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Prevalence of leukoplakia, oral submucous fibrosis, papilloma and its relation with stress among green marbles mine laborers, India

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Abstract

Objectives: To determine the prevalence of leukoplakia, oral submucous fibrosis and papilloma among "Green Marble Mines" laborer and uncover its relation with occupational stress.

Methods: Mines were divided in four geographic zones, and participants were selected by stratified cluster sampling technique. A total of 513 subjects were included in final study which were alienated among the four age cohort 15-24 , 25-34 , 35-44, 45-54 respectively. The study was been conducted following the research methodology recommended by World Health Organization- Oral Health Surveys 1997. A questionnaire from "Union of Shops, Distribution and Allied Worker (USDAW) Nationwide, Manchester" was used for stress assessment of mine workers and clinical examination for oral mucosa was conducted by one of the three examiner with the aid of an artificial light source. The kappa statistics for diagnosis of leukoplakia, oral submucous fibrosis and papilloma was determined (field teams versus expert) 0.81, 0.92 and 0.89 respectively two days prior to the examination. Data was analyzed using bivariate and multivariate analysis.

Results: An overall elevated prevalence of all three oral-mucosal lesion was found among mine workers (36.7%), mainly leukoplakia affecting 171 mine workers (33.3%). The affected workers were having body problems like headache, backache and stressed due to under-payment. Individuals having papilloma have faced problem at work like noise, dust or fumes and poor maintenance of equipment. Multiple logistic regression analysis model of oral-mucosal lesion have shown highly significant relation ($p<0.01$) with increased stress, age, alcohol habits and malnutrition.

Conclusion: The prevalence of oral mucosal lesion is higher, among marble mine laborers, and occupational stress can intensify the disease condition. Curative services along with prevention and stress reduction program, requires primary anticipation.

Key words: *Marble mineworkers, oral mucosal lesions, stress, Keshariyaji.*

Introduction

A large number of laborers work in the stone crushing and mining industry in India. Rajasthan (Kesheriyaji) is the only the place where more green marble mines are found. The physically stressful and tedious work in noisy environment drives these laborers to consume tobacco and alcohol, which deteriorates their oral health. The whole community is plagued by malnutrition, ill health and physical impediments from accidents. For a mineworker, an average life expectancy rate is of 49.3 years, which is 10 years earlier than those outside the mines (1) are. Moreover, majority of these people are living in rural areas and having limited access to essential oral health care due to geographic and economic barrier (2,3). There are no female workers due to the heavy physical work load involved.

A recent report by Araya SM(2004), for the impact of psychosocial factors on the oral mucosal lesions of individuals(4) found that stress can contribute to illness by 1) Causing the mind and body to become exhausted, worn down and damaged 2) Weakening immunity- increasing susceptibility to infection. 3) Motivating unhealthy behavior in an attempt to deal with stress-smoking, alcohol abuse, poor diet, violent behavior etc. A variety of other studies has shown that stress can impair the function of the immunity system. One of them by Dorian et al. (5) demonstrated in a study of chronic work stress in accountants that immunological defense was increased at the time of peak stress, followed by immunosuppression during the post stress period as reflected in the immunologic parameters. Gardell et al. (1982) (6) had suggested that important job stressors include high mental demands, excessive work with time pressure, under stimulation, underutilization of skills and lack of novelty.

However, various research dealing with the etiological factors like alcohol (7,8) and smoking (9,10) and diet (11) with oral precancerous lesion and cancer prevention, but very few study has been conducted for its relation with stress which is still unclear. The oral mucosa is considered as one of the body's most important initial lines of defense.

The present known as 'First Rajasthan Mines Oral Health Study' was intended to become an inventory of the present state of the oral health. Recording of oral mucosal lesions and co-relating it with stress was one part of this study and this paper solely focuses on it. In an era of Evidence Based Medicine (EBM) and Evidence Based Dentistry (EBD), scientifically testing such a fundamental concept of consequence of stress on oral health, should be given highest research priority.

Methods

Rajasthan state is located in north-western part of India. Kesheriyaji is one of its province divided into four geographic zones named Masoroi ki obri (south-east), Rishabhdev (north–east), Khandiovri (south-west), and Kagdar-bhatia (north -west). The study was done during the month of February 2007, for which prior ethical clearance was obtained from " Ethical Committee for Research" of Darshan Dental College and Hospital. The informed consent of each patient was taken prior to recording oral mucosal lesions.

