

A Case Control Assessment of the Association between Kharra Chewing and Periodontal Health Status in Oral Submucous Fibrosis Patients: A Comparative Study

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Conflict of interest: Nil

Abstract

Aim: To determine the effect of kharra chewing on periodontal tissues of patients with OSMF in Bihar region.

Methodology: 90 patients (aged 21–60 years) visiting the Department of Dentistry, Private Dental clinic, Patna, Bihar, India. during the duration of three months, were included in this study. The three groups with 30 patients each are classified as follows: Group I ($n = 30$) included patients with a healthy periodontium, Group II ($n = 30$) included patients with chronic periodontitis without OSMF, and Group III ($n = 30$) included patients with chronic periodontitis and OSMF. Periodontal indices such as gingival index (GI) and plaque index (PI), PPD, and CAL were measured with a graduated periodontal probe for each tooth on all the six sites. On the basis of the region of quid placement, regional PPD and regional CAL (Clinical Attachment Loss) scores were also calculated. OSMF was diagnosed on inspectory and palpatory findings adhering to the clinical classification by to the clinical classification. Differences in the clinical parameters among the three groups were analyzed using one-way analysis of variance.

Results: All the 90 patients were of age 21-60 years with mean age of 38.5 ± 13.9 years. Mean age in group I, II and III was 41.5 ± 15.7 , 39.6 ± 11.8 , and 40.2 ± 13.9 years. In group I, 50% were males and 50% were females. In group II, 46.7% were males and 53.3% were females. In group III, 53.3% were males and 46.7% were females. GI for Groups I, II, and III was 0.6 ± 0.5 , 1.8 ± 0.7 , 1.0 ± 0.7 , and PI was 0.7 ± 0.4 , 1.4 ± 0.6 , and 2.2 ± 0.5 , respectively. In Group III, PPD (overall) was 3.9 ± 0.8 mm and CAL (overall) was 4.6 ± 0.8 mm. Group I showed a lower PPD as compared to group II and III. The frequency of kharra chewing in Group II and Group III was 6.32 ± 3.14 times per day and 6.60 ± 2.4 times per day, respectively. The duration of kharra consumption was 4.15 ± 3.05 (3.6-8.4) years and 6.98 ± 3.45 (4.2-8.3) years for Group II and Group III, respectively. CAL regional was also seen higher as compared to CAL overall in group II and group III.

Conclusion: From this study in can be concluded that periodontal parameters were more destructive in patients with chronic periodontitis with OSMF as compared to chronic periodontitis without OSMF. Similarly, clinical attachment level in the region of kharra placement was deep as compared to overall clinical attachment level.

Keywords: Gingivitis, Periodontitis, Fibrosis, Collagen, Kharran, Smokeless tobacco.

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Introduction

Oral Sub-Mucous Fibrosis (OSMF) is one the most prevalent and premalignant condition caused by tobacco use affecting not only the oral cavity, but also the oropharynx [1]. The term derives from oral (mouth), submucosal (below the mucosa of the mouth), and fibrosis (meaning hardening and scarring) [2]. Although the onset of OSMF is insidious, there is unquestionably a need to thoroughly evaluate biological status of an individual. The prevalence rate of OSMF is 0.5% with possibility rate of 7.6-13% of malignant transformation, affecting mostly the persons aged 20-40 years and a 4 incidence of 29.094 years and male: female ratio of 34:15 [3].

Epidemiological studies in India have shown that up to 80% of oral cancer patients are tobacco users [4]. They are consumed either has smoking forms: beedi, cigarette, cigar, dhumti, gudakhu, hookah and hookli [5] and chewable forms or smokeless tobacco (SLT): paan, khaini, snuff, zarda, mawa, etc [5]. SLT is a major public health problem in the Indian subcontinent, and India is considered the global capital of SLT use [6]. Unlike other countries where cigarettes and water pipe smoking are the major form of tobacco used, in India, only less than one-fifth (19%) of tobacco consumed is in the form of cigarettes [7].

