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Factors associated with dependence on smokeless tobacco, Navi Mumbai, India

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Abstract

Objective: Nearly 300 million people in India use some type of tobacco product, with about 60% of those using smokeless tobacco. Smokeless tobacco use has been associated with a number adverse health outcomes in India and across South Asia.

Method: A cross-sectional study of outpatients at a dental hospital in Navi Mumbai, India was conducted between January and June 2015. Trained interviewers administered a 19-item questionnaire to all patients receiving regular dental care. In addition to demographic information, data about the use of smokeless tobacco was collected. Nicotine dependence was assessed using the six-item Fagerstrom Nicotine Dependence Scale, adapted for smokeless tobacco.

Results: Approximately one third of 1,067 respondents (30.55%; N = 326) reported use of smokeless tobacco. Neither use of smokeless tobacco nor nicotine dependence was associated with any demographic variables. High nicotine dependence was associated with a younger age of initiation of smokeless tobacco use (RD = 0.14; 95% CI: 0.03, 0.25) and with frequency of use, with those who reported daily use having an excess risk of high nicotine dependence of 14% (95% CI: 2%, 27%).

Conclusion: To reduce dependence on smokeless tobacco in India and subsequent adverse health outcomes, interventions should emphasize a combination of policy

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and public health interventions focused on increasing the age at which a person initially uses smokeless tobacco and decreasing the frequency of use.

Keywords: Epidemiology, Public health

1. Introduction

Smokeless tobacco – including products that are chewed, snuffed, or placed between the teeth and gum rather than smoked by the user – is highly addictive and has been linked with numerous health outcomes, including cardiovascular mortality (Bolinder et al., 1994), many types of cancer (Boffetta et al., 2005; Campbell et al., 2018), reductions in birth weight and gestational age (Gupta and Sreevidya, 2004; Gupta and Subramoney, 2006), and poorer mental health (Raffetti et al., 2018). According to the World Health Organization (2014), the nicotine in smokeless tobacco is more easily absorbed in the body when compared to smoking, increasing the potential for addiction. In South Asia, rates of smokeless tobacco use are high and increasing rapidly, especially among young people and women (Mutti et al., 2016; WHO, 2014). In 2009, there were approximately 274.9 million users of tobacco products in India. Of these, 59.5% used only smokeless tobacco products, 25.1% were solely tobacco smokers, and 15.4% consumed both forms (Asma et al., 2015). To better understand the factors that contribute to use of smokeless tobacco in India, a cross-sectional study was implemented in Navi Mumbai township, a planned community located on the West Coast of India with a population of approximately 1.2 million residents (CIDCO, 2015).

The predictive validity of the Fagerström Test for Nicotine Dependence (FTND) has been demonstrated in numerous evaluations of nicotine dependence among tobacco smokers (Pinto et al., 1987; Fagerstrom and Schneider, 1989; Heatherton et al., 1991; Kozlowski et al., 1994; Fagerström, 2012; Mushtaq and Beebe, 2012) and as modified, been applied to assess nicotine dependence among users of smokeless tobacco (Ebbert et al., 2006; Feretich et al., 2007). The Fagerström Test for Nicotine Dependence-Smokeless Tobacco (FTND-ST) survey instrument consists of questions that measure dependence by quantifying the pattern and severity of use (Ebbert et al., 2006). The questionnaire has been used alone (Manimunda et al., 2012) and in tandem with concentrations of cotinine, a primary nicotine metabolite, present in salivary (Boyle et al., 1995) or serum (Ebbert et al., 2006) samples collected from the respondent.

