



Health Locus of Control: A Determinant of Oral Health among Tobacco users in Rural India

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Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

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ABSTRACT

Purpose: The concept of health locus of control is important because of its relation with health attitudes, behavior and coping styles. This study was done to compare the locus of control orientation and oral health status of tobacco users with that of non-tobacco users.

Method: This cross-sectional study was conducted on rural population in southern Indian state. All the participants were interviewed to gather data on their socio-demographic correlates, oral health related behavior and health locus of control with the help of a pre-tested questionnaire. Clinical examination was done using WHO oral health assessment form (1997). Main outcome measures were Locus of Control, Oral Health (dental caries status and periodontal status).

Results: Tobacco users were found to score lower on the dimension of Internality and higher on

the Chance dimension compared to non-tobacco users. The prevalence and severity of periodontal disease was significantly higher in tobacco users than non-tobacco users irrespective of age and socioeconomic strata.

Conclusion: It was also concluded that non-tobacco users had internal orientation to health locus of control thereby being important behavioral factor controlling health in this group. Findings also demonstrated significant association between tobacco usage and adverse periodontal health.

Keywords: Locus of control; tobacco; oral health; periodontal health; rural.

1. INTRODUCTION

Oral health is strongly related to tobacco smoking and chewing practices. Approximately 90% of oral cancers in Southeast Asia are linked to tobacco use [1]. Prevalence of tobacco use in India has been escalating with considerable change in the methods of its use. There is a great deal of variation of tobacco use by region, social customs, gender and forms of tobacco consumption [2].

Tobacco use is much more common among the less educated and under privileged sections, mostly residing in rural areas [3]. The less educated and poor have lesser access to the facts on ill effects of tobacco. This ignorance on deleterious effects of tobacco leads to continued use of tobacco and sufferings from tobacco related diseases. India is a developing country and more than two thirds of the population resides in rural areas. Roughly, 266.8 million people in India are tobacco users [4] From public health perspective and for policy enforcement with respect to tobacco control, it becomes imperative to gather data on tobacco use in the rural population to help develop strategies for intervention and prevention targeting this large rural population.

Educational approach has been majorly adopted as health promotion initiative, providing information on the health hazards related to tobacco. However, it remains contentious whether knowledge necessarily translates into behavioral change [5]. What also adds to the ambiguity is how such messages are received and interpreted by the end users. An alternative approach is to address higher level beliefs such as self-efficacy or individuals' beliefs in their ability to control their health [6]. This approach can motivate individuals to have more control of their own health and be more likely to take action based on their knowledge about the negative effects of tobacco consumption [7].

Considering subject-level variation while conducting research on tobacco consumption seems warranted because the choice to

consume tobacco ultimately rests with the individual. This person-to-person variation can be attributed to behavioral differences and their psycho-social construct. One of the theories explaining behavioral patterns is Locus of Control, whereby behaviors are determined by the individual's own ability to control events. With respect to locus of control beliefs in the context of health, findings from various research suggest that locus of control orientations are associated in reasonable ways with health-related behaviors [8,9,10].

Literature shows a relationship between Health Locus of Control (HLC) and oral health. People with an external locus of control presented with poorer oral health status [11]. The concept of perceived HLC is meaningful because it has significant relations with health-related attitudes, behaviors, coping styles and outcomes [12]. Health locus of control is one the concepts that explains the behavioral pattern of an individual. People with better coping strategies and self-motivation have shown more internal locus of control. While, those with poor health beliefs have shown less control of themselves over their life and health events. Owing to lower socioeconomic position and low education, it is reasonable to believe, rural population may present with different psycho-social construct. Therefore, for designing effective community-based intervention strategy, understanding tobacco use pattern among vast rural population in the country becomes imperative. Hence, the study was conducted with the objective to compare the oral health status and locus of control orientation of tobacco users with that of non-tobacco users and to find the relationship between health locus of control and tobacco consumption in rural population of Udupi district, Karnataka State, India.

