Original Article

The Gap of Cigarette and Hookah Smoking Between Socioeconomic Groups in Iran: Effect of Inequalities on Socioeconomic Position

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Abstract

Background: Hookah and cigarette smoking have adverse effects on individuals' health and therefore place a great burden on public health. The aim of this study was to measure inequalities in socioeconomic position to determine contributing factors on cigarette and hookah smoking in Iran.

Methods: In this study, secondary analysis of the Iran's sixth national Surveillance of Risk Factors of Non-Communicable Diseases (SuRFNCD-2011) was conducted for 10,572 individuals aged 15 to 70 years old. Subjects were categorized into three groups according to their socioeconomic status (low, middle and high) in order to assess their inequalities using principal component analysis. At the end, the gap between the low and high socioeconomic groups was decomposed using Blinder-Oaxaca decomposition technique.

Results: The prevalence of cigarette and hookah smoking in high, middle, and low socioeconomic groups was 11.8%, 13.2%, and 13.1% ($P = 0.158$), and 2.6%, 3.3% and 4.3%, ($P < 0.001$), respectively. Blinder-Oaxaca decomposition technique showed a lower prevalence of hookah smoking in high socioeconomic group compared to low socioeconomic group ($P < 0.001$). The gap between the two mentioned groups was measured to be 1.7%. However, this gap for cigarette smoking (1.5%) was not significant ($P = 0.093$).

Conclusion: The finding indicates the importance of socioeconomic status in hookah smoking. After decomposition of the gap between the 2 socioeconomic groups, age, gender and education level were reported to be the major contributors to the differences observed between the 2 groups.

Keywords: Adult, Cigarette, Hookah, Smoking, Socioeconomic status

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Introduction

Cigarette smoking has been one of the greatest interests in public health as it is well known for causing morbidity and mortality worldwide.[1-6] There is a changing trend of smoking in men and women. In many countries, the prevalence of smoking women is increasing, while men show a decreasing trend.[7] According to the World Health Organization (WHO) reports, approximately 5.4 million people die annually because of cigarette smoking. Also, this number has increased for additional 600 000 because of those who are passive smokers. Approximately, 80% of cigarette smokers live in low and middle income countries.[8]

Moreover, hookah smoking has also become a world-wide health concern. Studies have shown that hookah smoking is also a threat to an individual's health similar to cigarette smoking in other countries like the United States.[9-11] Hookah smoking has become a global problem and its growing consumption causes concerns about its consequences on communities. Hookah smoking is more common at younger ages in the Middle East, and researches have shown that hookah smoking is the most common type of smoking among young people which is gradually affecting the rest of the world.[12]

Studies have shown that socioeconomic position (SEP) is inversely related to the prevalence of smoking.[1,13,14] On the other hand, smoking is also known as a factor in increasing socioeconomic health inequalities.[2] These

increasing socioeconomic health inequalities are of substantial importance for health authorities, because these inequalities are essential in making policies.[15] It is logical that SEP has been investigated, as it is an influential factor on smoking rates in Great Britain, northern and southern European countries, the United States and Australia.[2] In addition, similar studies have been conducted in Asian countries like South Korea and Japan, as these countries have similar smoking problems and are the leading countries in smoking worldwide.[1,2]

However, studies regarding the effects of SEP on cigarette and hookah smoking rates in other Asian countries including Iran have generally been scarce. Therefore, the aim of this study was to measure inequalities in SEP to determine contributing factors on cigarette and hookah smoking in Iran, by using the Blinder-Oaxaca decomposition technique.

Materials and Methods

Study Design and Setting

The present cross-sectional study used the data gathered in Iran's sixth national Surveillance of Risk Factors of Non-Communicable Diseases (SuRFNCD) in 2011.[16-19] In this survey, the cluster sampling was conducted under the direction of Iran's Center for Disease Control (CDC). The final stage was carried out by trained interviewers, and supervised by 43 medical universities across the country. All procedures described here were conducted in accordance with the guidelines and standards laid down in the current revision of the Declaration of Helsinki. The CDC Board of Ethics also approved the study protocol. At the beginning of each interview, a consent form was read by the interviewer and acceptance or refusal to participate was formally recorded.