The FTND-ST is widely used and has been applied in studies conducted to evaluate nicotine dependence in India (D'Souza et al., 2012; Manimunda et al., 2012; Mony et al., 2014), England (Croucher et al., 2012), Norway (Fagerström et al., 2010), Sweden (Fagerström et al., 2010) and the United States (Ebbert et al., 2006,

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2011). For example, Manimunda et al. (2012) used the FTND and the FTND-ST to assess the use of and nicotine dependency to smoking and smokeless forms of tobacco among a cross-sectional sample of residents of India's Andaman and Nicobar Islands. Although smokeless tobacco use among the 18,018 participants surveyed was significantly greater than that of tobacco smoking ($p < 0.001$), smokeless tobacco users were found to have a lower rate of nicotine dependence ($p < 0.001$). The FTND-ST has also been applied to measure the efficacy of pharmaceutical interventions in reducing nicotine dependency among smokeless tobacco users (Ebbert et al., 2011; Fagerström et al., 2010).

2. Method

A cross-sectional survey was implemented to explore potential associations between nicotine dependence and demographic and smokeless tobacco use variables. Between January 2015 and June 2015 all patients reporting for a regular dental care in the outpatient department at a dental hospital in Navi Mumbai were interviewed by a trained dentist. The survey included demographic data (e.g., age (10 year range between 20 and 60 and >60), gender, occupation, education, and income), seven questions related to the use of smokeless tobacco, and the six question FTND-ST. Variables related to the use of smokeless tobacco included current and prior use (yes/no); form (tobacco, betel quid with tobacco, tobacco with lime, khaini (raw tobacco mixed with herbs), guthka (a sweetened and flavored chewing tobacco), and mishri (tobacco containing teeth cleaning powder); frequency of use; age at first use; duration of habit in years; and reason for starting to use smokeless tobacco. The FTND-ST includes six questions related to time of first use in the morning; frequency of swallowing tobacco juice; the chew during the day you would most hate to give up; number of pouches chewed per week; frequency of use at different times of day; and willingness to chew if sick and in bed most of the day (Ebbert et al., 2006). The survey and consent documents were reviewed by the Terna Dental College and Hospital and considered to be exempt as enrollment was voluntary. Respondents were asked to provide written consent prior to the initiation of the survey. Either a signature or thumbprint could be provided to demonstrate consent.

Surveys were completed on paper and double data entry was used to input responses into Microsoft Excel (Redmond, Washington) to ensure data quality. For analysis, data were imported in Stata v. 14.0 (College Station, TX). Counts and frequencies were generated for each variable and bivariate analyses were performed using generalized linear models to identify any associations between nicotine use (yes/no) and very high nicotine dependence (score of 8 or higher on the FTND-ST) and demographic or smokeless tobacco use variables. Since the primary outcome of tobacco use was common (prevalence = 30.55%) and the data were cross-sectional, generalized logistic regression models were used to produce crude risk differences and

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95% confidence intervals to address the potential for an odds ratio to overstate the effect sizes (Davies et al., 1998). Since nicotine dependence may be modified or confounded by other characteristics, a predicted marginal risk model was used to produce adjusted risk differences, controlling for other covariates.

3. Results

In the study sample, 30.55% (N = 326) of those surveyed reported smokeless tobacco use, while 69.45% (N = 741) did not use smokeless tobacco. Tobacco use included primarily smokeless tobacco only, betelquid with tobacco, or other forms of smokeless tobacco (Table 1).

Use of smokeless tobacco was not significantly associated with any demographic factors in the crude analysis (Table 2). Results for crude risk differences for very high nicotine dependence (versus lower nicotine dependence) among users of smokeless tobacco were similar (Not shown).

While nicotine dependence was not significantly associated with any demographic variables, very high nicotine dependence was associated with a younger age of initiation of smokeless tobacco use (RD = 0.14; 95% CI: 0.03, 0.25) (Table 3). When compared with those who initiated use of smokeless tobacco over the age of 25, there was an excess risk of very high nicotine dependence of 14% among those who initiated smokeless tobacco use at age 25 or lower. Similarly, very high nicotine dependence was also positively associated with frequency of use, with those who reported daily use having an excess risk of very high nicotine dependence of 14% (95% CI: 2%, 27%).