The minimum sample size required for this survey was based on the lowest prevalence of a significant target lesion observed in previous surveys, so a pilot study was conducted for among 59 participants to calculate sample size. In the final study the World Health Organization (WHO) recommended stratified cluster sampling procedure was to collect the representative population for this cross sectional study (12). The total population of mine workers provided by owners of mines association from all the four geographic zones were 4832 mine workers in total 29 mines, and from each zone 2 mines were randomly selected where all the present workers were examined. Hence of total eight mines in all four regions total 534 workers were examined, 21 workers (3.94%) were dropped out for quality-neutral reasons who were having medically compromised condition or who were not willing to get explored in study. The remaining 513 males which were selected and included in the present study. The oral cavities were examined using additional artificial light. To visualize the oral mucosa, two mouth mirrors were used and palpation was done(where indicated) to detect the consistency of lesion. The World Health Organization (W.H.O) recommended "Oral Health assessment form 1997" was used to record the demographic information (12). No biopsies or histological examinations were done.

All clinical data were recorded by three trained project teams each consisting of a dentist, a dental nurse and a recording assistant. Recording the data for oral mucosal lesions was based on publications of the World Health Organization(WHO) (12) and comparable authorized publications (13-15). Definitions of diseases of oral mucosa were adapted from publications by Axe´ll (1976) and Zain (1995) (16,17). All three teams had undergone a full day's theoretical and practical training by the senior dental calibrator prior to the commencement of the project. To verify that the data obtained were of sufficient quality, reliability studies were carried out by the participating project calibrator among 36 participants during the field work. The agreement (kappa statistics) for diagnosis of leukoplakia, oral submucous fibrosis and papilloma was determined (field teams versus expert) 0.81, 0.92 and 0.89 respectively two days prior to examination.

The Stress Questionnaire was taken from "Union of Shops, Distribution and Allied Worker (USDAW) Nationwide", Manchester (18). The scale was developed for the appraisal of stress from a sociological perspective (19,20) to identify stressors. These questionnaires were

distributed in local language of mine workers, asking them to complete the questionnaire anonymously and were ensured complete confidentiality. Age (years), tobacco and alcohol habits(0- non user, 1- regular user, 2- occasional use, 3- ex user), oral hygiene practice (0-Does not clean their teeth daily,1- Cleans their teeth daily) were asked to each worker prior to the oral examination in their local language. Their height and weight were also recorded to calculate their Body Mass Index (B.M.I) and to assess their nutritional status.

For comparison for individual stress predictors and prevalence of oral mucosal lesions, chi-square test was applied among proportion values. Multivariate logistic regression analysis model was developed to determine variables that were significantly associated with the outcomes of these oral-mucosal lesions. For the model, the explanatory variables included were stress, age, tobacco use, alcohol use, malnutrition and oral hygiene practice.

P value < 0.05 was accepted as statistically significant and $P<0.01$ was set to be highly significant. The statistical analysis was performed using the SPSS 10.0 (SPSS Inc., Chicago, IL).

Results

Stress predictors affecting oral mucosal lesions are described in table-1. Leukoplakia was found to be most prevalent lesion affecting 171 mine workers (33.3%). The affected workers were having higher body problems like headache, neckache, backache and stressed due to under-payment. Individuals having papilloma were also having problem at work like noise, dust or fumes and poor maintenance of equipment. Other confounding variables affecting oral mucosal lesion are also described.

Multiple logistic regression analysis model (table-2) of oral-mucosal lesion have shown highly significant relation with increased stress('body problem', 'environment stress' and 'stress at work'), age (25-34, 35-44, 45-54) ,alcohol habits and malnutrition ($p<0.01$). Oral hygiene practice have not shown any statistically significant relationship.

Discussion

The occurrence of disease with a short duration is better elucidated in incidence studies but the occurrence of disease of chronic nature, as in case of majority of oral lesions is illustrated more clearly in prevalence study.

The intention of study was to provide systematic information on occupational stress and oral-mucosal lesions of marble mine workers, in a region of Keshariyaji. Moreover a comparable prevalence data have not been recorded previously; so to gather this data for comparing prevalence of lesions among other population of India and other countries. Rationale for this comparison was that, former Indian population especially workers differed considerably – occupationally, politically, socially and particular in health care utilization comparing to other countries. The relatively small population investigated, and the highly selective occupational character of this population makes comparison with other epidemiological studies precarious and the result should be interpreted with great caution.

There were no mine workers below 15 years of age and lesser number of representative populations of older age above 45 years was found in the present study as the work is more associated with physical load, less old aged workers were associated with this occupation. Moreover, stress predictors were recorded by questionnaire in local language of mine workers which is easy for them to communicate and thereby more reliable data for individual stress have been achieved. Tobacco and alcohol habits was also recorded for all mine workers as a potential confounding factor. There might be an under representation of tobacco and alcohol habits by mine workers, which should also be kept in mind while interpreting results.