Participants

A randomized multistage cluster sampling scheme was designed in order to select a representative sample of non-hospitalized and non-institutionalized Iranian individuals between the ages of 6 to 70 years. The sampling was done using a four-stage sampling scheme between May to June 2011. At the first stage of sampling, individual counties or a group of neighboring counties were designated as primary sampling units (PSUs). Fifty PSUs were then selected by employing the probability proportionate to size (PPS) random sampling method. In each PSU, 12 areas were selected as secondary sampling units (SSUs), in a manner similar to the previous step. In the third stage, 20 postal addresses (10-digit postal codes) within each SSU, from a framework provided by the Iran's postal service, were randomly selected. Each address was contacted and the inhabitants were registered.

A total number of 11 867 individuals aged 6 to 70 years

were surveyed in SuRFNCD 2011. It is worth mentioning that according to 2011 survey protocol, people who lived in settlements and nomadic tribes were not included in survey sampling (On the basis of 2011 national census, the nomads comprised only 0.07% of the population). In addition, if an individual was not available or refused to participate (after three attempts), the label 'non-response' was applied. Finally, a total of 10 572 individuals between the ages of 15 to 70 years with valid responses to the demographic items [age, gender, education level (illiterate, primary school, secondary school, high school, associate degree, university graduate and postgraduate), ethnicity (Persian or others), occupation (employed or unemployed), area of the home (grouped as: less than 50, 51-75, 76-100, 101-150, 151-200 and more than 200 m²), and number of family members], tobacco consumption (cigarette or hookah smoking) and socioeconomic status were included.

Socioeconomic Status Scores and Groups

Initially, the socioeconomic status scores were available for the studied individuals as were computed by Asgari et al.[20] For the purpose of our study, we divided their scores into tertiles to categorize socioeconomic status into three groups: low, moderate, and high. In summary, Asgari et al.[20] carried out a principal component analysis (PCA) on demographic data and home assets as described by O'Donnell et al,[21] and employed the first principal component to compute socioeconomic status scores. In order to assess inequalities, we compared the high (n = 3511) and the low (n = 3504) socioeconomic groups.

Statistical Analysis

Analysis was performed using R statistical software version 3.3.1.[22] In this software, "Oaxaca" package was used for decomposition.[23] We assessed the role of age, gender, education level, ethnicity, job status, home area and number of households of the studied people on observed differences between the 2 groups of low and high socioeconomic status. The outcome measures were cigarette smoking and hookah use. Cigarette smokers are those who report smoking every day. Daily hookah users are defined as those who smoke hookah once or more per day. For the Blinder-Oaxaca model and entering the most influential variables and blocking the variables with confounding effects, first, a multiple logistic regression model (entering all mentioned variables into the model) and backward stepwise approach were implemented. Then, confounder variables were excluded from the model. The final model was fitted based on results of the likelihood ratio test.

More details about Blinder-Oaxaca model have given in previous studies.[15,21] The initial idea of decomposition

to describe the discrepancies in the outcome distribution with respect to socioeconomic levels was proposed by Blinder and Oaxaca.[24,25] They assumed the gap between blacks' income and whites' income arises from 2 distinct components: a) the interracial inequalities in education, work experience, and other factors influencing wage, which is also called endowment or explained component, and b) factors attributed to discrimination. The latter is the unexplained component implying the gap that exists even in the absence of discrepancies in education, and job. This approach involves fitting 2 linear regression models to each population subgroup (racial group in the above example) as below:

$$Y_w = \beta X_w + \varepsilon_w$$
$$Y_B = \beta X_B + \varepsilon_B$$

where Y denotes the outcome variable of interest, β is a vector of model coefficients, X is the design matrix of explanatory variables and ε is the error terms which are assumed to be white noises. One may consider the gap between 2 racial groups as below:

$$\overline{Y}_W - \overline{Y}_B = (\overline{X}_W - \overline{X}_B)\beta_W + \overline{X}_B(\beta_W - \beta_B)$$

and

$$\overline{Y}_B - \overline{Y}_W = (\overline{X}_W - \overline{X}_B)\beta_B + \overline{X}_W(\beta_W - \beta_B)$$

where for each equation above, the first part of the right side represents the observable discrepancies between 2 groups attributable to the factors under study (endowment or explained component). This component is related to the intensity of determinants of outcome in 2 groups. The second part exhibits the differences in the model coefficients in 2 groups (coefficient or unexplained component). This component is related to intergroup discrepancies in the effect of the determinants of the outcome of interest.

To do decomposition, we initially estimated the model coefficients for main effects as well as interaction effects through a binary logistic regression model including age, education years, and the dummy variable of economic status. Then, discrepancies in β variables in 2 subpopulation groups were evaluated. Variables at a $P \leq 0.10$ were used for multivariate analysis and retained as independent predictors at a $P < 0.05$.

Results

According to the data of the sixth national SuRFNCD, from 10572 participants, 1343 (12.7%) were cigarette smokers and 364 (3.4%) were hookah smokers. The highest prevalence of cigarette smoking was observed at the age of 55 to 64 years (18.7%); however, it was highest in the age group of 15 to 24 years (4.2%) for hookah smoking. The highest prevalence of cigarette smoking was for individuals with primary school (17.8%)

and secondary school (17.0%) education levels, while in hookah smokers the highest prevalence was seen among illiterate people (4.6%). Tables 1 and 2 show the distribution of demographic characteristics and their effects on cigarette and hookah smoking. Only 5.1% of cigarette smokers (68 out of 1343) were hookah users. So, the effect of SEP on the gap between cigarette and hookah smoking should be studied separately.

The prevalence of cigarette smoking in high, middle, and low socioeconomic groups was 11.8%, 13.2%, and 13.1%, respectively ($P = 0.158$), and 2.6%, 3.3%, and 4.3% for hookah smoking, respectively ($P < 0.001$). The effects of seven demographic characteristics including participants' age, gender, education level, ethnicity, job status, home area, and number of family members on cigarette smoking were studied using a multiple logistic regression with backward method, and all except number of family members were found significant ($P < 0.05$). Then the significant factors entered into the decomposition model. However, in multiple logistic regression for hookah smoking, the participants' age, gender, education level and ethnicity were found significant ($P < 0.05$) and entered into the decomposition.

Prevalence of cigarette smoking was lower in high socioeconomic group (11.8%) compared to low socioeconomic group (13.1%). However, the gap between the 2 mentioned socioeconomic groups (1.3%) was not significant ($P = 0.093$) (Table 3).

Decomposition process for the observed gap between the low and high socioeconomic groups was carried out in respect to the major components (participants' age, gender, education level and ethnicity). This decomposition showed that the prevalence of hookah smoking was lower in high socioeconomic group (2.6%) compared to low socioeconomic group (4.3%), and the 1.7% gap between the 2 mentioned socioeconomic groups was significant ($P < 0.0001$). In addition, 1.1% of the gap between socioeconomic groups was due to endowments (explained component), while 0.6% was due to the differences in coefficients or unexplained components. Age, gender and educational level were the most important variables affecting this gap in the explained component, whereas these factors' coefficients were not significant in the unexplained component and between the 2 groups (Table 3).

Discussion

The relationship between socioeconomic status and cigarette smoking has been on debate for many years. In addition, the same is true for hookah smoking, and scarce data is present in this regard. The present study showed that although prevalence of cigarette smoking is independent of socioeconomic status,

Table 1. Cigarette Smoking According to Demographic Characteristics and Socioeconomic Groups, Iran, 2011