Adjusted predicted marginal risk differences were similar in both direction and magnitude to the crude results. If everyone in the sample were to initiate use of smokeless tobacco at age 25 or less, the predicted probability of very high nicotine dependence would be 67%, while initiation at an age greater than 25 would predict a probability of very high nicotine dependence of 48%, a risk difference of 19% (Table 4). Similarly, if everyone in the sample were to use smokeless tobacco daily, the predicted probability of very high nicotine dependence would be 62%, while less than

Table 1. Smokeless tobacco usage and type, Navi Mumbai, India (N = 1,067).

Use of smokeless tobacco	N (%)
No	741 (69.45)
Yes	326 (30.55)
Smokeless only	132 (40.49)
Betel quid with tobacco	88 (26.99)
Other	106 (32.52)

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Table 2. Distribution, Crude Risk Differences (RD) and 95% Confidence Intervals (95% CI) for demographic factors potentially associated with use of smokeless tobacco (N = 1,067).

Variable description	Use tobacco (N = 326) Percent (N)	Do not use tobacco (N = 741) Percent (N)	RD (95% CI)
Age (Years)			
20–30	24.9 (81)	22.4 (166)	0.03 (−0.07–0.13)
31–40	27.3 (89)	25.2 (187)	0.02 (−0.07–0.13)
41–50	21.2 (69)	22.0 (163)	0.00 (−0.10–0.10)
51–60	14.7 (48)	18.1 (134)	−0.04 (−0.14–0.07)
>60	12.0 (39)	12.3 (91)	REF
Gender			
Male	56.4 (184)	56.0 (415)	0.00 (−0.05–0.06)
Female	43.6 (142)	44.0 (326)	REF
Level of education			
Illiterate	13.2 (43)	12.0 (89)	0.09 (−0.02–0.20)
Primary school certificate	15.3 (50)	14.3 (106)	0.08 (−0.02–0.19)
Middle school certificate	24.2 (79)	22.1 (164)	0.09 (0.00–0.18)
High school certificate	21.5 (70)	21.5 (159)	0.07 (−0.02–0.16)
Intermediate/Post-high school diploma	15.6 (51)	15.7 (116)	0.07 (−0.03–0.17)
Graduate/Post-graduate/Professional	10.1 (33)	14.4 (107)	REF
Occupation			
Unemployed	27.9 (91)	28.1 (208)	0.03 (−0.05–0.11)
Unskilled worker	13.2 (43)	13.1 (97)	0.03 (−0.07–0.13)
Semi-skilled worker	18.7 (61)	18.5 (137)	0.03 (−0.06–0.12)
Skilled worker	22.7 (74)	20.1 (149)	0.06 (−0.03–0.14)
Clerical/Farmer/Professional	17.5 (57)	20.2 (150)	REF
Income			
Low	12.0 (38)	11.7 (89)	0.03 (−0.07–0.13)
Middle	69.9 (228)	66.0 (489)	0.05 (−0.02–0.12)
High	18.4 (60)	22.0 (163)	REF

daily use would predict a probability of very high nicotine dependence of 49%, a risk difference of 13%.

4. Discussion

The findings of this study diverged from the well-established association between early tobacco use and nicotine dependence. Unlike prior studies (Norberg et al., 2011; Sreeramareddy et al., 2014), which have shown higher use of smokeless tobacco among younger persons as well as those with lower education and income, in this study, there were no statistically significant associations between

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Table 3. Distribution, Crude Risk Differences (RD) and 95% Confidence Intervals (95% CI) for tobacco use factors potentially associated with very high nicotine dependence (N = 326).

