SMOKING PREVALENCE AND ITS COMBINATION WITH SOME CARDIOVASCULAR RISK FACTORS

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Abstract - This study was carried out on 2200 men and women aged 20-70 years in Isfahan who participated in Isfahan Cardiovascular Risk Factor survey, in order to find prevalence of cigarette smoking in this population and estimate the relation of smoking with other CAD risk factors. All information was obtained by standard questionnaires mainly concerning smoking habits of subjects and their personal charcteristics, etc. Serum lipids and fasting blood glucose levels were measured from 12-14 hr fasting specimen by ELAN 2000 autoanalyzer. Blood pressure was measured according to WHO standardized method. The prevalence of cigarette smoking among Isfahan population is 11.1% (0.92 in women, 23.3% in men). Contrary to serum total cholesterol (T.cho) and fasting blood sugar(FBS), the mean levels of HDL cholesterol (HDL-C), systolic (SBP) and diastolic blood pressure (DBP) and body mass index (BMI) were significantly higher in non-smokers than smokers ($p < 0.05$). Hypertension and obesity were significantly more prevalent in non-smokers than smokers. When the prevalence of risk factors were studied in two BMI levels, the prevalence of hypertriglyceridemia was significantly more in smokers than non-smokers opposite to hypertension in either BMI level. Higher prevalence of low HDL-C and hypercholesterolemia was observed in smokers than non-smokers when BMI < 27 kg/m^2 was cosidered.

The results of the present study revealed that hypertension is more prevalent in non-smokers than smokers. The observation that high blood pressure was less common among smokers than non-smokers may be related to the lower prevalence of obesity in smokers.

We conclude that due to the low prevalence of smoking in Iranian women, it is better to present the data regarding smoking as sex-based data in our society. On the other hand Cigarette smoking is not only considered as a major risk factor for CVD but also it may have a role in increasing some of other CVD risk factors in our population.

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Key Words: Coronary heart disease, obesity, prevalence, risk factors, smoking, serum lipid

INTRODUCTION

Cigarette smoking is one of the leading causes of premature death among older persons, primarily due to cardiovascular disease (CVD) and cancer (1,2).

World Health organization and Oxford university have reported that every second smoker will die prematurely as a result of smoking (3). In developed countries as a whole, tobacco was responsible for over 1.8 million deaths in 1990 representing 24% of all male deaths and 7% of all female deaths. The association of smoking with CVDs has been well documented (46) and so smoking is the most important as well as the most reversible risk factor for these diseases. In ten major cohort studies in several countries, each found a higher incidence of myocardial infarction and death from CHD among smokers, averaging 70% higher in cigarette smokers versus non-smokers (7).

Smoking cessation has health benefits in younger as well as older people (8,9).

Though the risk of CAD after smoking cessation drops by about 50% one year after cessation, it approaches that of the person who has never smoked within three to four year (8,9). Cigarette smoking is also associated with an increased risk of advanced atherosclerotic vascular disease in peripheral arteries (10). Smiking in the presence of the other coronary risk factors (e.g. hypertension, hypercholesterolemia) appeares to have a synergistic effect on cardiovascular disease mortality and morbidity (8,9). Smoking multiplies the effect of other coronary risk factors (11). and some studies demonstrate the relationship between smoking and other CVD risk factors (11-19).

Regarding the special life style of Iranian people, in this paper, we used the data from the Isfahan Cardiovascular Risk Factor (ICRF) survey to estimate those relationships in this population.

SUBJECTS AND METHODS

The data used in this analysis comes from the Isfahan Cardiovascular Risk Factor survey conducted in 1994 with 1000 men and 1200 women aged 20-70 years in Isfahan city. Details of the survey design, methods and sampling have been reported in the article published before (16). Briefly, the information about age, sex, education, occupation, drugs usage , previous history of CVD risk factors, smoking status and physical activity were obtained using standard questionnaire by trained medical students. A 12-14 hour fasting blood

sample was taken from each participant to measure the level of serum lipids and fasting blood sugar (FBS).