Factors	Cigarette Smoking (%)		OR (95% CI)	P^a
	No	Yes		
Age				
15–24	2159 (95.7)	98 (4.3)	Ref.	Ref.
25–34	2083 (89.1)	255 (10.9)	2.7 (2.1, 3.4)	<0.001
35–44	1276 (83.4)	254 (16.6)	4.4 (3.4, 5.6)	<0.001
45–54	1252 (84.9)	222 (15.1)	3.9 (3.0, 5.0)	<0.001
55–64	1765 (81.3)	406 (18.7)	5.1 (4.0, 6.4)	<0.001
65–70	686 (86.5)	107 (13.5)	3.4 (2.6, 4.6)	<0.001
Gender				
Female	6100 (98.2)	113 (1.8)	Ref.	Ref.
Male	3128 (71.8)	1230 (28.2)	21.2 (17.4, 25.9)	<0.001
Education level				
Illiterate	2269 (89.4)	269 (10.6)	Ref.	Ref.
Primary school	1816 (82.2)	393 (17.8)	1.8 (1.5, 2.2)	<0.001
Secondary school	1496 (83.0)	307 (17.0)	1.7 (1.5, 2.1)	<0.001
High school	2303 (89.9)	260 (10.1)	1.0 (0.8, 1.1)	0.594
Associate degree	496 (91.3)	47 (8.7)	0.8 (0.6, 1.1)	0.176
University graduate	726 (92.5)	59 (7.5)	0.7 (0.5, 0.9)	0.012
Postgraduate	117 (93.6)	8 (6.4)	0.6 (0.3, 1.2)	0.138
Ethnicity				
Persian	4562 (88.6)	586 (11.4)	1.3 (1.1, 1.4)	<0.001
Others	4665 (86.0)	757 (14.0)	Ref.	Ref.
Job status				
Unemployed	459 (76.2)	115 (23.8)	Ref.	Ref.
Employed	8722 (88.0)	1187 (12.0)	0.4 (0.3, 0.05)	<0.001
Area of home (m²)				
Less than 50	464 (84.7)	84 (15.3)	Ref.	Ref.
51 to 75	1529 (87.7)	214 (12.3)	0.8 (0.6, 1.0)	0.065
76 to 100	2215 (86.7)	339 (13.3)	0.8 (0.7, 1.1)	0.204
101 to 150	2571 (87.0)	385 (13.0)	0.8 (0.6, 1.1)	0.146
151 to 200	1227 (87.3)	178 (12.7)	0.8 (0.6, 1.1)	0.122
More than 200	928 (88.4)	122 (11.6)	0.7 (0.5, 0.9)	0.036
Number of family members				
1	280 (87.5)	40 (12.5)	Ref.	Ref.
2	1447 (88.3)	191 (11.7)	0.9 (0.6, 1.3)	0.670
3	2288 (88.6)	294 (11.4)	0.9 (0.6, 1.3)	0.556
4	2341 (86.5)	364 (13.5)	1.1 (0.8, 1.5)	0.634
5	1437 (86.3)	229 (13.8)	1.1 (0.8, 1.6)	0.551
≥6	1436 (86.5)	225 (13.6)	1.1 (0.8, 1.6)	0.615
Socioeconomic groups				
High	3045 (86.9)	459 (13.1)	Ref.	Ref.
Moderate	3050 (86.8)	463 (13.2)	1.2 (0.98–1.4)	0.069
Low	3096 (88.2)	415 (11.8)	1.1 (0.95–1.3)	0.181

CI, confidence interval; OR, odds ratio; Ref., reference category.

[a] Bivariate logistic regression

hookah consumption in low socioeconomic group is 1.7% greater than high socioeconomic group. Findings of the present study showed that parameters of age, gender, and education level are contributory factors to the gap between high and low socioeconomic groups. This finding can be very useful in designing effective interventions and making decisions in future to remove inequality and reduce hookah smoking.

Other studies have also reported that parameters of age and education level have effects on prevalence of smoking.[2,26-28] The significant effect of gender on the prevalence of hookah smoking as a contributory factor

to the gap between high and low socioeconomic groups in Iran, was not so far-fetched like some Asian countries,[2] as hookah smoking has roots in ancient culture of Iranians. Therefore, higher prevalence of hookah smoking in low socioeconomic group may be because of less cultural changes, improvements in living standards and modernization. In addition, this group of people consider hookah smoking less harmful than cigarettes. Therefore, health policy makers should pay a special attention to low socioeconomic group in taking both preventive measures and measures regarding hookah smoking cessation.