Variable description	Very high nicotine dependence (N = 193) Percent (N)	Lower nicotine dependence (N = 133) Percent (N)	Crude RD (95% CI)
Form of tobacco use			
Tobacco	37.7 (72)	44.3 (58)	−0.05 (−0.17−0.08)
Betel quid with tobacco	29.3 (56)	23.7 (31)	0.04 (−0.09−0.18)
Other	33.0 (63)	32.1 (42)	REF
Age at initiation			
≤25 years old	60.5 (115)	46.2 (61)	0.14 (0.03−0.25)
>25 years old	39.5 (75)	53.8 (71)	REF
Duration of tobacco use			
≤10 years	54.2 (103)	55.3 (73)	−0.02 (−0.16−0.11)
11−20 years	22.1 (42)	22.7 (30)	−0.02 (−0.18−0.13)
>20 years	23.7 (45)	22.0 (29)	REF
Frequency of use			
Daily	79.8 (150)	68.9 (91)	0.14 (0.02−0.27)
Occasionally	20.2 (38)	31.1 (41)	REF
Age			
20−40 years	52.3 (101)	51.9 (69)	0.00 (−0.10−0.11)
Above 40 years	47.7 (92)	48.1 (64)	REF
Income			
High	12 (6.22)	15 (11.28)	−0.16 (−0.36−0.40)
Middle	61 (31.61)	40 (30.08)	0.00 (−0.12−0.12)
Low	120 (62.18)	78 (58.65)	REF

demographic variables and either use of smokeless tobacco or very high nicotine dependence. The fact that there were few differences between demographic groups for either smokeless tobacco use or nicotine dependence suggests that further research focusing on other factors related to the use of and dependence on smokeless tobacco as well as increased use of risk differences and marginal risk models is warranted. The absence of statistically significant associations between demographic variables and use of smokeless tobacco or very high nicotine dependence in this study could be due to the use of adjusted risk differences, rather than odds ratios. However, associations between demographic variables and use of smokeless tobacco or very high nicotine dependence are well established in literature.

Younger age of initiation of smokeless tobacco use and daily use were both positively associated with very high nicotine dependence in both crude and adjusted models. These findings may provide public health authorities with priorities for the development and implementation of interventions focused on increasing the

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Table 4. Distribution, Predicted Marginal Risk Differences (RD) and 95% Confidence Intervals (95% CI) for tobacco use factors potentially associated with very high nicotine dependence (N = 326).

Variable description	Predicted marginal RD (95% CI)	Adjusted RD
Age at initiation		
≤25 years old	0.67 (0.60−0.74)	0.19
>25 years old	0.48 (0.39−0.57)	REF
Duration of tobacco use		
≤10 years	0.61 (0.53−0.69)	0.05
11−20 years	0.55 (0.44−0.67)	−0.01
>20 years	0.56 (0.42−0.70)	REF
Frequency of use		
Daily	0.62 (0.56−0.68)	0.13
Occasionally	0.49 (0.38−0.59)	REF
Age		
20−40 years	0.55 (0.45−0.64)	−0.07
Above 40 years	0.62 (0.53−0.71)	REF
Income		
High	0.38 (0.20−0.56)	−0.22
Middle	0.61 (0.52−0.70)	0.01
Low	0.60 (0.53−0.67)	REF

age of initiation to smokeless tobacco (e.g., school-based or sports-based youth campaigns) and decreasing the frequency of use (e.g., regulations on sales of smokeless tobacco or increases in taxes on smokeless tobacco products). It is unclear whether recent efforts to ban the production and sale of packaged smokeless tobacco have been enforced or effective at increasing age of initiation or frequency of use (Arora and Madhu, 2012; Khan et al., 2014). Additional research related to the social determinants of dependence on smokeless tobacco are also warranted (Palipudi et al., 2012), particularly in South Asia where smokeless tobacco is highly socially acceptable (Gupta and Ray, 2003; Kakde et al., 2012); however, these factors were unable to be assessed with the data available from our survey.

