

Oral health status and treatment needs of female beedi factory workers in Mangalore city, India

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Abstract: *Purpose:* To determine oral health status and treatment needs of female beedi factory workers in Mangalore city, Karnataka. *Methods:* A cross-sectional study was conducted on 426 female beedi factory workers age 15-70 years in Mangalore city to find out their oral health status and treatment needs. Data collection was done on a structured proforma: regarding demographic data, oral hygiene habits, personal habits, past dental history and data on oral health status and treatment needs was recorded using WHO oral health assessment form (1997). *Results:* Out of 418 dentate patients only 2 (0.47%) had healthy periodontium, 68 (16.26%) and 348 (83.25%) had gingival disease and periodontal disease respectively. Healthy periodontium and bleeding was seen only in younger age groups (15-24 years and 25-34 years), whereas as age increased score of code 4 (Deep pockets) also increased. The prevalence of dental caries was found to be 82.6%. The total mean DMFT was 5.97±5.78. The mean DT was 4.06±4.03, mean MT was 1.88±3.71 and mean FT was 0.03±0.20. Of the total study population 46 subjects exhibited oral lesions. *Conclusions:* There are more proportions of unfulfilled treatment needs in this working class as they are not provided with dental treatment, appropriate public health actions at various levels need to be taken like health education and health promotion to curtail the disease in this population.

Keywords: Oral health, beedi workers, female, treatment needs.

Introduction

Oral health is an inseparable part of general health. Oral diseases and dysfunctional oral conditions have a profound impact on the quality of life throughout an individual's life cycle. To individuals and societies worldwide, oral diseases are expensive in terms of financial resources, tooth loss, pain and fear, trauma and anxiety and time lost from work. Lifestyle is composed of cultural and behavioral patterns and lifelong personal habits.

In developing countries such as India where traditional lifestyles still persist, risks of disease and death are connected with poor nutrition, personal hygiene, customs and cultural patterns. These personal risk factors play an important role in etiology of adult periodontal disease [1].

Beedi workers represent a population who rolls beedis or poor man's cigarettes. India's 1.5 million private sector beedi workers are among the most exploited worker's in India [2]. Socio economic conditions adversely influence oral health status of individual's by indirectly lowering, preventing or postponing their use of appropriate self-care or professional services. One such condition is the financial loss of hourly wages for workers who take off to visit the dentist, a general inability to pay for dental care, poor access to dental care, lack of insurance and lack of regular source of dental care [3].

Women have special oral health needs and considerations; there is a need to assess the oral health status and treatment needs of women working in such environment having

an effect on oral health. Hence this study was carried out to determine the oral health status and treatment needs of female beedi workers in Mangalore city, Karnataka.

Material and Methods

A cross-sectional study was conducted on 426 female beedi factory workers age 15–70 years in Mangalore city to find out their oral health status and treatment needs. In Dakshina Kannada district, beedi rolling is one of the main occupations especially among women. In Mangalore presently there are about 8 thousand beedi workers who roll and pack beedis. The main work is rolling beedis, which engages 95% of work force. The rollers cut the leaves for 2-3 hours in the morning, then roll a pinch of tobacco in it, push in the ends and bundle beedis for packing department. On an average the workers roll about 300-1000 beedis per day ie 12-25 Beedi packs as each pack has 25 Beedis.

Prior permission to conduct the study in their campus of beedi collection centre was obtained from the in charge manager. Data collection was done on a structured proforma which had particulars regarding demographic data, oral hygiene habits, personal habits, past dental history and data on oral health status and treatment needs was recorded using WHO oral health assessment form (1997). The examination was carried out on all beedi workers present at beedi collection centers where only females were present. On the days of examination, prior consent was taken from subjects for examination. A single trained and calibrated examiner carried out all the examination.

