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ORIGINAL ARTICLE

THE THEORY OF REASONED ACTION IN DESCRIBING TONGUE CLEANING ADHERENCE AMONG COLLEGE GOING STUDENTS OF INDIA: A MODEL GUIDED STUDY

Mridula Tak[1], Sagrika Grover[1],Kailash Asawa[1], Jacob John[2], Bharathraj Shetty[3], Darshan Devang Divakar[4,5]

[1]Department of Public Health Dentistry, Pacific Dental College and Hospital, Udaipur, India
[2]Department of Dentistry, DM Wayanad Institute of Medical Sciences (DM WIMS), Meppadi, Kerala, India
[3]Department of Prosthodontics and Crown and Bridge, AB Shetty Memorial Institute of Dental Sciences, Nitte Deemed to be University, Karnataka, India
[4]Department of Oral Medicine and Radiology, Sharavathi Dental College and Hospital, Shivamogga, Karnataka, India
[5]Department of Oral Medicine and Radiology, Faculty of Dentistry, Levy Mwanawasa Medical University (LMMU), Ministry of Health, Lusaka 10101, Zambia

ABSTRACT

Background. Just mere brushing of teeth is not enough for maintaining good oral health. Regular cleaning of tongue is equally important for maintaining good oral hygiene and to escape social embarrassment and personal discomfort, which could arise as a result of halitosis.

Objective. To test the variables of Theory of Reasoned Action to explain the behavior of tongue cleaning among college going students of Udaipur city, Rajasthan, India.

Material and methods. A descriptive cross-sectional survey was conducted amongst 756 college going students of Udaipur city, India using an online self-administered structured questionnaire which was designed based on our study objectives. Logistic regression analysis and structural equation modelling (SEM) were employed for statistical analysis. Confidence level and level of significance were set at 95% and 5% respectively.

Results. Logistic regression analysis showed that with one unit increase in subjective norm, the tongue cleaning behavior odds increased significantly by 1.124. Also, the tongue cleaning behavior odds was 1.77 times significantly greater among those brushing their teeth twice a day than those brushing once a day. Structural Equation modelling also evidenced the significant direct effect of subjective norm on tongue cleaning behavior ($\beta = 0.2$, $p \leq 0.05$).

Conclusion. Our results highlighted the importance of subjective norms in espousing tongue cleaning preventive behaviour habit. It is thus recommended to highpoint the role of significant others in changing tongue cleaning behaviour.

Key words: *theory of reasoned action, preventive behavior, tongue coating, tongue cleaning, oral hygiene*

INTRODUCTION

As claimed by the World Health Organization (WHO), health of an individual is directly linked to his/her oral health [1]. Furthermore, oral health is reasoned to be an important factor that settles and resolves different facets of quality of life [1, 2]. Our mouth houses not a single group of microorganisms but a large community that interacts with each other in a complex manner. It is not surprising to know that the habitat of these microbial metabolic activities is the dental plaque [3].

Maintaining proper oral hygiene with efficient plaque removal methods is of utmost importance. The dental industry is flooded with oral care products which serve various purposes like mouth cleansing, maintain a fresh odorless breath and maintain efficient oral hygiene [4]. Regular cleaning of tongue is equally important for maintaining good oral hygiene and to escape social embarrassment and personal discomfort, which could arise as a result of halitosis [5]. Tongue coating is considered as a major etiological factor for oral malodor. For approximately 90% of the cases, it is seen that halitosis can be classified as intra oral halitosis [6]. In addition to this, the tongue coating

Corresponding author: Mridula Tak (ORCID: https://orcid.org/0000-0002-4353-3558), Pacific Dental College and Hospital, Udaipur, 313024, India, tel. +919928840140, e-mail: mtak1084@gmail.com

incorporates a wide range of bacteria, secretions from post nasal area, gingiva, saliva and deceased epithelial cells [7]. The dorsum of the tongue should be regularly cleaned as a part of oral hygiene measure to have a considerable effect on the levels of plaque as compared to toothbrushing done alone [8]. As dentists, educating patients is contemplated to be a trademark of our noble profession.