The use of predicted marginal risk differences to make inferences about population average risk differences presents public health authorities with potential avenues for evaluating the impact of these types of behavioral or policy interventions in reducing high nicotine dependency. For example, if initiation of smokeless tobacco use in the population residing in the catchment area of this clinic could be delayed until age 25, this could result in a reduction in very high nicotine dependence of 20%. Given an estimated prevalence of smokeless tobacco use of 33%, and a population of more than 112 million in the State of Maharashra, which includes Navi Mumbai, a reduction of 20% among the 37 million users of smokeless tobacco would mean a reduction of nearly 7 million people with very high nicotine dependence. More critically,

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since approximately 88% of women in India who use tobacco use smokeless tobacco exclusively, the potential public health benefits to women are even greater (International Institute for Population Sciences, 2010).

This study has several important limitations. While the Fagerstrom Tolerance Questionnaire and the adapted FTND are the most widely used measures in tobacco dependence assessment, they are based on self-reported measures and were not developed using standard psychometric methods (Mushtaq and Beebe, 2012). If those at highest risk for very high nicotine dependence are also more likely not to be included in the survey, there is the potential for response bias. While all patients receiving dental check-ups were required to pay ten Indian Rupees (approximately $0.15), surveys were conducted with all patients who visited the outpatient clinic of a dental hospital during regular weekday clinic hours – 9am to 1pm – over a period of 6 months. Recall bias is possible, particularly as related to age of initiation, which could have been many years prior to the completion of the survey. Berkson's bias is also possible since the survey was conducted among a subpopulation that included only clinic patients, who were likely different in terms of income, education, and other characteristics than the general population. This survey relied on self-reported measures of tobacco use and did not include clinical verification of reported use. In addition, no data was collected about the potential for using smokeless tobacco as a substitute for combustible tobacco products. Some respondents may have been hesitant to report tobacco use factors to clinic staff conducting the survey; however, with an estimated prevalence of more than 30% in many parts of India, social response bias related to the use of smokeless tobacco is likely limited. Estimates of the potential reduction in the number of residents of Navi Mumbai with high levels of nicotine dependence due to the implementation of laws or policies to delay initiation of smokeless tobacco cannot account for the potential contribution of illegal sales or the health impacts due to the initiation of cigarette smoking. Due to the nature of the questionnaire, only the demographic and tobacco use characteristics of the individuals were assessed, meaning that another limitation of the study is that documentation of intra- and inter-personal factors were not included. Finally, neither the role that anti-tobacco programs or policies developed or implemented by government agencies or non-governmental organizations in curbing nicotine dependence nor the role of marketing by tobacco companies is promoting nicotine dependence could be assessed.

5. Conclusion

The high prevalence of tobacco use, including smokeless tobacco, in developing counties such as India presents a major challenge for public health authorities. This clinic-based study in a suburb of Mumbai identified two potential avenues for public health intervention, increasing the age of initiation of use of smokeless

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tobacco and reducing the frequency of use to less than daily. The use of epidemiologic measures such as predicted marginal risk differences can provide authorities with evidence-based tools to assess the effectiveness of interventions and to quantify their efficacy.

Declarations

Author contribution statement

Apoorva Salvi, Teena Sura: Conceived and designed the experiments; Performed the experiments; Contributed reagents, materials, analysis tools or data.

Ibraheem Karaye: Analyzed and interpreted the data; Contributed reagents, materials, analysis tools or data.

Jennifer A. Horney: Contributed reagents, materials, analysis tools or data; Wrote the paper.

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Competing interest statement

The authors declare no conflict of interest.

Additional information

No additional information is available for this paper.

References

Arora, M., Madhu, R., 2012. Banning smokeless tobacco in India: policy analysis. Indian J. Cancer 49, 336−341.

Asma, S., Mackay, J., Song, S.Y., Zhao, L., Morton, J., Palipudi, K.M., Bettcher, D., Bhatti, L., Caixeta, R., Chandora, R., Cavacos Dias, R., Luiza da Costa e Silva, V., Fouad, H., Hsia, J., Husain, M.J., McAfee, T., Ramanadraibe, N., Rarick, J., Sinha, D., Talley, B., Tursan d'Espaignet, T., 2015. The GATS Atlas. CDC Foundation, Atlanta, GA.