Pilot study was carried out on 26 beedi workers at beedi collection centre to find out oral health status and treatment needs over a period of 3 days. A single dental assistant was trained regarding recording of the structured proforma and had accompanied the examiner on all days of examination. To estimate the oral health status on 8,000 beedi workers in Mangalore city, considering the 90% as prevalence of periodontal disease and worst acceptable limit of 15%, according to Epi info version 5 stat calc; at 99% confidence interval it was estimated that for this study 400 would be the required sample. The obtained data was analyzed using Chi square test for qualitative tables and Analysis of variance

(ANOVA) was used for means. Kruskal wallis test was used for finding out the significance. Stratified analysis was used along with Mantel-Haenszel test when required to find out the significance.

Results

A cross-sectional observational study was carried out among 426 female beedi workers in Mangalore among those aged between 15-70 yrs. Of them 54 belonged to 15-24 years, 124 aged 25–34 years, 132 aged 35–44 years, 79 aged 45–54 years and 37 were aged above 55 yrs. Of them 81.5% (347 subjects) were married. A total of 116 subjects and 134 were illiterate and had attained primary school education respectively and 14 and 3 subjects had attained pre-university education and their graduation respectively. Among these subjects 95 (22.3%) had 0-5 years of beedi rolling experience, 189 (44.4%) and 142 (33.3%) subjects had working experience of 6–15 years and more than 16 years of beedi rolling experience respectively.

It was seen that more number of illiterates were using indigenous aids for brushing their teeth. It was observed that more number of literates used tooth paste and powder than illiterates, who used more indigenous materials like charcoal, salt and tobacco. Out of 426, 343 subjects were brushing once in a day and 83 were brushing twice or more than twice a day. It can be seen that the number of people brushing twice or more than twice a day increased as level of education increased. This was highly statistically significant. Of the total participants of the study, 224 did not have any habit, 99 (23.2%) of them had pan with tobacco chewing habit, 16 had habit of only pan chewing and 87 had snuff inhaling Table 1 shows distribution of habits in relation to education. Here it was found that habit increased as the education level decreases ($p < 0.0001$).

Out of 418 dentate patients only 2 (0.47%) had healthy periodontium, 68 (16.26%) and 348 (83.25%) had gingival disease and periodontal disease respectively. Healthy periodontium and bleeding was seen only in younger age groups (15-24 years and 25-34 years) whereas, as age increased score of code

4 (Deep pockets, ≥ 6 mm) also increased. This difference was found to be statistically significant. Among illiterate group, more number of subjects had code 4 (Deep pockets, ≥ 6 mm) and code 2 (Calculus) was found to increase with

higher education. This was found to have very high statistical significance. Code 2 (Calculus) was found to decrease as the work experience increases and code 4 (Deep pockets, ≥ 6 mm) was found to increase with work experience.

Table-1: Distribution of habit among the subject in relation to education

Education	No Habits	Pan with tobacco	Pan without tobacco	Snuff	Total
Illiterate	30 (25.9%)	45 (38.8%)	2 (1.7%)	39 (33.6%)	116 (27.2%)
Primary school	62 (46.3%)	33 (24.6%)	7 (5.2%)	32 (23.9%)	134 (31.5%)
Middle school	72 (71.3%)	13 (12.9%)	3 (2.9%)	13 (12.9%)	101 (23.7%)
High school	49 (80.3%)	6 (9.8%)	4 (6.6%)	2 (3.3%)	61 (14.3%)
Intermediate	11 (78.6%)	2 (14.3%)	0	1 (7.1%)	14 (3.3%)
Total	224 (52.6%)	99 (23.2%)	16 (3.8%)	87 (20.4%)	426 (100%)

Chi Square = 83.77, $p < 0.0001$, highly significant.