The prevalence of oral mucosal lesions of 9.2% was found in epidemiological survey in Malaysia (17) by Zain RB et al. (1997), which is comparatively too less than present study. The prevalence of white patch in the previous study of Danish Glassblowers (7) reported up to 40% by Morten Schiodt et al. (1980). Very few research dealing with the prevalence of dental disorders and oral-mucosal lesions have been carried out among Indian population, especially with rural subjects (21) and specific occupation. Moreover, there has also been very few studies of oral mucosal lesion in Asian population among which one reported the prevalence of oral-mucosal lesion at Thai and Malaysian dental school (22) and other studied only precancerous lesions related to drinking, smoking and chewing habits (23).

Each individual responds differently for the varying level of stress to which they have undergone but when the stress becomes excessive for the individual, it can result in physical symptoms. It can also be considered that stress is a factor, which is indirectly affecting oral mucosal lesion by making more individuals towards tobacco and alcohol consumption. Psychoneuro-immunological (PNI) studies provided further molecular- and cellular-based evidences regarding the association between immunologic functioning and stressful life events, negative affective states(e.g. anxiety, depression, anger), and psychological vulnerability (24). PNI intervention studies focused on manipulation of the latter factors demonstrated that the outcome immune responses were suppressed by stress (25). This in turn may lead to compromised functioning of the immune system and hence reducing the defense against virulent or opportunistic pathogens. Risk associated with various stress can also be modified by other exposures such

Table 1. Prevalence of various oral mucosal lesion and stress predictor with confounding variables among Laborer in percentage.(n=513).

		No lesion	leukoplakia	pappiloma	oral submucos fibrosis	p-value (χ2 test)
Total Participants (513)		**324**	**171**	**9**	**9**	
1.Stress predictors						
A Body problems	No	19.3	14.0	1.8	0	
	Yes	43.8	19.3	0	1.8	0.00*
B Stress from Environment	No	43.8	22.8	1.8	1.8	
	Yes	19.3	10.5	0	0	0.04**
C Problem at work	No	45.6	28.1	0	1.8	
	Yes	17.5	5.3	1.8	0	0.02**
D Stress due to Working relationship	No	56.1	29.8	1.8	1.8	
	Yes	7.0	3.5	0	0	0.52
E 1.Underpaid		24.6	14.0	1.6	0	
2.Undervalued		17.5	5.3	0.2	0.8	
3.Get appreciation for good work		21.1	14.0	0	1.0	0.00*
F 1.Able to plan own work		28.3	17.5	1.2	1.8	
2. Participate in decision making for own job		21.1	12.3	0.6	0	
3. Have some control over content of work		13.8	1.8	0	0	
4.Have no control at all		0	1.8	0	0	0.00*
G.1.Completely happy and enjoy job.		49.3	19.3	1.4	0.6	
2. I sometimes feel dissatisfied but generally enjoy my job.		12.1	12.5	0	0	
3. I do not enjoy my job.		1.8	1.6	0.4	1.8	0.00*
2.Tobacco users		59.3	37.6	0	3.1	0.36
3.Alcohol users		59.8	33.3	0	6.6	0.03**
4. Age						
18-24 years		19.3	18.1	1.8	0	
25-34 years		22.8	8.8	0	0	
35-44 years		15.8	10.5	0	0	
> 45- years		5.26	1.8	0	1.8	0.001*
5.Malnutrition		54.8	38.3	1.8	4.8	0.02**
6. Poor oral hygine		79.4	17.5	0	3.1	0.69

*P<0.01(Highly significant), ** p<0.05 (significant)

Table 2. Multiple logistic regression analysis model for leukoplakia, oral submucous fibrosis and papilloma among marble mine laborers.

Effect	β	S.E	P
Intercept	7.033	4224.563	0.098
Stress			
a.Body problem	4.363	4741.500	0.029
b.Environment stress	2.826	3948.362	0.038
c.Work problem	2.133	3600.836	0.048
d.Working relationship	1.741	2321.435	0.899
Alcohol use	5.166	3009.290	0.039
Tobacco use	2.381	3707.083	0.099
Age(years)			
18-24	2.870	2796.401	0.095
25-34	2.233	2680.069	0.027
35-44	13.610	2769.312	0.003
45-54	11.870	2796.401	0.005
Nutrition(BMI>20)	-1.399	1843.178	0.999
Poor oral hygiene	2.195	4727.261	0.096

as diet and nutrition, tobacco, alcohol consumption, and genetics (26-28). Occupational or environmental exposures to, dust or fumes affect a large number of workers worldwide causing chronic irritative process. It increases the vulnerability to infections that favors the progression of oral lesions.

Heavy physical work associated with malnutrition can also be co-inciding factor. Hence higher stress level found in underpaid group of mineworkers, may be also due to malnutrition as their poor economy and incomplete dietary requirements leads to malnutrition with poor immunity. Treatment facet, should be oriented more towards preventive health care, especially alcohol and tobacco de-addiction with stress reduction protocols. Future studies should consider specific histological types of oral mucosal lesions, to analyze associations with environmental or occupational exposures.

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