The development of various theories and behavioral models have been a major breakthrough in the field of dental education. In accordance with this theory, the best predictor of subsequent behavior is intention and the intentions are further based on attitude towards performing the behavior and perceived social norms about performing the behavior [9]. In this theory, the attention is focused on the fact that attitudes and intentions together can bring about a change in the behavior. There are two cognitive models that work together to develop a healthy behavior – assumption what the other people contemplate and the desire and impulse to conform with them [10]. Since the role of other people is also included in this theory, it makes it all the way more interesting [11].

This study is intended with the purpose to test the variables of Theory of Reasoned Action to explain the current behavior of tongue cleaning amidst college going students of Udaipur city, Rajasthan, India.

MATERIALS AND METHODS

Study design, study population and study area

An online descriptive survey was conducted amongst 756 college going students of Udaipur city, Rajasthan, India.

Ethical approval

The study was approved by the institutional ethical committee and was acknowledged with the ethical clearance (PDCH/21/EC-287). Deans of the institutes selected for the study were contacted for necessary permissions and the official permission letters were obtained.

Informed consent

Study subjects were made aware about the goals and details of the present research and informed consent (online) was obtained prior to the study.

Inclusion criteria

Subjects who belonged to the age group of 18-30 years.

Exclusion criteria

Study subjects who were pursing medical, paramedical and dentistry courses. Those who were reluctant to participate in the study. Those who consumed tobacco in any form (smoked/smokeless).

Questionnaire

An online (google form) self-administered structured and organized questionnaire was established on the basis of our study manifesto. The questionnaire comprised of 3 sections – the initial section gathered the basic demographic specifics counting for name, age, gender, religion, monthly income, level of education and geographic location. Socioeconomic status was classified according to Prasad's Classification of socioeconomic status scale. A close ended question to enquire about tobacco consumption in any form (smoked/smokeless) was also added in the first section of questionnaire.

The next segment of the questionnaire comprised of 9 model guided items (Theory of Reasoned Action) with responses on *Likert's* scale of agreement. It included questions regarding tongue cleaning behavior (2Q), intention (1Q), attitude towards tongue cleaning (3Q) and subjective norms (3Q). The third section consisted of two close ended questions on oral health behavior to gather information on the regularity of tooth brushing and tongue cleaning habits.

Pre testing survey

A pretesting survey was conducted amongst a group of 12 students. These participants were then contacted to obtain their suggestions on the general acceptance pertaining to the number of questions, understandability and any other problem faced while submitting the responses. A high Cronbach's coefficient of 0.78 made the questionnaire acceptable in terms of internal consistency.

Questionnaire was validated based on the judgements of five senior faculty members. Based on their scores, content validity ratio was found to be 0.91. Furthermore, during the assessment of face validity, 95% of the study subjects assessed the survey form as simple and clear.

Sample size calculation

Using G power software, the findings of the pilot study, 80% power of study and 95% confidence level, the estimated sample size came out to be 756.

Sampling methodology

Before the instigation of the study, a list of the university institutes of Udaipur, Rajasthan was prepared. Amongst them, one university was randomly picked up. All the constituent colleges of the university formed different stratas (homogenous groups) and the subjects were selected using stratified random sampling. The number of participants selected in each stratum was in proportion to the students

enrolled in each college to reach the desired sample size of 756 (Probability Proportional sampling). The proportion of students chosen varied in all the colleges accordingly.

Methodology

After selecting the desired study subjects, their contact numbers were gathered. Sensitization of the study subjects regarding the research study was done via WhatsApp. Timely reminders were given to the study subjects to fill up the google form and they were advised to fill it up very carefully. The response rate was 100%.

Statistical analysis

Analysis was done using SPSS version 24 (IBM SPSS statistic Inc, Chicago, IL) windows software program. Descriptive statistics were calculated to determine the frequency of responses regarding tongue cleaning behavior among the study subjects. Binary logistic regression analysis was done multivariate analysis. The hypothesized model was tested using structural equation modelling. Model was verified using IBM SPSS AMOS 16.0. As per the standard, model was found to be good which was supported by the values of RMSEA (root mean square error of approximation) CFI (comparative fit index) and AIC (Akaike's information criteria) along with a non-significant *Chi* square [12]. The model with subjective norm, attitude, intention and preventive behavior was an acceptable fit to the data.