Among the chewers it was seen that none had code 0 (Healthy) and 1 (Bleeding), whereas the percentage of deep pockets were very high when compared to non-chewers (56.1% and 25.3% among chewers and non-chewers respectively). It was found among these study subjects that 120 (28.7%) did not have any loss of attachment. Of the rest 141, 114, 38 and 5 subjects had loss of attachment score of 1 (4-5 mm), 2, 3 and 4 respectively. Subjects with no loss of attachment were more in younger age group and it decreased as age increased (75.9%, 46%, 15.4%, 2.7% and 0% in those aged 15-24 years, 25-34, 35-44, 45-54 and ≥ 55 years respectively). It was observed that all subjects aged ≥ 55 years had loss of attachment. The loss of attachment scores was maximum for illiterates and subjects with primary school education.

Non-chewers had a higher score of code 0 and 1 of loss of attachment (35.3% and 34.3%) when compared to chewers (11.4% and 32.5%) and other scores of codes 2, 3 and 4 were all higher among chewers (39.5%, 14.9% and 1.8%). The prevalence of dental caries was found to be 82.6%. The total mean DMFT was found to be 5.97 ± 5.78 . The mean DT was 4.06 ± 4.03 , mean MT was 1.88 ± 3.71 and mean FT was 0.03 ± 0.20 . It was seen that caries experience increased as age increased up to 35-44 years and again it increased up to ≥ 55 yrs. Missing teeth

due to caries increased as age progressed up to 35-44 years and again decreased. Filled teeth were present only in age groups of 25-34 years, 35-44 years and 45-54 yrs. In the study root stumps were analyzed separately and it constituted a total mean of 1.33 ± 2.4 and this increased with age, which was statistically highly significant. Teeth missing due to other reasons increased with increase in age and it was maximum at age of ≥ 55 yrs. Missing component was more in illiterate group (2.43 ± 4.60) and it was also seen that illiterate group did not have any filled component.

It was seen that chewers had a low value of mean number of decayed teeth when compared to non-chewers (2.93 ± 3.60 and 4.48 ± 4.11 for chewers and non-chewers respectively). Mean number of missing teeth due to caries was also more in non-chewers (2.10 ± 3.94) when compared to chewers (1.29 ± 2.94). But it was also noted that there were no filled teeth in chewers, whereas non-chewers had a mean of 0.39 ± 0.23 filled teeth. The total mean DMFT score was 4.23 ± 5.65 in chewers and 6.62 ± 5.70 in non-chewers. This above difference showed a highly statistical significance.

Table-2: Distribution of dental caries in relation to education

Education	No of subjects	Decayed D	Missing M	Filled F	DMFT Total
Illiterate	116	4.01±4.21	2.43±4.60	0.00±0.00	6.44±6.61
Primary school	134	3.59±3.72	1.81±3.92	0.02±0.12	5.41±5.87
Middle school	101	4.59±3.89	1.87±2.88	0.06±0.31	6.53±4.96
High school	61	4.20±4.57	1.20±2.53	0.03±0.26	5.43±5.26
Intermediate	14	4.57±4.01	1.21±2.75	0.14±0.36	5.43±5.26
Total	426	4.06±4.01	1.88±3.71	0.03±0.20	5.97±5.78
p-value		p>0.05	p>0.05	p<0.01	p>0.05

p>0.05 = not significant, p<0.01 = highly significant.

Of the total study population 46 subjects exhibited oral lesions. Of them 11 had leukoplakic white lesions, 10 had betel chewers mucosa based on clinical appearance, characterized by a brownish-red discoloration of the oral mucosa with an irregular epithelial surface that has a tendency to desquamate or peel off. 11 had ulcerations (includes 1 herpetic labialis, 3 aphthous ulcers on tongue and buccal mucosa each and 3 traumatic ulcers on palate, only 1 oral submucous fibrosis was found on buccal mucosa) and 3 leukoedema were present on buccal mucosa, and 3 angular cheilitis cases were found. 1 cleft palate (extended up to soft palate including uvula) case and 7 lesions were found on the tongue. 4 (7.8%) subjects with ≤ 5 times chewing per day had oral lesions, 13 (25%) subjects with 6 -10 times chewing per day had oral lesions and 4 (33.3%) subjects with ≥ 11 times chewing per day had oral lesions. Here again there was increase in percentage of oral lesions as frequency of chewing increases. This difference was found to be statistically significant (p< 0.05).