FBS, serum total cholesterol (TC) and triglycerides were determined by enzymatic method on an ELAN 2000 autoanalyzer. HDL, cholesterol (HDL-C) was measured after dextra-Mg^{2+} preeipitaion. LDL cholesterol was calculated according to the Friedewaldf formula when the TG level was 400 ≤ mg/dl (17). Diabetes mellituse was defined if (i) subjects which at the time of study had already been diagnosed as diabetic (known diabetic) or (ii) a fasting venous whole blood glucose concentration ≥ 140 mg/dl.

Body mass index (BMI) was calculated by measurments of height and weight in light clothes and without shoes. Blood pressure was measured on right arm in sitting possition after 5 min of rest by WHO standardized method using a random zero sphygmomanometer. Smoking habits were described according to participants self report. We classified subjects as ex-smokers, current smokers (currently smoking cigarette every day or some days) and never smokers, and current smokers were asked about the number of cigarettes they smoked daily.

Statistical Analyses

The data were analyzed using SPSS package. Sex-based means of factors studied were calculated in both smoking and non-smoking groups and were compared by unpaired Student's t test. The differences of the frequency of all risk factors between smokers and non-smokers were tested by Yates corrected Chi-square test. Mantel Hanzel test was conducted to obtain the sex difference in all age groups.

The relation between age and the number of daily cigarettes was assessed by Pearson test.

A probability value of p less than 0.05 was considered to be significant.

RESULTS

We analyzed data on 2200 adults, representing an estimated 430 thousands people aged over 19 years who participated in ICRF survey. Table 1 shows the age-based prevalence of smoking according to sex. The prevalence of current cigarette smoking in total population is 11.1% (0.92% in women and 23.3% in men). The major result of this table is that smoking is more prevalent among men than women($p = 0.000$). Except for never smoking, in other smoking categories, men had more prevalence than women in all studied age groupes($p \leq 0.006$). Contrary to never smoking, ex-smoking prevalence increased by age groups but for current smoking, a peak value can be seen in the third decade of life.

The comparison of the mean values of serum lipids, FBS, blood pressure and BMI between smokers and non-smokers has been presented in Table 2.

The mean values of serum HDL cholesterol (HDL-C), diastolic and systolic blood pressure (DBP, SBP) and BMI were higher in non-smokers than smokers while serum total cholesterol(T.Cho) and FBS were significantly higher in smokers than non-smokers. When those comparisons were repeated in each sex, similar results were observed between the two groups in men except for HDL-C, but no significant difference was observed for women.

Table 3 presents the difference in prevalence of some cardiovascular risk factors between smoker and non-smoker groups. Low HDL-C as well as obesity and hypertension was significantly more prevalent among non-smoker subjects than smokers. The difference of some CAD risk factors between smokers and non-smokers were obtained for either sex. Contrary to women, low HDL-C, and diabetes mellitus were observed more frequently among smoker men whereas increased TG was higher in non-smokers. No diabetic smoker women existed in the studied population.

Smokers and non-smokers were categorized into two groups (BMI <27 kg/m^2 and BMI $>$ 27 kg/m^2) to discriminate groups between the effect of smoking and obesity on other factors (Table 4). Smokers with BMI less than 27 kg/m^2 had more frequency of increased serum TG, T.Cho and decreased HDL-C concentration than non-smokers ones. In BMI level ≥ 27 kg/m^2, hypertriglyceridemia was more prevalent in smokers than non-smokers while hypertension showed an

Table 1. Distribution of studied population in smoking categories according to age group and sex

Age group (yr)	Never smoker				Ex-smoker				Current smoker			
	men		women		men		women		men		women	
	No	%	No	%	No	%	No	%	No	%	No	%
20-29	176	79.4	131	100	7	3.0	0	0.00	39	17.6	0	0.0
30-39	157	65.0	237	98.3	14	5.8	3	1.2	70	29.2	1	0.5
40-49	133	65.2	336	98.8	18	8.8	1	0.3	53	26.0	3	0.8
50-59	118	65.2	271	98.2	23	12.7	2	0.7	40	22.1	3	1.1
60-70	93	61.2	204	96.2	28	18.4	4	1.9	31	20.4	4	1.9
Total	677	67.7	1179	98.2	90	9.0	10	0.83	233	23.3	11	0.92

