Article published online: 2020-12-31

Tobacco use, Body Mass Index, and Potentially Malignant Disorders among petrol fillers in Pimpri-Pune (India): A descriptive study

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Abstract

Background: Since petrol is combustible and smoking is banned at the petrol pumps, it may be predicted that use of smokeless tobacco is more prevalent among the petrol fillers. Also, smokeless tobacco is a major risk factor for developing oral potentially malignant disorders. The present study was conducted to determine the tobacco use, body mass index (BMI), and potentially malignant disorders among a cohort of petrol fillers and also to evaluate the interaction of tobacco use and BMI with the presence of potentially malignant disorders. **Settings and Design:** The study was conducted at 45 petrol stations located at Pimpri-Pune, India. A descriptive study design was used. **Materials and Method:** Four hundred and ten petrol fillers aged 17-64 years participated in the study. General information and tobacco history was obtained by interview. Height and weight were recorded to obtain BMI. Oral examination was conducted to identify the potentially malignant disorders. **Statistical Analysis:** Chi-square test, Z test, and logistic regression were used. The level of significance was fixed at 5%. **Results and Conclusions:** It was found that 242 (59.02%) used tobacco in different forms. 77.68% were tobacco chewers, and 8.26% were smokers. Leukoplakia was prevalent among 68.47%, oral submucous fibrosis among 27.45%, and 5.08% had erythroplakia. Age (χ^2 = 11.46, $P < 0.05$), duration (χ^2 = 17.46, $P < 0.05$), and frequency of tobacco chewing (χ^2 = 14.16, $P < 0.05$) were significantly associated with potentially malignant disorders. Tobacco chewing was more prevalent as compared to smoking. It can be concluded that the petrol fillers are at a high risk for developing oral potentially malignant disorders.

Key words: Body mass index, leukoplakia, oral submucous fibrosis, petrol fillers, potentially malignant disorders, smokeless tobacco

Introduction

The petrol fillers (petrol filling attendants) are continuously exposed through the skin, inhalation, eyes, and oral cavity[1] to the organic and inorganic substances present in the petrol, diesel, and additionally, to the exhaust from the vehicles coming for refueling at the petrol stations. These substances are carcinogenic and affect different systems of the body.[1,2] According to the data obtained from the petrol stations around the world, each worker pumps an average 2000 L of petroleum, containing 5% (w/v) benzene, during their 8-hour work shift.[1] Benzene is a potential mutagenic and carcinogenic agent. There are studies in literature that have monitored genotoxicity,[2-4] assessed general health,[1,5,6] and lung function test[7] of the petrol fillers, while there are no studies assessing their oral health. Leukoplakia, oral submucous fibrosis (OSMF), and erythroplakia are the most common potentially malignant disorders of the oral cavity. Epidemiological studies provide consistent evidence that tobacco chewing is a major risk factor for all the three lesions.[8,9] Body mass index (BMI) is a good overall indicator of nutritional status and predictor of overall health. Tobacco smoked or chewed is another important determinant of health. Studies have shown an influence of tobacco use on the BMI.[10-13] Since petrol is combustible and smoking is banned at the petrol pumps, it may be predicted that use of smokeless tobacco is more prevalent among the petro fillers. Hence, this present study has been undertaken to determine the tobacco use, body mass index, and potentially malignant disorders among a cohort of petrol fillers and also to evaluate the interaction of tobacco use and body mass index with the presence of potentially malignant disorders.

Materials and Methods

An initial survey was conducted to identify the areas and locate the petrol stations in Pimpri-Pune. Forty-five petrol station owners gave permission to conduct this study. In all, there were 465 petrol fillers, of which 410 were willing to participate and were recruited for the study. Participants were informed about the study and asked to sign an informed consent form. The study was approved by the Institutional Ethics Committee.