2. MATERIALS AND METHODS

In this community based cross-sectional study, participants were recruited from rural areas of Udupi district in Karnataka state of India. The sample was calculated using the formula $n = (Z^2 \cdot p \cdot q) / d^2$

$\{P(1-P)/d^2\}$, keeping the confidence level at 0.95 and absolute precision at 0.04. The sample estimated was 505 per group. The district is geographically and administratively divided into three Talukas (Sub-provinces). One village was randomly selected from each Taluka. Simple random sampling technique was used for selection of households. A household was included only if it had at least one-member reporting of tobacco use. A corresponding member from the same household who had never consumed tobacco was included in the comparison group. 550 households were included in the study. Tobacco user was defined as one reporting of currently indulging in either smoking or smokeless form of tobacco consumption with a minimum history of continuous habit for last one month. Individuals with a habit of using both smokeless and smoking form of tobacco were not included. Individuals of less than 15 years of age, those who had quit tobacco and those with systemic illness were excluded from the study.

Data collection was done by a trained team of two Public Health Dentists of the dental school. A self-administered, pre-tested questionnaire was used to collect data. Information on income, education, tobacco habit, previous dental visit and oral hygiene behaviors was obtained using questionnaire. Alcohol consumption habit was established asking "have you consumed any alcoholic drink within the past 30 days". The population was broadly divided into three strata, upper, middle and poor based on revised BG Prasad's socioeconomic status scale for rural population in India (2008) [13]. The scale is revised annually based on the consumer price index in India and using the appropriate conversion factors. Educational status was recorded as per the levels of education used in National Family Health Survey [14]. The categories were: Illiterate, Primary school, High school, College, and Graduate.

Tobacco users were classified according to tobacco use as (a) current smoker and (b) current smokeless tobacco user. The tobacco habit of an individual was expressed in terms of consumption type i.e. form of tobacco being used; frequency i.e. the number of times consumed per day and duration, i.e., the number of years of consumption [15].

An eighteen-item multidimensional health locus of control (MHLC) scale was used to obtain information on Locus of Control orientation of the

participants. The MHLC questionnaire consists of three six-item scales. The three subscales are internality, Powerful others externality and chance externality. Respondents rate each item on the MHLC using a six-point (1, "strongly disagree" to 6, "strongly agree") scale. Thus, each subscale of six questions has a scoring range from 6 to 36. There is no total MHLC score. The translated version of questionnaire was used. The tool was translated into local language (Kannada) applying the forward and backward methodology and then pretested on 20 participants. The Translated version (Kannada) has been reported to have good validity [16].

Oral clinical examination was done by single examiner under natural day light setting. Data on oral health was collected using WHO oral health assessment form [17]. Statistical analysis was done using IBM SPSS statistics for Windows, version 26, Armonk, NY: IBM Corp. Z test was used for inter group comparisons for size >30. Two proportion z test was used for comparison of proportions in two groups. Student's t test was used to compare the means between two groups.

3. RESULTS

A final of 503 tobacco and 516 non tobacco users participated in the study. Male: female ratio was comparable between the two groups. Median age of the tobacco and non-tobacco group was 35 years and 30 years respectively. Majority of tobacco users had education of primary level or below (Table 1).

Smokeless form of tobacco use was more prevalent (80.92%). All the females reported to be using tobacco were smokeless tobacco users. Among males, smokeless tobacco was significantly more prevalent. Smokeless form of tobacco was more prevalent in 15-39 years of age range while smoking form was significantly more in >40 years age participants (Table 2).

Non tobacco users had significantly higher number of sound teeth and filled teeth (FT). The number of decayed teeth (DT) was also significantly more in non-tobacco users and the sum of Decayed, Missing and Filled teeth (DMFT) as well. The missing teeth (MT) were significantly lesser in non-tobacco users (Table 3).

Mean sextant value of CPI score 0 indicating healthy periodontium was present neither in the tobacco group nor in non-tobacco group subjects from poor socioeconomic strata. In the middle

and upper socioeconomic strata, non-tobacco users had higher mean sextant value of CPI score 0. Among subjects from poor socioeconomic strata, mean sextant value of CPI score 3 and 4 was significantly higher in tobacco users ($p<0.001$), while CPI score 1 and 2 was higher in non-tobacco users across all the strata of socioeconomic division. Tobacco users were found to have poorer periodontal health with significantly higher mean LOA (Table 4).