Table 2. Mean value and standard deviation of some cardiovascular risk factors in smoker and non-smoker people in Isfahan

Risk factor	Smoker	Non-smoker	
	Mean ± SD	Mean ± SD	P
	Total		
Total cholesterol*	197.1±23.9	193.0±23.7	0.01
LDL cholesterol*	119.9±45.8	117.7±41.8	0.79
HDL cholesterol*	44.3±9.4	54.4±5.2	0.00
Triglycerides*	122.0±38.0	120.4±36.2	0.31
Fasting blood sugar*	88.7±10.8	86.1±11.5	0.00
Diastolic blood pressure +	77.0±9.5	79.6±10.6	0.00
Systolic blood pressure +	114.0±13.5	118.6±15.2	0.00
Body mass index #	23.9±3.2	24.8±2.1	0.00
	Men		
Total cholesterol*	198.3±23.5	192.7±23.7	0.00
LDL cholesterol*	122.1±43.0	117.9±42.7	0.54
HDL cholesterol*	43.9±10.0	55.5±56.9	0.28
Triglycerides*	125.3±36.7	120.8±36.4	0.12
Fasting blood sugar*	87.6±10.2	85.9±11.3	0.01
Diastolic blood pressure +	77.0±9.5	79.7±10.6	0.01
Systolic blood pressure +	114.1±13.6	118.7±15.8	0.00
Body mass index #	23.9±3.8	24.8±3.7	0.00
	Women		
Total cholesterol*	194.4±24.6	201.5±25.7	0.40
LDL cholesterol*	118.0±42.7	118.5±48.8	0.59
HDL cholesterol*	45.2±7.8	39.5±0.71	0.30
Triglycerides*	116.5±39.3	110.1±28.01	0.54
Fasting blood sugar*	91.1±11.8	90.8±15.0	0.95
Diastolic blood pressure +	76.9±9.8	79.0±10.7	0.54
Systolic blood pressure +	111.4±11.2	115.8±11.3	0.70
Body mass index #	24.6±3.8	25.3±3.4	0.62

* mg/dl + mmHg # kg/m²

Table 3. The prevalence of major cardiovascular risk factors among Isfahan population based on smoking status

Risk factor	Smoker		Non-smoker		
	No	(%)	No	(%)	P
	Total				
Serum triglyceride > 200 mg/dl	93	35.1	599	30.9	0.085
Serum total cholesterol > 240 mg/dl	59	16.1	421	21.7	0.90
Serum LDL cholesterol > 160 mg/dl	29	12.2	172	8.9	0.33
Serum HDL cholesterol < 35 mg/dl	229	62.6	1561	80.6	0.04
Hypertension*	148	40.4	1063	54.6	0.00
Diabetes mellitus #	11	3.0	76	3.92	0.99
Obesity +	112	42.6	1100	56.8	0.000
	Men				
Serum triglycerise > 200 mg/dl	82	34.6	326	35.2	0.000
Serum total cholesterol > 240 mg/dl	53	22.3	157	20.6	0.62
Serum LDL cholesterol > 160 mg/dl	23	9.6	89	11.7	0.472
Serum HDL cholesterol < 35 mg/dl	208	87.8	623	81.6	0.04
Hypertension*	94	39.8	386	50.3	0.00
Diabetes mellitus #	11	4.6	29	3.8	0.70
Obesity +	117	42.7	397	52.0	0.000
	Women				
Serum triglyceride > 200 mg/dl 93	11	38.5	273	23.3	0.02
Serum total cholesterol > 240 mg/dl	6	23.1	264	22.5	0.93
Serum LDL cholesterol > 160 mg/dl	6	23.1	83	7.1	0.01
Serum HDL cholesterol < 35 mg/dl	21	75.0	938	80.0	0.96
Hypertension*	14	51.1	667	56.9	0.000
Diabetes mellitus #	0	0.0	47	4.0	-
Obesity +	10	35.7	704	60.1	0.000