The data was collected by interview to record the general demographic information and history of tobacco use. To calculate the BMI, height and weight were recorded. Weight was measured using a bathroom scale accurate to 0.5 kg. The scale was kept on a flat surface and the participant was asked to step on it in bare feet without holding on to anything. The weight was recorded to the nearest kg. Height was measured using steel measuring tape by making the subject to stand parallel against flat wall. With the subject standing erect on the floor, the tape was pulled vertically above the head and then brought down to touch the flat ruler placed horizontally on the crown of the head. Height was recorded to the nearest cm. BMI was calculated using the formula, BMI = (Weight in Kilograms) (Height in Meters).[2] Based on the BMI score, the subjects were categorized into four groups.[14] Every subject underwent an oral examination. The oral pathologist clinically examined the oral cavity, by inspecting the buccal and labial mucosa, gingivae, gingiva-buccal sulci, tongue, palate, and floor of the mouth for the presence of potentially malignant disorders. The obtained data was entered in the MS excel sheet. SPSS version 16 was used to perform the statistical analysis. Chi-square test was used to determine if there was association between the potentially malignant disorders and the independent variables (Age, BMI, Educational status, tobacco use) and further on, if significant relation was obtained, then Z test of proportion was conducted. Logistic regression was used to estimate the odds ratio. The level of significance was fixed at 5%.

Results

Four hundred and ten petrol fillers participated in the study. Three hundred and ninety-three (95.85%) were males and 17 (4.14%) were females. Their age ranged from 17-64 years with a mean age of 31 ± 9.3 years. Of the 410 people, 242 (59.02%) used tobacco in different forms and they were all males. 77.68% were tobacco chewers, while only 8.26% were smokers. The tobacco chewers used tobacco

Access this article online
Quick Response Code:
Website: www.sajc.org
DOI: 10.4103/2278-330X.142954

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powder and/or combination, which included tobacco powder plus betel quid, gutka, mishri, pan masala, and areca nut. Very few people (4.83%) were both tobacco chewers and smokers. Overall, 127 (52.48%) used tobacco 1-5 times/day, 63 (26.03%) used 6-10 times/day, and 38 (15.7%) used 11 and more times/day. It was found that 110 (45.45%) petrol fillers used tobacco for the past 1-5 years, 56 (23.14%) used for 6-10 years, and 58 (23.97%) used for 11 and more years. Out of the 242 tobacco users, potentially malignant disorders were detected among 118 (48.76%) people. Among them, leukoplakia was prevalent among 68.47%, oral submucous fibrosis among 27.45%, and very few cases of erythroplakia (5.08%) were identified. In addition to these potentially malignant disorders, few cases of tobacco pouch keratitis (n = 4) and nicotina palatine (n = 9) were also identified. The average BMI of people with and without potentially malignant disorders was 22.16 and 22.79, respectively. Table 1 shows the comparison and distribution of potentially malignant disorders in relation to the descriptive variables, type, duration, and frequency of tobacco use. The descriptive variables considered were age, educational status, and BMI. Age was significantly associated with the presence of potentially malignant disorder (χ^2 = 11.46, $P < 0.05$). The potentially malignant disorders were more likely to be detected in the 35-44 years group (z = 1.95, P = 0.02), and people without potentially malignant disorders were significantly more from <25 years old group (z = 2.58, P = 0.004). Educational status (χ^2 = 0.7072, $P > 0.05$) and BMI (χ^2 = 2.33, $P > 0.05$) did not show any significant association with potentially malignant disorders. The BMI of majority of the petrol fillers ranged from 20-25. Overall, the type of tobacco used did not show statistically significant association with the premalignant lesions (χ^2 = 0.5830, $P > 0.05$). Also, the comparison between the two types of smokeless tobacco did not show significant association (χ^2 = 0.2782, $P > 0.05$).

