planus and recurrent aphthous ulceration has been diagnosed. Erythematous lesions on the palate are observed, which is related to prosthesis, it is diagnosed as denture stomatitis associated to candidiasis is seen. This study shows the oral lesion are more in the uncontrolled compared to the controlled once (Tables 2 and 3).

**DISCUSSION**

Diabetes mellitus is a metabolic syndrome considered to be caused by multiple factors resulting from a deficiency of insulin, which may be absolute due to pancreatic β-cell destruction (Type 1) or relative due to an increased resistance of the tissues to insulin (Type 2). A series of alterations in the oral mucosa in diabetic patients have been reported including gingivitis, periodontitis, and oral mucosal diseases that favor infections such as candidiasis, salivary gland dysfunction, altered taste, glossodynia, and stomatopyrosis [1].

Pathogenic lesions in diabetic patients are not usual but few cases were reported which was not associated with age. Oral mucosa is normally protected with saliva when present in adequate quality and quantity. Saliva makes lubrication, cleansing, and pH buffering. It also secretes antimicrobial proteins such as secretory immunoglobulin A and aggregation and clearance of bacteria. In innate immunity in the mouth is maintained by the epithelium and oral mucosa. Hyposalivation leads to development of several oral manifestations [5].

One of the oral manifestations in diabetic patients is hyposalivation. It is due to polyuria and involvement of salivary glands. The functioning tissues in salivary glands are replaced by adipose tissue, further reduces salivary secretion and produces burning symptoms of mouth [6-9]. Certain medicines such as diuretics were also associated with such symptoms. The main function of saliva is to maintain normal flora in salivary secretion and produces burning symptoms of mouth [6-9].

<table>
<thead>
<tr>
<th>Signs and symptoms</th>
<th>Uncontrolled (%)</th>
<th>Controlled (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parotid enlargement</td>
<td>58.6</td>
<td>26.3</td>
</tr>
<tr>
<td>Hyposalivation</td>
<td>93</td>
<td>64.1</td>
</tr>
<tr>
<td>Taste alterations</td>
<td>52.5</td>
<td>23.9</td>
</tr>
<tr>
<td>Burning mouth sensations</td>
<td>20.4</td>
<td>15.1</td>
</tr>
</tbody>
</table>

Table 1: Signs and symptoms observed in both controlled and uncontrolled diabetic patients

<table>
<thead>
<tr>
<th>Patients</th>
<th>Dental caries</th>
<th>Patients with lesions</th>
<th>Periodontal diseases</th>
</tr>
</thead>
<tbody>
<tr>
<td>Controlled</td>
<td>8</td>
<td>4</td>
<td>10</td>
</tr>
<tr>
<td>Uncontrolled</td>
<td>24</td>
<td>20</td>
<td>29</td>
</tr>
</tbody>
</table>

Table 2: Presence of dental caries and periodontal diseases in both controlled and uncontrolled diabetics

<table>
<thead>
<tr>
<th>Lesions</th>
<th>Uncontrolled (%)</th>
<th>Controlled (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Candidiasis</td>
<td>21.4</td>
<td>16.3</td>
</tr>
<tr>
<td>Herpes</td>
<td>12.3</td>
<td>5.2</td>
</tr>
<tr>
<td>Proliferative lesions</td>
<td>29.1</td>
<td>10.6</td>
</tr>
<tr>
<td>Benign neoplasias</td>
<td>9.3</td>
<td>3.5</td>
</tr>
</tbody>
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Table 3: Types of lesions observed in both controlled and uncontrolled diabetics

Farman and Nutt reported the atrophic lesions of tongue in *Candida albicans* infected patients [12,13]. In diabetic individual's the development candidiasis is multifactorial and not well understood, one is due to microvascularization, further reduces blood flow to tissues. The other is reduced the local resistance of the tissues.

Sialosis, the uncontrolled enlargement of bilateral parotid gland is mainly observed in diabetic patients. Our study also reported the same, the percentage of sialosis in uncontrolled diabetic patients is more in comparison to controlled diabetic individuals. In the current study, it is observed that main lesions to be varicosities of tongue and Fordyce granules which is not associate with any systemic diseases. These results were in accordance with previous studies [14].

The development of all these oral manifestations in the diabetes is multifactorial. Enhanced periodontal destruction is due to impaired neutrophil adherence, chemotaxis, and phagocytosis. Along with these high blood glucose levels in gingival cervical fluid diminishes wound healing capacity of fibroblasts [15]. Hyperglycemia also promotes abnormal collagen metabolism, impairs proliferation of osteoblasts and weakens newly formed bone [16,17]. Advanced glycation end products (AGE) was also reported in diabetic patients. These AGE products bind with macrophage and monocytes receptors causes release of interleukin-1 and tumor necrosis factor, which further enhances tissue destruction [15,16].

**CONCLUSION**

Oral complications - Such as hyposalivation, alteration of taste, burning sensation of mouth, parotid gland enlargement, and erythematous candidiasis - were seen in uncontrolled diabetic patients.

**REFERENCES**