Table 2. Hookah Smoking According to Demographic Characteristics and Socioeconomic Groups, Iran, 2011

Factors	Hookah Smoking (%)		OR (95% CI)	P^a
	No	Yes		
Age				
15–24	2161 (95.8)	96 (4.3)	Ref.	Ref.
25–34	2258 (96.6)	80 (3.4)	0.8 (0.6, 1.1)	0.143
35–44	1473 (96.3)	57 (3.7)	0.9 (0.6, 1.2)	0.418
45–54	1432 (97.2)	42 (2.9)	0.7 (0.5, 0.9)	0.027
55–64	2101 (96.8)	70 (3.2)	0.7 (0.5, 1.0)	0.072
65–70	775 (97.7)	18 (2.3)	0.5 (0.3, 0.9)	0.013
Gender				
Female	6035 (97.1)	178 (2.9)	Ref.	Ref.
Male	4172 (95.7)	186 (4.3)	1.5 (1.2, 1.9)	<0.001
Education level				
Illiterate	2422 (95.4)	116 (4.6)	Ref.	Ref.
Primary school	2137 (96.7)	72 (3.3)	0.7 (0.5, 0.9)	0.021
Secondary school	1731 (96.0)	72 (4.0)	0.9 (0.6, 1.2)	0.358
High school	2483 (96.9)	80 (3.1)	0.7 (0.5, 0.9)	0.007
Associate degree	533 (98.2)	10 (1.8)	0.4 (0.2, 0.8)	0.005
University graduate	773 (98.5)	12 (1.5)	0.3 (0.2, 0.6)	<0.001
Postgraduate	124 (99.2)	1 (0.8)	0.2 (0.0, 1.2)	0.077
Ethnicity				
Persian	4965 (96.4)	183 (3.6)	0.9 (0.8, 1.2)	0.547
Others	5241 (96.7)	181 (3.3)	Ref.	Ref.
Job status				
Unemployed	619 (95.3)	31 (4.8)	Ref.	Ref.
Employed	9576 (96.6)	333 (3.4)	0.7 (0.5, 1.01)	0.058
Area of home (m²)				
Less than 50	516 (94.2)	32 (5.8)	Ref.	Ref.
51 to 75	1670 (95.8)	73 (4.2)	0.7 (0.5, 1.1)	0.108
76 to 100	2480 (97.1)	74 (2.9)	0.5 (0.3, 0.7)	0.001
101 to 150	2874 (97.2)	82 (2.8)	0.5 (0.3, 0.7)	<0.001
151 to 200	1354 (96.4)	51 (3.6)	0.6 (0.4, 0.9)	0.031
More than 200	1011 (96.3)	39 (3.7)	0.6 (0.4, 1.0)	0.052
Number of family members				
1	311 (97.2)	9 (2.8)	Ref.	Ref.
2	1587 (96.9)	51 (3.1)	1.1 (0.5, 2.3)	0.775
3	2505 (97.0)	77 (3.0)	1.1 (0.5, 2.1)	0.866
4	2615 (96.7)	90 (3.3)	1.2 (0.6, 2.4)	0.625
5	1598 (95.9)	68 (4.1)	1.5 (0.7, 3.0)	0.284
≥6	1592 (95.8)	69 (4.2)	1.5 (0.7, 3.0)	0.262
Socioeconomic groups				
High	3352 (95.7)	152 (4.3)	Ref.	Ref.
Moderate	3398 (96.7)	115 (3.3)	1.3 (0.96–1.7)	0.091
Low	3420 (97.4)	91 (2.6)	1.7 (1.3–2.2)	<0.001

CI, confidence interval; OR, odds ratio; Ref., reference category.