Tobacco users scored significantly higher on Chance locus of control and lower Internal locus of control as compared to non-tobacco users. (Table 5)

4. DISCUSSION

The study was intended to build up scientific evidence about the effects of tobacco on oral health by re-examining this association in a different socio-behavioral context. India has distinct pattern of tobacco consumption with respect to socioeconomic and spatial distribution. The deprived sections of population are at increased risk of consuming tobacco [18]. The present study sample was drawn from rural area

of a developing country characterized by lower standards of education and socioeconomic status, lower oral health awareness and culture specific type of tobacco chewing. It emerged from the findings of this study that worse oral health was found in tobacco users compared to non-tobacco users. Importantly, tobacco users had more Chance Locus of control than non-tobacco users. Similar trends have been reported from developed world as well, where people from lower socioeconomic brackets, with mental illness and of indigenous origin have shown substantially higher consumption of cigarettes than general population [19].

The median age of the tobacco and non-tobacco group was 35 years and 30 years respectively. The sample was stratified by age to overcome the confounding effect of age on oral health. The use of tobacco was more common among the male. Higher prevalence of tobacco consumption in men could be because the use of smoking form of tobacco remains a taboo for females in India. Similar pattern of tobacco use with respect to gender has been reported in Australia [20].

Table 1. Distribution of study population according to the demographic characteristics

Variable		Tobacco n (%)	No tobacco n (%)	Total n (%)
		503 (49.36)	516 (50.64)	1019 (100)
Age groups	15-39 years	296 (58.85)	374 (72.48)	670(65.75)
	40-65years	207 (41.15)	142 (27.52)	349(34.25)
Gender	Male	403(80.1)	393(76.2)	796(78.1)
	Female	100(19.9)	123(23.8)	223(21.9)
Education	Illiterate	25(4.97)	5(0.97)	30(2.94)
	Primary school	427(84.9)	398(77.13)	825(80.96)
	High school	33(6.56)	67(12.98)	100(9.81)
	College	15(2.98)	46(8.91)	61(5.99)
Socio Economic Status	Graduate	3(0.6)	0(0)	3(0.29)
	Poor	22(4.37)	17(3.29)	39(3.83)
	Middle	312(62.02)	281(54.45)	593(58.19)
	Upper	169(33.59)	218(42.24)	387(37.97)

Table 2. Distribution of study group according to the form of tobacco used, stratified by age and gender

Variable		Tobacco form		p-value
		Smoking n (%)	Smokeless n (%)	
Age groups	15-39 years	29(30.21)	267(65.6)	p<0.001
	40-65years	67(69.79)	140(34.4)	
	Total	96 (19.08)	407 (80.92)	
Gender	Male	96(100)	307(75.43)	p< 0.001
	Female	0(0)	100(24.57)	
	Total	96 (19.08)	407 (80.92)	

*Z test, $p<0.05$

Table 3. Comparison of mean number of Sound teeth, DT, MT, FT and DMFT in tobacco and non-tobacco users

Variable	Tobacco Mean ± SD	No tobacco Mean ± SD	p-value
SOUND	26.14 ± 4.16	27.12 ± 3.41	<0.001
DT	2.15 ± 1.44	3.06 ± 1.86	<0.001
MT	2.10 ± 3.79	1.46 ± 3.04	0.003
FT	0.02 ± 0.20	0.28 ± 0.92	<0.001
DMFT	4.29 ± 3.82	4.80 ± 3.43	0.025

Table 4. Comparison of periodontal health status (CPI and LOA) between tobacco and non-tobacco group by socioeconomic stratification