A total mean of 1.41± 1.75 one surface filling were needed and 0.83 ± 1.51 two surfaces filling were needed. One surface filling were required more in younger generations (15–24 and 25–34 years age group), whereas 2 surface fillings were needed more by 35–44 year old age group (p < 0.001) Pulp care was required more by younger generation and it its need decreased with advanced age. Extractions (total 1.64 ± 2.7) were required maximum by those aged ≥ 55 years and

it decreased as age level decreased (p < 0.0001). Of the total population, 4 had upper partial dentures and 1 had lower partial denture. Five out of the total population had both upper and lower dentures. Among them 248 and 277 did not need any prosthesis for lower arch and upper arch respectively. Need for a combination of one and/or multi unit prosthesis for upper and lower arch was 93 (21.8%) and 131 (30.8%) respectively. Eight subjects were in need for full prosthesis.

Of the 115 (27%) pan with or without tobacco chewers, 34.8% exhibited signs of TMJ abnormalities and of 311 (73%) non- chewers 20.9% had signs of TMJ abnormalities. It was shown that chewers were twice at the odds of exhibiting signs of TMJ abnormalities when compared to non-chewers. Among the chewers percentages of deep pockets were very high when compared to non-chewers (56.1% chewers and 25.3% non chewers). Table 3 shows that as age increases lesions increase. It also shows that lesions are present only in subjects with habit.

The stratified analysis determines that habit is more significantly related to lesion compared to age also table 4 shows that, as education level increases the number of lesions decreases. It also shows that the lesions are present only in subjects with habit. The stratified analysis determines that habit is more significantly related to lesion compared to education.

Table-3: Stratified analysis, to determine the influence of age and habit on oral lesion

Age groups (In years)		With habit	Without habit	MHCHI ²	p-value
15-24 n=54	With lesion	11	0	17.69	p<0.0001
	Without lesion	36	69		
25-34 n=124	With lesion	05	0	12.11	p<0.0001
	Without lesion	35	94		
35-44 n=132	With lesion	04	0	21.91	p<0.0001
	Without lesion	12	85		
45-54 n=79	With lesion	0	0	-	-
	Without lesion	10	51		
≥55 n=37	With lesion	1	0	6.00	p<0.05
	Without lesion	1	12		

MHCHI² = Mantel Haenszel p>0.05 = not significant, p<0.01 = highly significant, p<0.001 = very highly significant.

Table-4: Stratified analysis, to determine the influence of education and habit on oral lesion

Education		With habit	Without habit	MHCHI ²	p-value
Illiterate n=116	With lesion	2	0	16.31	p<0.001
	Without lesion	4	48		
Primary school n=124	With lesion	1	0	4.90	p<0.05
	Without lesion	20	103		
Middle school n=101	With lesion	5	0	15.47	p<0.0001
	Without lesion	28	99		
High school n=61	With lesion	8	0	10.50	p<0.01
	Without lesion	28	43		
Pre-university n=14	With lesion	5	0	5.33	p<0.05
	Without lesion	14	18		

MHCHI² = Mantel Haenszel p>0.05 = not significant, p<0.01 = highly significant, p<0.001 = very highly significant.

Discussion

The main raw material used for beedi rolling involves tobacco, which is provided in the powder form, to which the workers are constantly exposed. Since the beedi rollers are a special population group who are exposed to tobacco environment and dust. The present study was conducted to assess the oral health status and treatment needs of the beedi factory workers. Since literatures pertaining to the oral health status of beedi workers were not available as no study has been published in this regard and the present study has been compared with the general population. The use of tobacco, pan and snuff in the present study is quite high. A total of 99 (23.2%) chewed pan with tobacco in the present

study which was similar to a study by Vaish et al [4] where tobacco habit in females was 22.3%. Ikeda et al [5] conducted a study on Cambodian women where tobacco chewing habit was prevalent in 32.6% of the population which was quite high compared to present study.