RESULTS

In a total population of 756 subjects, majority of the respondents were males (n= 353, 59.0%) and belonged to 21-25 years of age group (n = 459, 76.5%). Around 55.7% (n = 334) and 51.0% (n = 306) of the study subjects belonged to urban locations and were post-graduates respectively. Nearly 53.0% (n = 318) of the study subjects belonged to upper class socio-economic status, followed by 21.8% (n = 131) of the subjects belonging to upper middle class socioeconomic status. Only 3.3% (n =20) of the study subjects belonged to lower class socio economic status (Table 1).

Table 1. Distribution of study population according to demographic variables

Variables	Number (n)	Percentage (%)
Age group (years)		
18-20	62	10.3
21-25	459	76.5
>25	79	13.2
Gender		
Male	353	59.0
Female	247	41.0
Place of residence		
Rural	266	44.3
Urban	334	55.7
Per capita income		
Upper class	318	53.0
Upper middle class	131	21.8
Middle class	85	14.2
Lower middle class	46	7.7
Lower class	20	3.3
Educational qualification		
Under- graduation	296	49.0
Post-graduation	306	51.0
Total	**600**	**100**

Table 2. Frequency of responses to questions concerning Theory of Reasoned Action among study subjects

Questions	Strongly agree n (%)	Agree n (%)	Disagree n (%)	Strongly disagree n (%)
INTENTION				
I intend to clean my tongue once a day/ more	220 (36.7)	288 (48.0)	65 (10.8)	27 (4.5)
ATTITUDE				
By cleaning tongue, one can prevent halitosis	283 (47.2)	244 (40.7)	36 (6.0)	37 (6.2)
By cleaning tongue, one can maintain good oral hygiene	228 (47.2)	246 (41.0)	84 (14.0)	42 (7.0)
Regular tongue cleaning means healthier oral cavity, which can make you look & feel better about yourself	100 (16.7)	298 (49.7)	178 (29.7)	24 (4.0)
SUBJECTIVE NORM				
Most people who are important to me, think that I should clean my tongue	300 (50)	100 (16.7)	150 (25)	50 (8.3)
By cleaning tongue, I can set an example for others by looking and feeling better about myself	257 (42.8)	291 (48.5)	25 (4.2)	27 (4.5)
By cleaning tongue, I can have a nice smile and healthy oral cavity and I can impress people around me	400 (66.6)	75 (12.5)	100 (16.7)	25 (4.1)

The frequency of responses to answers concerning intention, attitude and subjective norms regarding tongue cleaning behavior were calculated. Around 48.0 % (n = 288) of the study subjects agreed that they intend to clean their tongue once a day or more. It was observed that, 47.2% (n = 283) of the study subjects strongly agreed that by cleaning tongue, one can prevent halitosis and maintain good oral hygiene. More than half i.e 66.6% (n = 400) of the study subjects strongly agreed that by cleaning tongue, one can have a nice smile and healthy oral cavity and can impress people around them (Table 2).

Table 3. Binary Logistic Regression analysis with tongue cleaning behavior as dependent variable

Variables	Tongue Cleaning Behavior Odds ratio (95% CI)	P value
Attitude	0.963 (0.846-1.096)	0.56
Subjective Norm	1.124 (0.986-1.280)	**0.05***
Intention	1.064 (0.825-1.371)	0.63
Age (years)		
18-20	0.875 (0.365-2.096)	0.764
21-25	0.808 (0.420-1.554)	0.523
>25[a]	-	-
Tooth brushing frequency		
Twice a day	1.77 (0.516-1.173)	**0.001***
Once a day[a]	-	-
Per capita income		
Upper class	0.684 (0.336-1.393)	0.296
Upper middle class	1.440 (0.831-2.495)	0.194
Middle class	0.598 (0.324-1.046)	0.235
Lower middle class	3.06 (0.653-1.968)	0.103
Lower class[a]	-	-
Gender		
Female	1.081 (0.711-1.042)	**0.05***
Male[a]	-	-
Education		
Under-graduation	3.968 (0.546-1.304)	**0.000***
Post-graduation[a]	-	-