As per the Global Adult Tobacco Survey (2010), more than one-third (35%) of adults in India are tobacco users. Of them, 21% are addicted only to SLT products whereas 9% are addicted to smoking alone. The rest 5% are addicted to both forms, i.e., smoking as well as SLT [6, 8]. The World Health Organization estimates 4.9 million deaths that are annually attributed to tobacco. This figure is expected to raise to 10 million in 2030, with 7 million of these deaths occurring in developing countries, mainly India [9].

Kharra chewing (areca nut and tobacco) is the most prevalent addiction in central and eastern India. Arecoline, a natural alkaloid in areca nut, has genotoxic, carcinogenic, embryotoxic, and immunotoxic potential [10]. It warrants special attention in India because of its popularity and widespread social acceptance [11]. The major factors that persist to encourage people to use smokeless form of tobacco are its low price, ease of purchase, and the widely held misconception of purported medicinal value in curing toothache, headache, and in decreasing hunger. Furthermore, in contrast to smoking, there is no taboo against using SLT [12]. While the SLT products have been strongly associated with oral cancer, the association between SLT and periodontal disease is less clear. Gingival recession has been reported in SLT users by many but not all clinical surveys. There is insufficient evidence to support consistent association between SLT and periodontal disease [13].

Several epidemiological and experimental investigations have established that quid chewing causes oral and oropharyngeal cancer, interferes with the microbial mechanism of neutrophils, and inhibits protein synthesis and attachment of fibroblasts. This in turn promotes bacterial colonization and periodontal infection [14]. As a result, the harmony between various periodontal structures is disrupted that leads to induced gingivitis and periodontitis. It also exerts excessive masticatory load on the tissues, leading to wearing facets, attrition, sensitivity, food lodgment, and food impaction [15].

Periodontitis being a multifactorial and chronic inflammatory disease, prevalent among adults affecting the periodontium [16]. Tobacco in smoke or smokeless form along with the local bacterial residence is considered as significant environmental risk factors for periodontitis. Studies have shown the impact of ghutka on

periodontium wherein, the loss of clinical attachment level along with local gingival recession at the site of placement was appreciated [17, 18]. Although considerable information is available on the effects of quid on oral tissues and dentition, this study was designed to determine the effect of kharra chewing on periodontal tissues of patients with OSMF in Bihar region.

Materials and Methods

The study was conducted on 90 patients (aged 21–60 years) visiting the Department of Dentistry, Private Dental clinic, Patna, Bihar, India. During the duration of three months. The patients were informed about the purpose and design of the study and a written informed consent was obtained from them. A special proforma recorded the detailed case history with periodontal indices and clinical examination.

The three groups with 30 patients each are classified as follows: Group I ($n = 30$) included patients with a healthy periodontium, Group II ($n = 30$) included patients with chronic periodontitis without OSMF, and Group III ($n = 30$) included patients with chronic periodontitis and OSMF.

The inclusion criteria for patients with chronic periodontitis were probing pocket depth (PPD) ≥ 3 mm, clinical attachment level (CAL) ≥ 3 mm, and habit of chewing

kharra for at least 3 years >5 times per day. Patients with any systemic disease, allergies or drug usage, smokers, history of periodontal treatment in the past 6 months, or pregnant and lactating women were excluded from the study.

Periodontal indices such as gingival index (GI) [19] and plaque index (PI) [20], PPD, and CAL were measured with a graduated periodontal probe for each tooth on all the six sites. On the basis of the region of quid placement, regional PPD and regional CAL (Clinical Attachment Loss) scores were also calculated. OSMF was diagnosed on inspectory and palpatory findings adhering to the clinical classification by to the clinical classification by Khanna *et al* [21]. Differences in the clinical parameters among the three groups were analyzed using one-way analysis of variance. The level of significance was set at $P < 0.05$.