In the present study prevalence of periodontal disease increased as age advanced which is similar to studies by Dini et al.[6], Miyazaki H. et al.[7], Van Palenstein Helderma WH et al. [8], Krustrup U et al. [9], Weirzbicka M et al.[10] and Davies GN et al.[11].In the present study almost 99.5% had periodontal disease, Code 0(Healthy) was present in 0.5% of

younger population and Code 1 (Bleeding on probing) was present in 0.5% of study population, which is similar to a study by Holmgren CJ et al [12]. However in contrast a study by Roman A et al [13], (9.34% and 21.49%), Miyazaki H et al [7] (4% and 4%) it was observed that code 0 and code 1 was exhibited in more number of patients. Code 4 (Deep pockets) in the present study increased as age advanced 34%, which was similar to studies by van Palenstein et al. [8], Reichart PA et al [14]. Other studies showed a lower percentage of population affected as in studies by Davies GN et al. [11] (2%), Dini EL et al. [8] (8%), Anil S et al. [15] (11%). Mean number of healthy sextants were found to decrease with age (0.63). This was statistically significant. This was similar to study by van Palenstein et al. [8] (0.5), Dini et al. [6] (0.1–0.5). Mean number of sextants with calculus and highest score was seen in 4.87 mean number of sextants/subject., which is similar to studies by Pilot T et al [16] mean number of sextants with deep pockets per person was 0.4 in the present study, which is similar to studies by Anil S et al [15] (0.5) and Dini et al. [6] (0.3), whereas study by Rao S et al [17] gave a very low value.

Mean number of excluded sextant was 0.34 in the present study which can be compared to study by Miyazaki et al [7] (0.1–0.4). In the present study it was seen that loss of attachment score of 2, 3 and 4 increased as age advanced. In the younger age group the subjects were more with no loss of attachment where as all subjects had loss of attachment in ≥ 55 year old age group. A study by Baelum et al [18] showed similar results.

D component of dental caries was increasing with age up to the age of 35–44 years but it again decreased as age progressed. A total of 82.6% persons were found to have decayed teeth in the present study of which root stumps constituted a major part. Among the subjects of the present study it was observed that one most common reason for pan chewing with tobacco was because of tooth ache which later on became a habit. The above finding is consistent with the previous studies by Davies et al [11] where caries prevalence was 73% in 15–29 years age group to 98% in those aged ≥ 55 years. In present study D value was quite high (4.75 for 35–44 years) compared to a study by Astroth et al. [19] (3.19 for those aged 35–44 years). Here higher

prevalence may be attributed to unawareness of the population about the conservative treatment, negligence and may be they cannot afford the treatment.

In present study it was observed that dental caries and missing component were significantly low in chewers when compared to non-chewers. In a study by Greer R O and Paulson T C [20] speculated that the relative possibility of lower caries experience seen in heavy chewers of tobacco may largely be due to the accelerated salivary flow that the tobacco stimulates, which causes a physical cleaning action and mild buffering action that inhibits the aggregation of plaque and cariogenic material.

The missing component also increased along with age up to 35–44 years and again decreased. This decrease in missing component can be contributed to the missing teeth due to reasons other than caries, which increased as the age increased. The mean M component was 1.88 which is comparable to other studies by Mosha et al. [21] on 2 groups in Tanzania which was 1.64 and 1.75 respectively.

The filled component, which is observed to be very less in present study, could be due to the reason that the present study population preferred extraction than restorative treatment. The mean filled component was 0.03. In the age group of 15–24 and ≥ 55 years of age no filled component could be observed. This is attributed to their unawareness, unaffordability and negligence of the patient to get their treatment done.

