ASSOCIATION BETWEEN CIGARETTE SMOKING AND SOCIO-DEMOGRAPHICS, LIFESTYLE AND MENTAL HEALTH FACTORS IN A SAMPLED IRANIAN POPULATION

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Abstract. The objective of this study was to evaluate associations between cigarette smoking and socio-economic variable in an Iranian male population. Isfahan Healthy Heart Program (IHHP) is a community oriented health study from which we obtained our data regarding male subjects. Socio-demographic variables–sex, age, marital status, educational level, occupation, and income–and physical activity level were derived from the questionnaire. Nutritional status was asked by the Food Frequency Questionnaire and the general dietry index (GDI) was calculated. A general health questionnaire (GHQ) comprised of 12 items was used to assess mental health. Smoking status was investigated by a self reported questionnaire as a dependent variable. A logistic regression model was used for statistical analysis. Current smokers comprised 26.2% of respondents while 8.5% were ex-smokers. High income (OR 2.04; 95%CI 1.13-3.67), GDI (OR 1.83; 95%CI 1.44-2.32) and high stress (GHQ≥4 OR 1.71; 95%CI 1.48-2) were associated with smoking. Older age (OR 0.991; 95%CI 0.985-0.998), university education level (OR 0.53; 95%CI 0.37-0.77), unemployment (OR 0.8; 95%CI 0.64-0.99) and obesity (BMI≥25 kg/m^2 OR 0.63; 95%CI 0.55-0.73) were associated with non-smoking status. Our findings confirm an association between socio-demographics, lifestyle and mental health variables with smoking in the Iranian population, consistent with other studies worldwide. These factors should be considered when developing smoking cessation strategies.

Keywords: cigarette smoking, socio-demographic, lifestyle, mental status, Iran

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INTRODUCTION

The World Health Organization (WHO) has reported smoking as a major public health problem (WHO, 1997, 2008). Smoking is a behavior which causes chronic diseases, such as ischemic heart disease, cerebrovascular disease, pulmonary

obstructive disease and cancers (WHO, 2008). One-third to one-half of tobacco users die from the effects of smoking. Smoking causes 1 out of 10 deaths among adults worldwide (Peto *et al*, 1996; Mathers and Loncar, 2006).

Many socio-economic factors, such as education, occupation and monthly income, have been associated with smoking (Jarvis and Wardle, 1999; Siahpush and Borland, 2001; Barbeau *et al*, 2004; Laaksonen *et al*, 2005). The rate of smoking is higher in subjects with a lower education level (Cavelaars *et al*, 2000; Giskes *et al*, 2005). Manual laborers, blue-collar workers and people with high stress jobs are more frequently exposed to cigarette smoke than other employees or managers (CDC, 2000; Howard, 2004). The first phase of the Isfahan Healthy Heart Program showed the socio-demographic factors associated with current smoking in men (Bahonar *et al*, 2008).

Some life style factors, such as physical activity, nutritional status and obesity, have been associated with smoking behavior (Schlettwein-Gsell *et al*, 1991; Wada and Fukui, 1994; Smith *et al*, 2009; Stea *et al*, 2009).

Previous studies showed an increasing rate of smoking globally during the past two decades, from 11.1% in 1994 (Boshtam *et al*, 2000) to 18% in 2007 (Alikhani *et al*, 2009). Smoking habits differ in Iran; smoking among women is socially not acceptable. The smoking rate among women is much lower than men but because of social stigma, self-reporting of smoking among women may not be reliable (Sarrafzadegan *et al*, 2004). Solving of health problems requires adequate, accurate data. We explored the association between socio-demographic and life style variables and smoking among Iranian men. We selected men because of the low frequency of smoking among women and the unreliability of their responses about smoking status.

MATERIAL AND METHODS

Study setting

Our study was part of the Isfahan Healthy Heart Program (IHHP) carried out by the Isfahan Cardiovascular Research Center (ICRC- a WHO collaborating center studying non-communicable diseases), in three cities in Iran: Isfahan, Najafabad and Arak. It was an interventional community based study comprised of three phases. The first phase sought basic information about the community and was carried out in 2001. It obtained socio-demographic data regarding health behavior, such as nutritional habits, physical activity and smoking behavior. Laboratory data were also collected from the community. In the second phase, from 2002 to 2007, special interventions were carried out and surveys assessed behavior every year for 4 years. The third and final phase repeated the basic phase during 2007-2008. Multistage random sampling was used. Samples were recruited from a household survey. The IHHP has been discussed in detail previously (Sarraf-Zadegan *et al*, 2003). It was approved by the research and ethics committee of Isfahan University of Medical Sciences. We used the data from the final stage in the current study.