Results:

This cross-sectional study compared the clinical stages and periodontal findings in a total of 90 patients. All the patients were of age 21–60 years with mean age of 38.5 ± 13.9 years. Mean age in group I, II and III was 41.5 ± 15.7 , 39.6 ± 11.8 , and 40.2 ± 13.9 years. In group I, 50% were males and 50% were females. In group II, 46.7% were males and 53.3% were females. In group III, 53.3% were males and 46.7% were females.

Table 1: Demographic details and tobacco habit details.

	Group I	Group II	Group III
Number of patients	30	30	30
Mean age (in years)	41.5 ± 15.7	39.6 ± 11.8	40.2 ± 13.9
Males	15	14	16
Females	15	16	14
Frequency (times/day)	0	3.6–8.4	4.2–8.3

All clinical parameters were significantly higher in Group III and Group II compared to Group I ($P < 0.05$). Pair-wise analysis using Tukey's *post hoc* test revealed statistically significant difference between

Group III, Group II, and Group I. GI for Groups I, II, and III was 0.6 ± 0.5 , 1.8 ± 0.7 , 1.0 ± 0.7 , and PI was 0.7 ± 0.4 , 1.4 ± 0.6 , and 2.2 ± 0.5 , respectively. In Group III, PPD (overall) was 3.9 ± 0.8 mm and CAL

(overall) was 4.6 ± 0.8 mm. Group I showed a lower PPD as compared to group II and III. The frequency of kharra chewing in Group II and Group III was 6.32 ± 3.14 times per day and 6.60 ± 2.4 times per day, respectively. The duration of kharra

consumption was 4.15 ± 3.05 (3.6-8.4) years and 6.98 ± 3.45 (4.2-8.3) years for Group II and Group III, respectively. CAL regional was also seen higher as compared to CAL overall in group II and group III.

Table 2: Comparison of clinical parameters among the groups

Parameter	Group I (Control Healthy Periodontium) i.e.	Group II (Chronic periodontitis without OSMF)	Group III (Chronic periodontitis and OSMF)	P- value
GI	0.6 ± 0.5	1.8 ± 0.7	1.0 ± 0.7	0.070
PI	0.7 ± 0.4	1.4 ± 0.6	2.2 ± 0.5	0.076
PPDr (mm)	1.6 ± 0.5	3.2 ± 0.6	4.1 ± 0.9	<0.05
PPDo (mm)	1.2 ± 0.4	3.0 ± 0.5	3.9 ± 0.8	<0.05
CALr (mm)	0	4.7 ± 0.8	5.2 ± 0.9	<0.05
CALo (mm)	0	4.3 ± 0.5	4.6 ± 0.8	<0.05
Frequency (times/day)	0	6.32 ± 3.14	6.60 ± 2.4	<0.05
Duration (in years)	0	4.15 ± 3.05	6.98 ± 3.45	<0.05

(PI-Plaque Index; GI-Gingival Index; PPDr-Probing Pocket Depth regional; PPDo-Probing Pocket Depth overall; CALr-Clinical Attachment Level regional; CALo-Clinical Attachment Level overall)

Discussion:

Smokeless tobacco and arecanut consumptions are widespread around the globe including some parts of U.S. also. Ghutka is mainly an addictive consumption found in South Asian regions of the world. Ghutka is the form of smokeless tobacco consisting of chewable agents, primarily betel nuts (Areca catechu) which contain substances like arecoline, an active alkaloid found in betel nuts, stimulating fibroblasts to increase the production of collagen by 150% and 2.04gm of nicotine/100gm of the product, which on testing showed pH levels sufficient to contribute to the quick absorption of nicotine in the blood, delivering to the customer the desired kick [22].