Periodontal Status	SES	Tobacco Status	0	1	2	3	4	Mean ± SD
CPI Mean ± SD	Lower	Tobacco	-	0 (0)	0 (0)	8 (36.36)	14 (63.64)	3.64 ± 0.49
		No Tobacco	-	3 (17.65)	6 (35.29)	8 (47.06)	0 (0)	2.29 ± 0.77
		p value		Z= 1.45 NS	Z= 2.5 <0.01	Z= 0.34 NS	Z= 3.77 <0.001	<0.001
	Middle	Tobacco	-	4 (1.29)	20 (6.45)	206 (66.45)	80 (25.81)	3.17 ± 0.59
		No Tobacco	-	75 (26.69)	91 (32.38)	100 (35.59)	15 (5.34)	2.20 ± 0.89
		p value		Z= 8.9 <0.001	Z= 7.9 <0.001	Z= 7.4 <0.001	Z= 6.6 <0.001	<0.001
	Upper	Tobacco	1(0.59)	1 (0.59)	14 (8.28)	122 (72.19)	31 (18.34)	3.07 ± 0.58
		No Tobacco	7 (3.21)	75 (34.4)	76 (34.86)	50 (22.94)	10 (4.59)	1.91 ± 0.94
		p value	Z= 1.4 NS	Z= 8.1 <0.001	Z= 6.0 <0.001	Z= 9.5 <0.001	Z= 4.1 <0.001	<0.001
LOA Mean ± SD	Lower	Tobacco	0 (0)	4 (18.18)	4 (18.18)	14 (63.64)	-	2.45 ± 0.80

	No Tobacco	3 (17.65)	9 (52.94)	5 (29.41)	0 (0)	-	1.12 ± 0.70
	p value	Z= 1.44 NS	Z=1.94 NS	Z=0.44 NS	Z=3.7 <0.001	-	<0.001
Middle	Tobacco	9 (2.9)	70 (22.58)	149 (48.06)	82 (26.45)	-	1.98 ± 0.78
	No Tobacco	100 (35.59)	126 (44.84)	45 (16.01)	10 (3.56)	-	0.88 ± 0.80
	p value	Z=10.2 <0.001	Z=4.2 <0.001	Z=6.7 <0.001	Z=7.5 <0.001	-	<0.001
Upper	Tobacco	2 (1.18)	47 (27.81)	76 (44.97)	41 (24.26)	3 (1.78)	1.98 ± 0.80
	No Tobacco	125 (57.34)	64 (29.36)	27 (12.39)	2 (0.92)	0 (0)	0.57 ± 0.74
	p value	Z=11.5 <0.001	Z=0.51 NS	Z=7.0 <0.001	Z=7.0 <0.001	Z=1.3 NS	<0.001

Table 5. Comparison of multidimensional health locus of control between tobacco and non-tobacco users

MHLC	Tobacco Mean ± SD	No tobacco Mean ±SD	p-value
Internal	25.47 ± 4.76	30.12 ± 3.64	<0.001
Chance	22.96 ± 4.10	19.42 ± 6.04	<0.001
Powerful others	27.62 ± 3.55	27.24 ± 5.18	0.167

The study results were in agreement with the hypothesis that a low level of education is a risk factor for tobacco use. Similar findings have been observed in developed countries where remote aboriginal participants with lower education had lower level of knowledge on the health consequences of using tobacco and were less likely to know of support services [21]. In accordance with these reports, a greater segment in the tobacco group of the current study was illiterate or with primary level education (< 5years of formal education). Tobacco use by the less educated is majorly practiced in ignorance of the health consequences. Also, believing in the medicinal properties of tobacco (e.g., for cleaning of teeth, for relieving toothache and relieving gastric complaints like gas and stomach acidity) and relatively inexpensive source of pleasure and satisfaction. Compared to the non-tobacco group, greater proportion of tobacco users were from middle and poor socioeconomic strata. Consequentially, tobacco related morbidity and mortality is expected to be much higher among lower socio-economic strata.

Use of smokeless form of tobacco was more prevalent in this population, irrespective of age and gender. Factors that contribute to preferred use of smokeless tobacco include its affordability due to low price, and misconception about its medicinal values. Findings from previous research shows that ease of access to substance plays a direct role in its use [22]. Moreover, in contrast to smoking tobacco, there is no taboo against using smokeless tobacco. Additionally, the campaign against tobacco from the government has been confined largely to cigarette/bidi use than eliminating tobacco as a whole [23]. All these, coupled with the belief that smokeless tobacco is less hazardous than smoking has led to incessant and indiscriminate use of smokeless forms of tobacco. The present study showed that Gutka (a form of smokeless tobacco) was the most commonly reported type of tobacco, by smokeless tobacco users, followed by pan and pan masala. Gutka is a combination of tobacco, areca nut, and several other substances in varied proportions. It is available as powdered or granulated form in small aluminum foil sachets. The product is placed in the mouth and then chewed and sucked to be later spat out or swallowed [24].