Particularly, it was the duration of use of smokeless tobacco (χ^2 = 17.46, $P < 0.05$) and tobacco combination (χ^2 = 7.28, $P < 0.05$), which showed significant relation with the presence of potentially malignant disorders. The prevalence of potentially malignant disorder was significantly lesser among those who used tobacco for 1-5 years (z = 3.24, P = 0.0006) and highest among those who used for 11 and more years (z = 2.66, P = 0.003). However, for tobacco combination, it was the duration of 11 years and above, which was significantly associated with the presence of potentially malignant disorder (z = 1.97, P = 0.02). The frequency of smoking was not associated with the presence of potentially malignant disorder (χ^2 = 0.8322, $P > 0.05$). Smokeless tobacco (χ^2 = 14.16, $P < 0.05$) and tobacco combination (χ^2 = 12.20, $P < 0.05$) showed statistically significant association. Majority of the people with no disorder belonged to group who reported a chewing frequency of 1-5 times per day for tobacco (z = 2.68, P = 0.003) and tobacco combination (z = 1.88, P = 0.02). Among those chewing 6-10 times/day tobacco (z = 2.86, P = 0.002) and tobacco combination (z = 2.53, P = 0.005) and chewing 11 or more times tobacco (z = 2.71, P = 0.0032) and tobacco combination (z = 1.86, P = 0.04), the prevalence of potentially malignant disorders were significantly greater.

Table 1: Comparison and distribution of potentially malignant disorders in relation to the descriptive variables, type, duration, and frequency of tobacco use

	Potentially malignant disorders		Odds ratio (95% confidence interval)
	Present	Absent	
Descriptive variables			
Age[#]			
• <25 years*	20	40	1.0
• 25-34 years	43	48	1.87(0.88,3.88)
• 35-44 years*	37	22	4.75(2.07,10.91)**
• 45-54years	18	13	3.22(1.21,8.53)
Educational status			
• ≤matriculation	83	88	
• Pre-university	24	27	---
• University degree	11	08	
Body mass index:			
• <20	33	36	
• 20-25	60	52	---
• 25.1-30	20	27	
• >30	05	08	
Type of tobacco use			
• Smoking	18	22	
• Smokeless	100	101	---
Smokeless			
• Tobacco	38	46	---
• Tobacco combination	62	55	
Duration			
Smoking			
• 1-10 years	11	14	
• 11-20 years	05	04	---
• >20 years	02	04	
Smokeless tobacco[#]			
• 1-5 years*	12	34	1.0
• 6-10 years	12	09	2.52(0.68,9.30)
• ≥11 years*	14	03	8.52(1.74,41.68)**
Tobacco combination[#]			
• 1-5 years	20	31	1.0
• 6-10 years	21	14	1.38(0.51,3.73)
• ≥11 years*	21	10	1.98 (1.60,6.45)**
Frequency (times/day)			
Smoking			
• 1-10	16	20	---
• ≥11	02	02	
Smokeless tobacco[#]			
• 1-5*	20	41	1.0
• 6-10*	12	4	5.39(2.77,10.47)**
• ≥11*	06	1	5.91(2.34,14.92)**
Tobacco combination[#]			
• 1-5	24	39	1.0
• 6-10	25	10	5.26(1.97,14.03)**
• ≥11*	13	06	4.06(1.17,14.01)**

[#]statistically significant with chi-square test. *statistically significant using z test of significance. **$P < 0.05$

The variable which showed statistically significant relation with Chi-square test was used for logistic regression. For age, a highest OR of 4.75 (2.07-10.91) was recorded among the 35-44 years group. Use of tobacco OR = 8.52 (1.74-41.68) and tobacco combination OR = 1.98 (1.6-6.45) for 11 and more years showed significant relation. Also, the frequency of tobacco and tobacco combination for 6-10 times and 11 and

more times per day showed statistically significant relation with potentially malignant disorders.