The Arecoline that is present in areca nut is known to have some deleterious effects on liver functioning. Higher concentrations of transaminase enzymes, i.e. aspartate

aminotransferase (AST) and alanine aminotransferase (ALT) are present in liver, and muscles. These enzyme elevations in blood indicate liver function impairment and this in turn may have an effect on collagen regeneration, and hyalinization of collagen tissues. Singh N evaluated serum SGPT (ALT) levels in 150 patients and observed raised levels in all the cases and suggested that role of systemic involvement in OSMF cannot be ignored [23]. However a strong association was also demonstrated between periodontal active sites and presence of high levels of gingival crevicular fluid AST: thus supporting the view that AST levels of serum is an indicator of tissue destruction [24, 25]. Oral submucous fibrosis is characterized by definite increase in fibrous collagen, which is protein in nature. Some of the studies have found a correlation between total serum protein (TSP) levels and degree of OSMF.

Areca nut extracts in kharra have been shown to have a significant causative role in causing periodontal diseases along with the variables such as oral hygiene levels, dietary factors, and general dental health status. As the disease progresses, the

chewers often have complaints of bleeding gums, halitosis, reduced mouth opening, pain during swallowing food, and ulceration and burning sensation in the soft tissues. The stiffness is characterized by formation of fine fibrillar dispersed collagen with marked edema in the initial stages and juxta-epithelial hyalinization later on. The signs and symptoms vary with the affected sites and stage of disease. Thick inelastic rope-like fibrous bands extending from the lamina propria through the entire submucosa to the muscle layer appear vertically in the buccal mucosa, along the contours of the faucial pillars and around the entire circle of lips narrowing the rima oris. This compromises oral hygiene and food intake by reducing mouth opening [26, 27].

In the presence of several confounding factors, the cholinergic effect of areca nut along with calcium salts in the saliva leads to increased heavy deposition of calculus which destroys the gingival tissue and periodontal attachment [28]. The mean values of PI were found to be significantly higher in Groups II and III as compared to Group I. The GI was also found to be higher in Group II as compared to Group III. Akhter *et al* [29] and Dodani *et al* [30] reported that the plaque index of patients with compromised periodontium was higher than their healthy counterparts. Since one of the biological effects of tobacco chewing is vasoconstriction of the gingival vasculature, the gingival blood flow is impaired. This suppresses the normal gingival inflammatory response to plaque infection and consequently conceals the actual levels of gingival inflammation [31, 32].

Kharra chewers showed higher mean values of periodontal parameters including PPD and CAL. In this study also, Group I showed a lower PPD as compared to group II and III. This could be attributed to the fact that, since arecoline inhibits cell attachment, spreading and migration and decreases collagen synthesis in human-

cultured periodontal fibroblasts, the increased deposition of extracellular matrix unsettles the equilibrium between the matrix metalloproteinases and tissue inhibitors of matrix metalloproteinase, leading to inevitable periodontal destruction [14]. In study done by Akhter *et al*, mean PPD was approximately 3.8 ± 0.7 mm and CAL was 4.2 ± 1.2 mm in betel quid chewers [29]. Besides, Ling *et al*. had also found strong positive relation between habit of betel quid chewing and severity of periodontal destruction [10]. Dodani *et al*. had reported PPD in patients with OSMF and without OSMF as 1.88 ± 0.36 and 1.68 ± 0.16 mm, respectively [30]. Chu *et al*. had also reported PPD of 1.8 ± 0.38 mm and CAL of 0.52 ± 0.76 mm in betel quid chewers [33].

We observed a significant difference in the periodontal parameters of particular region of kharra placement and the entire or overall teeth of same patients. The intragroup comparison in Group III between PPD region was significantly higher than PPD overall. Similarly, CAL in the region of kharra placement was seen much more than CAL overall which indicate that the severity of destruction was dependent on the placement of kharra in patients with OSMF. [34]

Conclusion

From this study it can be concluded that periodontal parameters were more destructive in patients with chronic periodontitis with OSMF as compared to chronic periodontitis without OSMF. Similarly, clinical attachment level in the region of kharra placement was deep as compared to overall clinical attachment level. The data generated from the present study concludes that chewing gutka leads to periodontal destruction in patients with OSMF.

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