Boffetta, P., Aagnes, B., Weiderpass, E., Andersen, A., 2005. Smokeless tobacco use and risk of cancer of the pancreas and other organs. Int. J. Cancer 114 (6), 992−995.

https://doi.org/10.1016/j.heliyon.2019.e01382

Bolinder, G., Alfredsson, L., Englund, A., De Faire, U., 1994. Smokeless tobacco use and increased cardiovascular mortality among Swedish construction workers. Am. J. Public Health 84 (3), 399–404.

Boyle, R.G., Jensen, J., Hatsukami, D.K., Severson, H.H., 1995. Measuring dependence in smokeless tobacco users. Addict. Behav. 20 (4), 443–450.

Campbell, B.R., Netterville, J.L., Sinard, R.J., Mannion, K., Rohde, S.L., Langerman, A., Kim, Y.J., Lewis, J.S., Kuhs, K.A.L., 2018. Early onset oral tongue cancer in the United States: a literature review. Oral Oncol. 87, 1–7.

City and Industrial Development Corporation of Maharashtra (CIDCO), 2015. Population. Available at: http://www.cidco.maharashtra.gov.in/NM_Population.aspx. (Accessed 27 June 2017).

Croucher, R., Shanbhag, S., Dahiya, M., Kassim, S., Csikar, J., Ross, L., 2012. Smokeless tobacco cessation in South Asian communities: a multi-centre prospective cohort study. Addiction 107 (Suppl 2), 45–52.

Davies, H.T.O., Crombie, I.K., Tavakoli, M., 1998. When can odds ratios mislead? BMJ 316 (7136), 989–991.

D'Souza, G., Rekha, D.P., Sreedaran, P., Srinivasan, K., Mony, P.K., 2012. Clinico-epidemiological profile of tobacco users attending a tobacco cessation clinic in a teaching hospital in Bangalore city. Lung India 29 (2), 137–142.

Ebbert, J.O., Croghan, I.T., Severson, H.H., Schroeder, D.R., Hays, J.T., 2011. A pilot study of the efficacy of Varenicline for the treatment of smokeless tobacco users in Midwestern United States. Nicotine Tob. Res. 13 (9), 820–826.

Ebbert, J.O., Patten, C.A., Schroeder, D.R., 2006. The Fagerström test for nicotine dependence-smokeless tobacco (FTND-ST). Addict. Behav. 31 (9), 1716–1721.

Fagerström, K.O., Schneider, N.G., 1989. Measuring nicotine dependence: a review of the Fagerstrom tolerance questionnaire. J. Behav. Med. 12 (2), 159–182.

Fagerström, K., 2012. Determinants of tobacco use and renaming the FTND to the Fagerström test for cigarette dependence. Nicotine Tob. Res. 14 (1), 75-58.

Fagerström, K., Gilljam, H., Metcalfe, M., Tonstad, S., Messig, M., 2010. Stopping smokeless tobacco with varenicline: randomized double blind placebo controlled trial. BMJ 341, c6549.

Ferketich, A.K., Wee, A.G., Shultz, J., Wewers, M.E., 2007. A measure of nicotine dependence for smokeless tobacco users. Addict. Behav. 32 (9), 1970–1975.

Gupta, P.C., Ray, C.S., 2003. Smokeless tobacco and health in India and South Asia. Respirology 8 (4), 419–431.

 https://doi.org/10.1016/j.heliyon.2019.e01382

Gupta, P.C., Sreevidya, S., 2004. Smokeless tobacco use, birth weight, and gestational age: population based, prospective cohort study of 1217 women in Mumbai, India. BMJ 328 (7455), 1538.

Gupta, P.C., Subramoney, S., 2006. Smokeless tobacco use and risk of stillbirth: a cohort study in Mumbai, India. Epidemiology 47–51.

Heatherton, F., Kozlowski, L.T., Frecker, R.C., Fagerström, K.O., 1991. The Fagerström test for nicotine dependence: a revision of the Fagerström Tolerance Questionnaire. Br. J. Addict. 86 (9), 1119–1127.