Discussion

Literature search does not reveal any study on petrol fillers evaluating their tobacco use, BMI, and potentially malignant disorders. Hence, comparison has been done with studies conducted among general population and other working cohorts. In India, majority of the petrol fillers are males. In the present study, there was participation by a small percentage of female petrol fillers. However, none had the habit of tobacco and hence were excluded during analysis. The level of education was low (< or = matriculation) among majority of the petrol fillers (70.95%). To be employed as petrol filler, one doesn't require a professional degree. Hence, there is every possibility to find less literate petrol fillers. However, low education has been strongly associated with smoking and premalignant lesions.[15,16]

In the present study, the prevalence of potentially malignant disorders and tobacco chewing was high as compared to the prevalence in the general population. A study[17] among different cohorts in India reported a tobacco chewing rate of 27.1% among Ahmedabad textile workers, 47% policemen, 52% media personnel, and 20.6% university staff. With regards to potentially malignant disorders, various studies have reported 29.8% potentially malignant lesions,[18] 46.1%/1000 and 16.4/1000 for leukoplakia and OSMF,[19] respectively, and 9.27% OSMF and 40% leukoplakia in people with abnormal mucosal lesions.[20] As predicted, smoking was less prevalent among the petrol fillers as compared to the use of smokeless tobacco. The workers who smoked revealed that they went outside the petrol station premises for smoking. There were no restrictions for chewing tobacco and hence they leisurely chewed throughout the day at work. The type of smokeless tobacco used, BMI, and educational status could not explain the association between presence and absence of potentially malignant disorder. However, studies[21,22] among Indian population have shown that BMI might be inversely associated with the risk of oral leukoplakia and oral submucous fibrosis.

The duration and frequency of chewing tobacco showed a significant association with the presence of the lesions indicating that as the duration increases beyond 11 and more years and frequency of 11 and more times per day, the prevalence of potentially malignant disorders also increased. Besides the fact, that petrol fillers who used tobacco for a lesser duration and frequency also showed potentially malignant disorders. This may be attributed to the other factors like diet, alcohol, duration of exposure to the tobacco products in the mouth, and the genetic makeup of the individual, which influence the occurrence of this disorder. The history of the duration and frequency of tobacco use was solely based on the information provided by the petrol filler. All self-reported data are susceptible to bias[9] towards socially desirable behavior. Nevertheless, using a questionnaire or interview is the only method to obtain this kind of data.

Previous reports have indicated that smoking is a risk factor for potentially malignant disorders,[23] while this association was not found in the present study. Chewing tobacco has more effect on the oral cavity as compared to tobacco smoking, which involves inhalation of smoke and is more likely to affect the throat and lungs. The micronucleus (MN) assay which is a marker for cytogenotoxic damage showed that the value of micronuclei was more among the petrol fillers than the normal people.[2] There is a clear relationship between the increase in micronuclei frequency and exposure to benzene and benzene metabolites.[24] Increased frequencies of nuclear abnormalities in buccal cells of smokeless tobacco users have been confirmed by an earlier study.[25] Hence, this study provides direction for future research to assess the association that if continuous exposure to benzene and benzene products at the petrol stations synergistically along with tobacco chewing increases the risk of potentially malignant disorders among the petrol fillers as compared to the general population.

Within the limits of the present study, it can be concluded that the petrol fillers are a high-risk cohort for potentially malignant disorders. It becomes important that the dental professionals should now take up the role to educate the petrol fillers about the harmful effects of tobacco, motivate them to quit the tobacco chewing habit, and provide information about the treatment modalities for those with potentially malignant disorders.

Acknowledgement

This study was funded by Indian Council of Medical Research (ICMR) under Short Term Studentship (STS) project - 2011. The authors wish to thank Medilinkers Research Consultancy for assistance in statistical analysis and editing the manuscript.

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How to cite this article: Reddy MG, Kakodkar PV, Singh A. Tobacco use, Body Mass Index, and Potentially Malignant Disorders Among petrol fillers in Pimpri-Pune (India): A descriptive study. South Asian J Cancer 2014;3: 196-9.
Source of Support: Nil. **Conflict of Interest:** None declared.