^{a} Bivariate logistic regression

According to the results of multiple logistic regression studies, for example the study by Weglicki et al,[29] ethnicity had a significant effect on hookah smoking, but this factor was not associated with the intergroup gap. The socioeconomic similarities between all ethnicities in Iran and same developmental policies of central government in different cities with different ethnicities may be reasons for this exclusion.

Some part of the gap observed among different socioeconomic groups for hookah smoking was not justifiable based on studied factors, and was related to unexplained component of the model. It seems that

income level, regular exercise and knowledge about harmful effects of hookah smoking were the most important factors that were not assessed in the present study.

In contrast with hookah smoking, the prevalence of cigarette smoking was similar among different socioeconomic groups. This finding is different from the results of previous studies indicating that there is a significant relationship between cigarette smoking and socioeconomic status. Primarily, these studies were mostly conducted in developed countries[2]; however, there is a great disparity among reported findings in these

Table 3. Decomposition of the Gap Between the Low and High Socioeconomic Groups in Prevalence of Cigarette and Hookah Smoking, Iran, 2011

	Prediction (%)	95% CI	P
Cigarette smoking			
Prevalence in high socioeconomic group	11.8	10.7, 12.9	<0.001
Prevalence in low socioeconomic group	13.1	12, 14.3	<0.001
Total differences	-1.3	-2.9, 0.2	0.093
Due to endowments (explained)	-0.3	-1.7, 1.1	0.697
Due to coefficients (unexplained)	-1.0	-3.0, 0.9	0.293
Due to endowments (explained)			
Age	-1.3	-1.6, -1.0	<0.001
Gender	2.5	1.9, 3.1	<0.001
Education level	-0.1	-1.4, 1.2	0.908
Ethnicity	-0.7	-1.0, -0.4	<0.001
Job status	-0.2	-0.3, -0.1	0.005
Area of home	-0.5	-1.0.1, 0	0.046
Due to coefficients (unexplained)			
Age	2.9	-0.5, 6.3	0.097
Gender	-3.2	-4.6, -1.8	<0.001
Education level	-3.1	-6.1, -0.1	0.041
Ethnicity	2.1	-2.4, 6.5	0.367
Job status	2.7	-4.0, 9.5	0.430
Area of home	-2.2	-6.1, 1.6	0.261
Constant	-0.2	-11.4, 10.9	0.968
Hookah smoking			
Prevalence in high socioeconomic group	2.6	2.1, 3.1	<0.001
Prevalence in low socioeconomic group	4.3	3.6, 5.0	<0.001
Total differences	-1.7	-2.6, -0.9	<0.001
Due to endowments (explained)	-1.1	-1.9, -0.5	0.001
Due to coefficients (unexplained)	-0.6	-1.7, 0.5	0.320
Due to endowments (explained)			
Age	0.3	0.2, 0.5	<0.001
Gender	0.2	0.1, 0.3	<0.001
Education level	-1.8	-2.6, -1.0	<0.001
Ethnicity	0.2	0.0, 0.4	0.092
Due to coefficients (unexplained)			
Age	-0.3	-2.5, 1.8	0.749
Gender	0.3	-0.4, 1.1	0.396
Education level	0.5	-1.3, 2.3	0.559
Ethnicity	0.7	-2.0, 3.4	0.613
Constant	-1.8	-6.8, 3.2	0.486

CI, confidence interval.

countries.[14]

One of the limitations of the present study was lack of assessment of other factors influencing cigarette or hookah smoking such as presence of a first degree relative who is a hookah or cigarette smoker, divorce of parents and etc. Results of this study could be different if mentioned data were used in the analyses. However, these analyses could not be done in present research due to the lack of these data in sixth national SuRFNCD. On the contrary, having a national data set about cigarette or hookah smokers to look at the gap between socioeconomic groups was a great strength of this study. In conclusion, in Iran, the prevalence of hookah smoking is 1.7-fold higher in low socioeconomic group compared to high socioeconomic group. Therefore, this finding indicates the importance of socioeconomic status in hookah smoking. After decomposition of the gap between the 2 socioeconomic groups, age, gender and education level were reported to be the major contributors to the differences observed between the 2 groups.

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