Variable definition

Standard questionnaires were used to obtain socio-demographic and health related behavior information. Marital status was divided into two categories: single and married. Education level was divided into four categories: illiterate, primary education, under graduate

(high school level) and graduate (university education level). Income was categorized based on the poverty boundary in Iran of 3,000,000 Rials per month. Under 3,000,000 was very low, 3,000,000 to 4,500,000 was low, 4,500,000 to 6,000,000 was middle, 6,000,000 to 8,000,000 was high and greater than 8,000,000 was very high. One American dollar equals 10,000 Iranian Rials.

Occupation was classified using a 22 category questionnaire. There are no definite categories for occupation in Iran; thus, we used four categories: 1) managerial and professional, 2) employee and non-manual workers, 3) manual laborers, and 4) unemployed and retired persons. This categorization was based on occupational designation.

The lifestyle variables measured were nutritional status, smoking, physical activity, body mass index and mental health. Nutritional status was determined using the Global Dietary Index (GDI), evaluated by the average of the mean of twenty-nine questions in seven categories on a food frequency questionnaire (FFQ). It represented behavior and dietary quality. A lower GDI indicates better behavior (Huot *et al*, 2004; Mohammadifard *et al*, 2009).

Smoking status: Current cigarette smokers were persons who were smoking tobacco at the time of the survey, ex-smokers were defined as persons who had smoked prior to the survey but had stopped and never smokers was defined as a person who had never smoked (Hu *et al*, 2007). This information were obtained from an interview and questionnaire. Physical activity was measured by questionnaire and presented as metabolic equivalents (METs). We used total physical activity, frequency and duration of activities per week. Body mass index

(BMI) as weight (kg) divided by height (m) squared. Mental health status was measured with a General Health Questionnaire (GHQ) of 12 items standardized for the Iranian population (Montazeri *et al*, 2003). This questionnaire assessed stress levels. The cut-off point for high stress was a GHQ≥4.

Statistical analysis

Smoking status was considered as a dependent variable. Socio-demographic factors, life style items and mental health were considered as independent variables. The association between smoking status and the aforementioned variables was assessed by univariate analysis with the chi-square and Kruskal-Wallis tests for categorical and ordinal variables and ANOVA for numerical variables. Odds ratios (OR) with 95% confidence intervals (95% CI) for current smoking and ex-smoking *versus* never smoking were presented for each variable by logistic regression. The Hosmer-Lemeshow test was used to assess goodness-of-fit of the model. The statistical software package SPSS 15 (SPSS, Chicago, IL) was used for data processing and analysis. The significance level was set at $p<0.05$.

RESULTS

A total of 4,786 males were included in the study, their characteristics are found in Table 1. The smoking prevalence was 26.2%, 8.5% of respondents had smoked previously.

In current and ex-smokers mean ages of starting smoking were 18.8±6.5 and 19±7 years, respectively, and the mean durations of smoking were 18.6±12.6 and 14±12 years, respectively. The median daily cigarette consumption in current smokers was 10 cigarettes/day.

Table 1
Socio-demographic and life style habits
in study sample.

Variable	
Age (mean±SD) (years)	38.4 ± 15.8
Education level (*n*=4,777)	
Illiterate	551 (11.5%)
Primary	2,157 (45.2%)
High school	1,274 (26.7%)
University	795 (16.6%)
Marital status (*n*=4,784)	
Single	1,179 (24.7%)
Married	3,605 (75.4%)
Income (*n*=4,774)	
Very low	609 (12.8%)
Low	2,663 (55.8%)
Medium	1,073 (22.5%)
High	348 (73%)
Very high	81 (1.7%)
Occupation (*n*=4,742)	
Manual laborer	2,065 (43.6%)
Worker-employee	1,277 (26.9%)
Managerial	208 (4.4%)
Unemployed	1,191 (25.1%)
BMI (kg/m^2) (*n*=4,666)	
>25 kg/m^2	2,554 (54.7%)
≤25 kg/m^2	2,112 (45.3%)
Mental status (*n*=4,777)	
<4 low stress	3,402 (71.2%)
≥4 high stress	1,375 (28.8%)
GDI (mean±SD)	0.83 ± 0.31
TPhA (mean±SD) (METs)	662.9 ± 460.2