In the present study, white mucosal lesions suspected of leukoplakia were found in 2.6% of total subjects, all of which were present in only the chewers. Similar results were observed in a study Ikeda et al. [5] where it was observed that the prevalence was 0.6% and another study by Axell et al. [22] prevalence was 1.2% in women. In the present study all the lesions were found in the place where the quid was kept. This shows similarity to the results obtained in the study conducted by Vaish RP [4] and Reichart et al [23].

Lesions suspected of betel chewers mucosa was observed in 2.3% subjects, in contrast Reichart et al [23] reported a prevalence of 60.8% in Cambodian women. This difference in observation and reporting of prevalence could be due to the difference in selection procedure. It may also be because of highly selected versus unselected populations, sampling methods, age profiles and different interpretation of definition and insufficient calibration of examiners.

In this present study prosthesis was seen to be worn by 5 subjects (4 upper and 1 lower partial dentures) and 5 persons had complete upper and lower dentures. Upper prosthesis was required in 11.3% of subjects and 9.1% subjects needed lower prosthesis. 1.9% of subjects were in need of both the upper and lower prosthesis.

In our study a mean of 1.4 one surface filling per person, mean of 0.83 two surface fillings per person were needed among the subjects and pulp care was required by mean of 0.35 per person also extractions by mean of 1.64 per person. In a study by Astroth J et al.[19], in the age group of 15 years mean of 4.08 teeth per person was present for 1/ multiple fillings and mean of 1.53 per person required extractions in age group 35–44 years which was comparable to findings of present study. The treatment needs in this population was more because decayed teeth are more and fillings are very less.

Mean number of healthy sextants was more in non-chewers but all other disease elements were significantly more in chewers. The mean number of excluded sextants was almost same in both chewers and non-chewers. A study by Wolfe MD et al.[24] concluded that smokeless tobacco users

were no different than non-users with respect to gingival recession, gingival bleeding and loss of periodontal attachment. In the present study increased periodontal disease in chewers may be because of smokeless tobacco use in chewers, increased age in chewers and low education level in chewers compared to non-chewers.

All the oral mucosal lesions in the present study were observed in the area of placement of quid. In the present study, though the duration of chewing was not significantly associated with lesions it was seen that as duration of chewing increased the percentage of lesions increased. In a study by Wolfe MD and Carlos JP[24] duration and frequency of use of smokeless tobacco was associated with presence of Leukoplakia. It was also seen that only people with habit had leukoplakia and betel chewer's mucosa. No person without the habit had lesion, hence it is implied that habit is strongly associated with lesion.

Conclusion

Dental disease is a major but too often overlooked and misunderstood cause of morbidity. It is closely linked to lifestyle as well as availability of preventive and dental treatment services. There are more proportions of unfulfilled treatment needs in this working class as they are not provided with dental treatment or dental insurance from management. Hence appropriate public health actions at various levels need to be taken like health education and health promotion is of utmost important to curtail the disease in this population.

References

1. Dharmashree S, Chandu GN, Pushpanjali K, Jayashree SH, Md Shafiulal. Periodontal status of industrial workers in Davangere city, Karnataka – A descriptive cross sectional study. *J Indian Assoc public health Dent* 2006; 7:20-24.
2. Prakash. C. Gupta, Samira Asma. Beedi smoking and Public health. Published by *Ministry of Health and Family Welfare*, March 2008.
3. Richie Poulton, Avshalom Caspi, Barry J Milne et al. Association between children's experience of socioeconomic disadvantage and adult health: a life-course study. *The Lancet* 2002; 360: 1640-45.
4. Vaish RP, Jena DC. Prevalence of Leukoplakia in relation to tobacco habits in Southern Orissa. *JIDA* 1982; 54: 419-425.
5. Ikeda N, Handa Y, Khin SP, Durward C, Axell T, Mizuno T, Fukaro H, Kawai T. Prevalence study of oral mucosal lesions in a selected Cambodian study. *Community Dent Oral Epidemiol.* 1995; 23:49-54.
6. Dini EL, Guimaraes L. O. Periodontal conditions and treatment needs (CPITN) in a worker population in Araraquara, SP, Brazil. *Int Dent J.* 1994; 44(4):309-11.