Test applied - Binary logistic regression; *p≤0.05 statistically significant

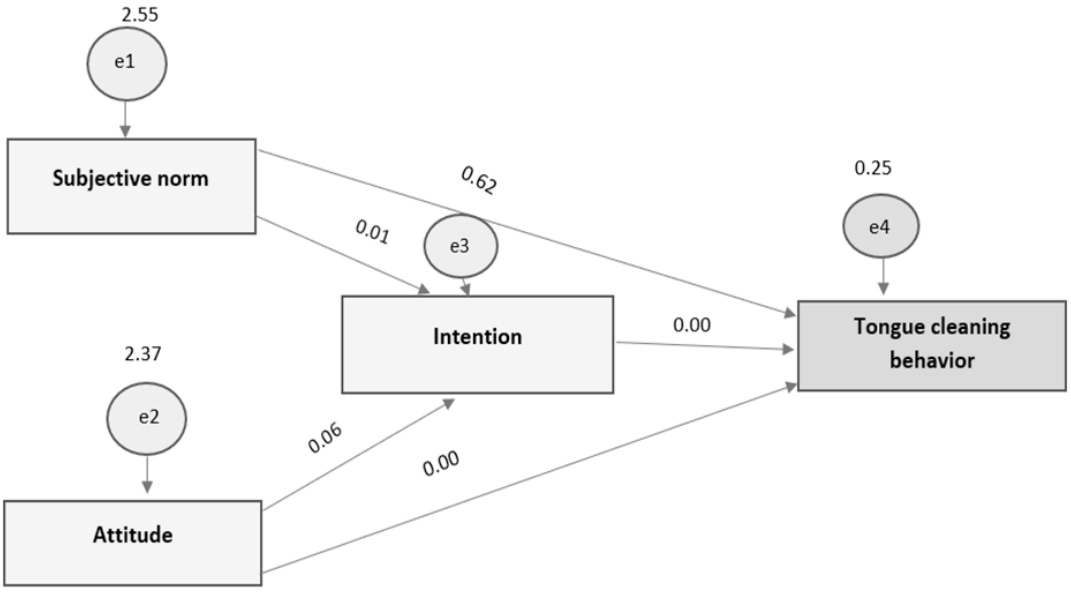

Figure 1. Structural equation model analysis for the determinants of tongue cleaning behavior using Theory of Reasoned Action

Binary logistic regression analysis with tongue cleaning behavior as a dependent variable was analyzed. It was observed that significant greater odds of 3.968 and 1.081 was seen among the undergraduates and female study subjects than postgraduates and male subjects respectively, concerning the tongue cleaning behavior. With one unit increase in subjective norm, the tongue cleaning behavior odds increased significantly by 1.124. Also, the tongue cleaning behavior odds was 1.77 times significantly greater among those brushing their teeth twice a day than those brushing once a day (Table 3).

Figure 1 depicts that the direct effect of subjective norm on tongue cleaning behavior was significant ($\beta = 0.2$, $p \leq 0.05$). The indirect direct effects of attitude and intention on tongue cleaning behavior were non – significant ($p \geq 0.05$). Specific indirect effects were estimated by multiplying the direct effects of the variables involved in total pathway.

DISCUSSION

People of all ages have benefitted immensely from daily and routine oral health behaviors. These everyday practices contribute to improved oral health status. Rendering preventive dental care has shown to explain the reason behind notable gains in the oral health status and quality of life [13]. To boost and escalate the awareness pertaining to healthy actions, health behavior models have been refined time and again and inculcated in related investigations and analysis. It should be noted that an adjustment and alteration is required in behavior so as to cultivate health and bypass illness. A deficiency in adhering to acceptable healthy conduct can be clearly witnessed in every sections of the society, irrespective of literacy and socioeconomic status.

College going population also does not exhibit any distinctive features when compared to their synonymous groups. This population is no more in their cocoons and in the immediate presence of their parents to constantly emphasize them to brush their teeth or clean their tongue. The simple oral hygiene practices like brushing and flossing of teeth and cleaning of teeth can completely escape from their memories and they may even continue to do this for several days. Students as a community cannot be neglected because they offer a critical and crucial role bringing about revolution in the field of behavioral change. Consequently, it becomes very important to construct an awareness in their minds in view of the application of oral hygiene practices in day-to-day life.

The various psychological assumptions and concepts that are seeded on oral health education has immensely helped in advertising a change in knowledge, attitudes, perceptions, all of this leading towards the wider goal of changing behavior. Taking this into account, the current research was directed to determine the efficacy of the variables of the Theory of Reasoned Action (attitude, subjective norm and perceived behavioral control) amongst the college going students.