BMI, Body mass index; GDI, Global dietary index; TPhA, Total physical activity

Table 2 shows the relationship between smoking status and socio-demographic factors, lifestyle habits and mental health. There were some significant differences between current, ex- and never smokers: current smokers began smoking at a lower mean age, lower education level and had a high rate of manual laborers. A trend towards better mental health was found in smokers. Nutritional behavior was worse in current smokers but this was not significant. The BMI was better in current smokers than in the two other groups.

The association between current smokers and never smokers with socio-demographic and life style variables is shown in Table 3. Older age, university education level, non-manual occupation and obesity (BMI≥25 kg/m^2) were associated with non-smoking status and enhancement in GDI, marriage and high stress status (GHQ≥4) were associated with smoking on univariate analysis. The multivariate model confirmed the results of univariate analysis. In this model high income was a risk factor for smoking after adjusting for other variables.

Table 4 shows the variables associated with current smokers and ex-smokers. Univariate analysis and multivariate analysis results were similar between current and ex-smokers. The OR (95% CI) of current smokers on multivariate analysis was as follows: older age 0.98 (0.97-0.99), higher GDI 1.7 (1.12-1.91), BMI≥25 kg/m^2 0.63 (0.49-0.81) and high stress 1.47 (1.13-1.91).

DISCUSSION

Tobacco consumption has a fluctuating epidemiology worldwide. A four-stage model can be used for men and women regarding cigarette smoking. During the first stage, a rapid increase in smoking prevalence among men. During the second stage a gradual increase in smoking is seen among women. During the third stage a marked decrease in smoking prevalence is seen among men, a plateau is seen among women so that a convergence of smoking frequency is seen among men and women. During the fourth stage a continuing decrease in smoking prevalence is seen in men and to

Table 2
Smoking status of men by socio-demographics, life style and mental health.

Variable	Current	Ex-	Never	*p*-value
Age (mean±SD) (years)	37.2 ± 13.6	41.6 ± 15.9	38.5 ± 15.8	$p<0.0001$[a]
Education level (*n*=4,760)				$p<0.0001$[b]
Illiterate	127 (10.2%)	56 (13.8%)	368 (11.8%)	
Primary	676 (54.3%)	207 (51.1%)	1,268 (40.8%)	
High school	311 (25%)	91 (25.5%)	864 (27.8%)	
University	132 (10.5%)	51 (12.6%)	610 (19.6%)	
Marital status (*n*=3,883)				$p<0.0001$[b]
Single	99 (79.6)	337 (83)	2,264 (73.7)	
Married	255 (20.4)	69 (17)	849 (23.7)	
Income (*n*=4,757)				N.S[c]
Very low	165 (13.3)	47 (11.6)	393 (12.6)	
Low	695 (55.9)	225 (55.4)	1,735 (55.8)	
Medium	271 (21.8)	94 (23.2)	704 (22.7)	
High	91 (7.3)	33 (8.1)	223 (7.2)	
Very high	22 (1.8)	7 (1.7)	52 (1.7)	
Occupation(*n*=4,722)				$p<0.0001$[b]
Manual laborer	627 (50.9)	169 (42)	1,264 (40.9)	
Worker-employee	320 (26)	125 (31.2)	825 (26.7)	
Managerial	42 (3.4)	13 (3.2)	151 (4.9)	
Unemployed	244 (19.7)	95 (23.6)	847 (27.4)	
BMI (kg/m^2) (*n*=3,349)				$p<0.0001$[b]
>25 kg/m^2	768 (62.9)	190 (48.2)	1,590 (52.4)	
≤25 kg/m^2	453 (37.1)	204 (51.8)	144 (47.6)	
Mental status (*n*=4,760)				$p<0.0001$[b]
<4 low stress	790 (63.5)	297 (73.1)	2,303 (74)	
≥4high stress	454 (36.5)	109 (26.9)	807 (26)	
GDI (mean±SD)	0.89 ± 0.3	0.81 ± 0.32	0.81 ± 0.31	N.S[a]
TPhA (mean±SD)(METs)	670.89 ± 458	687.4 ± 475	657.5 ± 458.9	N.S[a]

BMI, Body mass index; GDI, Global dietary index; TPhA, Total physical activity; N.S, Not significant

[a]ANOVA test, [b]chi-square test, [c]Kruskal-Wallis test

a less extent in women (Lopez *et al*, 1994; Thun and da Costa e Silva, 2003).