7. Miyazaki H, Hanada N, Andoh MI, Yamashita Y, Saito T, Sogame A, Goto K, Shirahama R, Takehara T. Periodontal disease prevalence in different age groups in Japan as assessed according to CPITN. *Community Dent Oral Epidemiol.* 1989; 17:71-74.
8. Van Palenstein Helderma Wh, Joarder MA, Begum A. Prevalence and severity of periodontal diseases and dental caries in Bangladesh. *Int dent J* 1996; 46:76-81.
9. Krstrup U, Erik Petersen P. Periodontal conditions in 35-44 and 65-74 year old adults in Denmark. *Acta Odontol Scand.* 2006; 64(2): 65-73.
10. Wierbicka M, Frankowaska E, Bratthall G, Slotwiska S, Kwiatkowska A. Periodontal treatment needs of employees in a polish technical factory. *Community Dent Oral Epidemiol.* 1990; 18:161-64.
11. Davies GN, Hedrick P, Luveni J, Pal V, Singh HD. Dental caries and Periodontal disease in Fiji. *Aust Dent J.* 1992; 37(5):386-93.
12. Holmgren CJ, Corbet EF, Lim LP. Periodontal conditions among middle aged and elderly in Hong Kong. *Community Dent Oral Epidemiol.* 1994; 22:396-402.
13. Roman A, Pop A. Community periodontal index of treatment needs values (CPITN) in a factory worker group in Cluj- Napoca, Romania. *Int Dent J* 1998; 48:123-25.
14. Reichart PA, Schmidtberg W, Scheifele CH. Betel chewers mucosa in elderly Cambodian women. *J oral path Med* 1996; 25(7): 367-70.
15. Anil S, Hari S, Vijaykumar T. Periodontal conditions of selected population in Trivandrum District, Kerala, India. *Community Dent Oral Epidemiol.* 1990;18: 325-326.
16. Pilot T, Lu ZY, Lin ZQ, Yen WP, Cao GR. Periodontal conditions in 35-44 year old factory workers in Shanghai. *Community Dent Oral Epidemiol.* 1989; 17(4): 216.
17. Rao S, Singh BP, Kaur P, Khuntia SK. Oral health status and treatment needs of a rural community. *JPFA* 1996; 10:7-13.
18. Baelum V, Manji F, Wanzala P, Fejerskov O. Relationship between CPITN periodontal attachment loss findings in an adult population. *J Clin Periodontol* 1995; 22: 146-52.
19. Astroth J, Berg R, Berkey D, Mc Dowell J, Denver H. Dental caries prevalence and treatment need in Chiriqui Province Panama. *Int Dent J* 1998; 48:203-9.
20. Greer RO, Paulson TC. Oral tissues alteration associated with use of smokeless tobacco by teenagers. *Oral Surg Oral Med Oral Pathol.* 1983; 56(3): 275-84.
21. Moshia HJ, Ngilisho LAF, Nkwera H, Scheutz F, Poulsen S. oral health status and treatment needs in different age groups in two regions in Tanzania. *Community Dent Oral Epidemiol.* 1994; 22(5): 307-10.
22. Axell T. Occurrence of Leukoplakia and some other oral white lesion among 20,333 adult Swedish people. *Community Dent Oral Epidemiol.* 1987; 15(1):46-51.
23. Reichart PA, Mohr U, Srisuwan, Geerlings, Theetranot C, Kangwanpong T. Precancerous and other oral mucosal lesions related to chewing, smoking and drinking habits in Thailand. *Community Dent Oral Epidemiol.* 1987; 15(3): 152-60.
24. Wolfe MD, Carlos JP. Oral health effects of smokeless tobacco use in Navajo Indian adolescents. *Community Dent Oral Epidemiol.* 1987; 15(4): 230-5.

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