Till date, nowhere in the literature has tongue cleaning behavior been scrutinized in relation to *Ajzen* and *Fishben's* model. Studies on the past have focused on oral health behavior and oral self-care habits. As per the Theory of Reasoned Action, analytical decisions are made by individuals as per their awareness, morals and mindset. Hence, an individual's aim to accomplish a behavior is the utmost important interpreter of executing that behavior. Behavioral beliefs and normative beliefs are two kinds of beliefs that shape intentions. Intent to perform an action must be constant and consistent to bring about the change in behavior [14]. When faced with an unforeseen hindrance, there may be a divergence from the path of healthy behaviors. Social norms and community expectations are powerful predictors of healthy action, as per the Theory of Reasoned Action [15].

Study conducted by *Pedrazzi* et al [16] has projected that around 85% of all halitosis have their source in the mouth, of these 50% are triggered by tongue residues. Thus, tongue cleaning advances to be on the top position for halitosis management and promoting good overall health when complemented with toothbrushing and flossing.

The results of our study confirmed that subjective norm concerning tongue cleaning was related significantly to the tongue cleaning behavior. Studies conducted by *Kawakami* et al [17] has shown that social surroundings of an individual, which includes friends, family and colleagues, are significant in patient care. The significant effect of subjective norms on preventive behavior was also justified by *Bratt* [18]. He stated that friends, family and colleagues, could increase a person's awareness to the consequences of his/her actions and encourage the individual to take responsibility for his/her action. He stated that social norm revealed direct link to behavior.

However, our results are in dissimilarity with the findings of *Dumitrescu* et al [13], which revealed that attitude was of paramount importance in predicting the intention. This difference in the study results could be because of the fact that both affective and instrumental attitudes were included as separate constructs in their study and parental attitudes towards child's oral health were studied as well. Subjective norms did not significantly contribute to the prediction of behavior was supported by the findings of *Rhodes* et al [19], *Saunders* et al [20] and *Fen & Sabaruddin* [21]. These differences could be because of the fact that the

Theory of Reasoned Action may perform differently in different socio-cultural contexts.

In our study, the subjective norm seemed to be important for tongue cleaning which advocates the inclusion of significant others in oral health promotion programmes.

The results of our study also suggested that women had better oral health orientation than males, as they had greater odds of tongue cleaning compared to the males. This result was supported by the studies conducted by *Syrjala* et al [22], *Kneckt* et al [23], *Davidson* et al [24] and *Sakki* et al [25]. Female's adherence to a healthier behavior may be an implication of several contextual psychological aspects.

Higher odds of 3.968 was observed amongst the undergraduates as compared to post graduate students, which suggests dearth of hours which they can actually devote in maintaining a healthy oral cavity. Also, as anticipated, tongue cleaning behavior odds was 1.77 times greater among those brushing their teeth two times daily than once a day. Our results concluded, that socio economic status did not significantly affect the tongue cleaning behavior. Although demographic factors strongly influence oral health yet they play a negligible role because a clinician/ practitioner cannot directly modify demographic factors [26]. In addition to this, tongue cleaning as a practice for maintaining good oral hygiene does not cost an arm and a leg and is a budget friendly practice, requiring no special tools.

The use of structural equation modelling analysis, permitted in identification of factors associated positively with tongue cleaning behaviour, thereby suggesting improvements in further educational models and rendering our study statistically more competent. The current results might pave a way for dental professionals to educate masses and bring about a change in person's oral health promoting behaviour. At last, health professions should enquire regarding peer pressure evidenced by the subjects that might eventually predict actions. Involvement of significant others like partners, colleagues or other people in the surroundings in oral health educational might be further beneficial. When employed, these strategies, in addition to traditional patient education, are likely to result in more robust interventional efforts.

CONCLUSION

Present research suggested the importance of subjective norms for tongue cleaning preventive behaviour. In the companionship of significant others, rendering oral health education to college going students would be of help. Keeping in mind the future prospective, it could be of use to objectify the role of social surroundings which might reinforce the subjective norms and attitudes regarding the tongue cleaning behaviour amongst college going students.

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Conflict of interest

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