In developing countries, health promotions and smoking cessation programs have resulted in many countries entering the fourth stage of the cigarette epidemic model (Thun and da Costa e Silva, 2003). Data from Iran show it is in the second stage (Sarraf-Zadegan *et al*, 1999; Alikhani *et al*, 2009).

Vartiainen *et al* (2002) reported smoking prevalence assessed by questionnaire is underestimated when compared to serum cotinine measurement. This finding was supported by our previous study. In our previous study, the rate of smoking

Table 3
Odds ratios of current smoker *versus* never smoked for socio-demographics, life style and mental health[a].

Variable	Univariate OR (95% CI)	Multivariate OR (95% CI)
Age (mean±SD)	0.995 (0.991-0.999)	0.991 (0.985-0.998)
Education level		
Illiterate	1	1
Primary	1.54 (1.23-1.93)	1.2 (0.92-1.59)
High school	1.04 (0.82-1.33)	0.82 (0.6-1.13)
University	0.63 (0.48-0.83)	0.53 (0.37-0.77)
Marital status		
Married	1	1
Single	1.46 (1.24 - 1.71)	0.8 (0.59- 1.07)
Income		
Very low	1	1
Low	0.95 (0.78-1.17)	1.01 (0.81-1.26)
Medium	0.92 (0.73-1.15)	1.27 (0.98-1.65)
High	0.97 (0.71-1.32)	1.7 (1.2-2.4)
Very high	1 (0.59-1.71)	2.04 (1.13-3.67)
Occupation		
Manual laborer	1	1
Worker employee	0.78 (0.67-0.92)	0.96 (0.8-1.15)
Managerial	0.56 (0.4-0.8)	0.87 (0.59-1.13)
Unemployed	0.58 (0.49-0.69)	0.8 (0.64-0.99)
BMI		
>25 kg/m^2	1	1
≤25 kg/m^2	0.65 (0.57 -0.75)	0.63 (0.55-0.73)
Mental Status		
<4 low stress	1	1
≥4 high stress	1.64 (1.42-1.89)	1.71 (1.48-2)
GDI (mean±SD)	2.24 (1.8-2.78)	1.83 (1.44-2.32)
TPhA (mean±SD) (METs)	1 (0.99-1.001)	1 (0.99-1.001)

BMI, Body mass index; GDI, Global dietary index; TPhA, Total physical activity
[a]All variables entered into the model together (enter approach).

in men measured by questionnaire was 18.7% *versus* 21.2% with the serum cotinine test. In contrast, the difference in smoking rate obtained by the cotinine test *versus* the questionnaire was approximately 5-fold greater in women than in men (6.7% *vs* 1.3%, respectively) (Sarraf-Zadegan *et al*, 2004). The prevalence of smoking in women during the last phase of IHHP was 0.8%.

In the current study, we evaluated the association between socio-demographic factors and life style behaviors with smoking habits. There was a strong association between education level and smoking. The highest smoking prevalence was seen in the lowest educated. Many studies have demonstrated this association (Huisman *et al*, 2005; Smith *et al*, 2009; Tramacere *et al*, 2009). In some studies, educational level is

Table 4

Odds ratio of current smoker *versus* ex-smoker for socio-demographic and life style behavior and mental health[a].