Since tobacco habits have been related to socio-economic status, it is important that the impact of tobacco be evaluated by comparing tobacco strata which are socio-economically similar.

Dividing the study population by socioeconomic strata, less than one percent of the total sample had healthy periodontium (CPI 0), which could be attributed to the sample, being drawn from rural area.

It is also noteworthy that tobacco users had significantly lower number of teeth present compared to non-users. Tooth loss has been attributed to an array of factors like socioeconomic status, pattern of dental visits, attitude of patients towards treatment and oral diseases. Therefore, greater tooth loss in tobacco users compared to non-users may only possibly be reflective of high level of periodontitis in tobacco users. It may not necessarily be ascribed to worse disease in tobacco users than in non-users.

Tobacco users scored lower on the dimension of 'Internality' and higher on the 'Chance' dimension compared to non-tobacco users, indicating a more External health locus of control. These findings suggest that individuals, who use tobacco feel less in control of their lives, believing that chance/destiny plays a larger role in their health. In addition, the dimension of 'Powerful others' presented no significant difference between the two groups. Beliefs about control over health outcomes are among the most important motivational factors [25,26,27]. This could possibly explain better oral health related behavior among non-tobacco users, they having more internal health locus of control and also the reason for not taking up tobacco habit [26]. All the tobacco users were counselled on site and were given referral cards for visit to the institute for customized tobacco cessation program.

This study should be considered in light of few limitations. Exact comparisons relating to the quantity of tobacco used and periodontitis was not possible as variables and parameters used differed in other studies. Most of the studies have been conducted on only smokers, whereas the present sample included smokers (cigarette and beedi) as well as smokeless form of tobacco users. Therefore, there might be inadvertent differences in the quantity of tobacco used and also the bioavailability of tobacco when consumed in chewing mode against smoking. Also, tobacco chewers prefer to use tobacco in various combinations with betel leaf, areca nut and lime [26]. The effect of such additives on periodontal health has not been established, it is plausible that complex interactions between these additives and tobacco might lead to a

unique presentation and occurrence of periodontitis in tobacco chewers depending on the mode of usage. Further studies are warranted to expound the effects of these additives on periodontal health, that contribute to the various commercially available brands of smokeless tobacco. The sampled population represented a developing country and further studies are needed before they can be compared with those done in western countries and extrapolated have been studied extensively.

However, it is noteworthy that notwithstanding such obstacles to comparison, findings of this study have shown significant association between the tobacco usage and adverse periodontal health. It was also concluded that non tobacco users had internal orientation to health locus of control thereby being important behavioral factor controlling health in this group. Developing countries like India, need to stride their way through coordinated implementation of existing policies and formulate new policy towards tobacco control in similar lines as of developed nations.

5. CONCLUSIONS

Tobacco users scored lower on the dimension of 'Internality' and higher on the 'Chance' dimension compared to non-tobacco users, indicating a more External health locus of control. These findings suggest that individuals, who use tobacco feel less in control of their lives, believing that chance/destiny plays a larger role in their health. In addition, the dimension of 'Powerful others' presented no significant difference between the two groups. This could possibly explain better oral health related behavior among non-tobacco users, they having more internal health locus of control and also the reason for not taking up tobacco habit.

DISCLAIMER

The products used for this research are commonly and predominantly use products in our area of research and country. There is absolutely no conflict of interest between the authors and producers of the products because we do not intend to use these products as an avenue for any litigation but for the advancement of knowledge. Also, the research was not funded by the producing company rather it was funded by personal efforts of the authors.

CONSENT

Written informed consent was obtained from all the respondents.

ETHICAL APPROVAL

The study protocol was reviewed and approved by University Ethics Committee, Manipal University. (UEC/10/2018).

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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