International Institute for Population Sciences, Ministry of Health and Family Welfare, Government of India, 2010. Global Adult Tobacco Survey India (GATS India), 2009-10. New Delhi Ministry of Health and Family Welfare; Mumbai: International Institute for Population Sciences.

Kakde, S., Bhopal, R.S., Jones, C.M., 2012. A systematic review on the social context of smokeless tobacco use in the South Asian population: implications for public health. Public Health 126 (8), 635–645.

Khan, A., Huque, R., Shah, S.K., Kaur, J., Baral, S., Gupta, P.C., 2014. Smokeless tobacco control policies in South Asia: a gap analysis and recommendations. Nicotine Tob. Res. 16, 890–894.

Kozlowski, L.T., Porter, C.Q., Orleans, C.T., Pope, M.A., Heatherton, T., 1994. Predicting smoking cessation with self-reported measures of nicotine dependence: FTQ, FTND, and HSI. Drug Alcohol Depend. 34 (3), 211–216.

Manimunda, S.P., Benegal, V., Sugunan, A.P., Jeemon, P., Balakrishna, N., Thennarusu, K., Pandian, D., Pesala, K.S., 2012. Tobacco use and nicotine dependency in a cross-sectional representative sample of 18,018 individuals in Andaman and Nicobar Islands, India. BMC Public Health 12 (515).

Mony, P.K., Rose, D.P., Sreedaran, P., D'Souza, G., Srinivasan, K., 2014. Tobacco cessation outcomes in a cohort of patients attending a chest medicine outpatient clinic in Bangalore city, southern India. Indian J. Med. Res. 139 (4), 523–530.

Mushtaq, N., Beebe, L.A., 2012. A review of the validity and reliability of smokeless tobacco dependence measures. Addict. Behav. 37 (4), 361–366.

Mutti, S., Reid, J.L., Gupta, P.C., Pednekar, M.S., Dhumal, G., Nargis, N., Hussain, A.G., Hammond, D., 2016. Perceived effectiveness of text and pictorial health warnings for smokeless tobacco packages in Navi Mumbai, India, and Dhaka, Bangladesh: findings from an experimental study. Tobac. Contr. 25 (4), 437–443.

https://doi.org/10.1016/j.heliyon.2019.e01382

Norberg, M., Lundqvist, G., Nilsson, M., Gilljam, H., Weinehall, L., 2011. Changing patterns of tobacco use in a middle-aged population—the role of snus, gender, age, and education. Glob. Health Action 4 (1), 5613.

Palipudi, K.M., Gupta, P.C., Sinha, D.N., Andes, L.J., Asma, S., McAfee, T., GATS Collaborative Group, 2012. Social determinants of health and tobacco use in thirteen low and middle income countries: evidence from Global Adult Tobacco Survey. PLoS One 7 (3), e33466.

Pinto, R.P., Abrams, D.B., Monti, P.M., Jacobus, S.I., 1987. Nicotine dependence and likelihood of quitting smoking. Addict. Behav. 12 (4), 371−374.

Raffetti, E., Donato, F., Forsell, Y., Galanti, M.R., 2018. Longitudinal association between tobacco use and the onset of depressive symptoms among Swedish adolescents: the Kupol cohort study. Eur. Child Adolesc. Psychiatry 1−10.

Sreeramareddy, C.T., Pradhan, P.M.S., Mir, I.A., Sin, S., 2014. Smoking and smokeless tobacco use in nine South and Southeast Asian countries: prevalence estimates and social determinants from Demographic and Health Surveys. Popul. Health Metrics 12 (1), 22.

World Health Organization, 2014. Smokeless Tobacco Use. Available at: Fact_Sheet_TFI_2014_EN_15318.pdf. (Accessed 29 June 2017).

 https://doi.org/10.1016/j.heliyon.2019.e01382