Variable	Univariate OR (95% CI)	Multivariate OR (95% CI)
Age (mean±SD)	0.98 (0.972-0.987)	0.98 (0.97- 0.99)
Education level		
Illiterate	1	1
Primary	1.44 (1.01-2.04)	1.12 (0.73-1.7)
High school	1.51 (1.02-2.2)	1.18 (0.71-1.95)
University	1.14 (0.73-1.8)	0.97 (0.53-1.76)
Marital status		
Single	1	1
Married	0.8 (0.59-1.07)	1.25 (0.87-1.81)
Income		
Very low	1	1
Low	0.88 (0.62-1.26)	0.88 (0.6-1.3)
Medium	0.82 (0.55-1.22)	0.84 (0.53-1.32)
High	0.78 (0.47-1.31)	0.87 (0.49-1.56)
Very high	0.89 (0.36-2.22)	0.94 (0.35-2.5)
Occupation		
Manual laborer	1	1
Worker employee	0.69 (0.53- 0.9)	0.8 (0.59-1.7)
Managerial	0.87 (0.46-1.66)	1.2 (0.58-2.44)
Unemployed	0.69 (0.52-0.93)	0.83 (0.57-1.2)
BMI		
>25 kg/m^2	1	1
≤25 kg/m^2	0.55 (0.44-0.69)	0.63 (0.49-0.81)
Mental status		
<4 low stress	1	1
≥4 high stress	1.57 (1.22-2)	1.47 (1.13-1.91)
GDI (mean±SD)	2.3 (1.6-3.3)	1.7 (1.12- 1.91)
TPhA (mean±SD) (METs)	1 (0.99- 1.001)	1 (0.99-1.001)

BMI, Body mass index; GDI, Global dietary index; TPhA, Total physical activity
[a]All variables entered into the model together (enter approach).

strongly associated with socio-economic status, which explains the association between smoking and socio-economic status (Miech and Hauser, 2001; Huisman *et al*, 2005; Smith *et al*, 2009).

We found manual laborers are more likely to smoke cigarette than employees and managers. Being unemployed or retired was associated with non-smoking.

Managerial and professional jobs are associated with higher educational levels partially explaining the association between smoking and occupation in Iran. Occupation is an important component of socio-economic status and it influences many health outcomes (Hellerstedt and Jeffery, 1997). Some studies have supported this relationship between smoking

and occupation in different countries (Johansson *et al*, 1991; Nelson *et al*, 1994; McCurdy *et al*, 2003; Albertsen *et al*, 2006; Hu *et al*, 2007; Smith and Leggat, 2007; Smith, 2008).

A higher monthly income had a negative association with cigarette smoking in our study. The findings of the first phase of the study are similar to the third phase (Bahonar *et al,* 2008). Other studies have also found a lower monthly income is associated with a higher smoking prevalence (Maziak *et al*, 2001; Fukuda *et al*, 2005; Virtanen *et al*, 2007). These results show the association between education, occupation and income in Iran.

We found an association between BMI (kg/m^2), nutritional status, and mental health with smoking, but did not see an association between physical activity and smoking.

Nearly 60% of studies have seen an inverse relationship between physical activity and smoking; however, such conclusions should be made with caution since they depend on demographic and other socio-economic factors (Kaczynski *et al,* 2008). On logistic regression we found no association between physical activity and smoking in our study.

The smokers were thinner and had a lower BMI than non-smokers and ex-smokers. This was also seen in other studies (Kroke *et al,* 2002; Jitnarin *et al,* 2008). Although cigarette smoking causes smokers to lose weight, smoking increases mortality even adjusting for BMI (Bigaard *et al,* 2003). The nutritional status of smokers is poorer than non- and ex-smokers. Nutritional status depends on many socio-economical, demographic and cultural factors. Poor nutritional state is more frequently seen in smokers (Diana, 1993; Hu *et al,* 2007; Mohammadifard *et al,* 2009).

Smoking is associated with mental health and stress. Smokers use more negative coping strategies and have more psychiatric symptoms than the general population (Jorm *et al,* 1999; Brisson *et al,* 2000; Daniel *et al,* 2004; Jofre-Bonet *et al,* 2005; Van *et al,* 2007; Marinho *et al,* 2008; Bridger *et al,* 2009; Chapman, 2009). We also found this association when controlling for socio-economic status.

Our study had some limitations. Length of smoking cessation in ex-smokers was not included in our questionnaire. The relationship between smoking intensity and study variables was not investigated in our study. A comparison between ex-smokers and other groups should be interpreted cautiously.

The results of this study may be used to assist in developing smoking cessation policies and programs in Iran.

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