* Hypertension was difined as SBP ≥ 140 &/or DBP ≥ 90 mmHg or use of antihypertensive medication

Diabetes mellitus was defined as 1) Known diabetic subjects at the time of study 2) Fasting venous whole blood glucose ≥ 140mg/dL + BMI ≥ 25 kg/m²

Table 4. Prevalence of major cardiovascular risk factors between smokers and non-smokers based on BMI level

Risk factor	Smoker		Non-smoker		
	No	(%)	No	(%)	P
	BMI < 27kg/m²				
Serum triglyceride ≥ 200 mg/dl	86	29.5	258	21.8	0.005
Serum total cholesterol ≥ 240 mg/dl	64	21.2	191	16.1	0.046
Serum LDL cholesterol ≥ 160 mg/dl	33	11.0	91	7.7	0.088
Serum HDL cholesterol < 35 mg/dl	260	86.0	768	64.9	0.000
Hypertension*	6	1.9	56	4.7	0.049
Diabetes mellitus #	10	3.4	48	4.1	0.668
	BMI ≥ 27 kg/m²				
Serum triglyceride ≥ 200 mg/dl	45	54.2	240	38.1	0.006
Serum total cholesterol ≥ 240 mg/dl	22	26.4	146	23.2	0.588
Serum LDL cholesterol ≥ 160 mg/dl	6	6.9	69	10.9	0.398
Serum HDL cholesterol < 35 mg/dl	77	93.0	542	86.0	0.126
Hypertension*	1	1.4	54	8.5	0.032
Diabetes mellitus #	7	8.3	21	3.4	0.34

* Hypertension was difined as SBP ≥ 140 &/or DBP ≥ 90 mmHg or use of antihypertensive medication

Diabetes mellitus was defined as 1) Known diabetic subjects at the time of study 2) Fasting venous whole blood glucose ≥ 140mg/dL

opposite relationship. The prevalence of hypertension was significantly less in smokers than non-smokers in either BMI level. The difference of all studied risk factors between smoker and non-smoker subjects in two BMI levels based on sex has been obtained (not shown). A singificant direct relation was observed between being a smoker and low HDL-C, and having diabetes mellitus in men, whereas this significant relationship was inverse with hypertension in women.

No significant difference in the mean levels of TG and LDL-C and the prevalence of diabetes mellitus and elevated TG was observed between smokers and non-smokers. The correlation between age and the number of cigarettes per day was obtained in both sexes in which no significant relation was observed (Men: r = 0.06 and p = 0.11, Women: r = 0.25 and p = 0.08).

DISCUSSION

The prevalence of current smoking is 11.1% (0.92% in women and 23.3% in men).

The peak value in the prevalence of smoking is in the third decade of life may be due to the high social, economical and consequently psychological problems such as lack of job, high cost of living compared to the inadequate income in our country.

In women, cigarette smoking is less prevalent than men because of the cultural factors, hut its increasing trend is based on increasing age. As in old people specially women, physical activity and fun is less than the other age groups on one hand, and sedentary lifestyle is often linked to a cluster of other negative health habits including smoking (12) on the other hand, it seems that this problem in this age group is interpretable.

The augmentation of other CAD risk factors by smoking has been shown in some societies (11,13-15). Some previous studies showed increased blood pressure among smokers (5,13,19-22), while other studies reported different results (23-26).

In the present study mean DBP and SBP in men and prevalence of hypertension in both sexes were significantly higher in non-smoking than smoking subjects. The reason of these differences existing could be sonic confounding factors which affected blood pressure levels in smokers.

For instance, our findings, agree with other studies (27), have shown that, in smokers group BMI was significantly lower than non-smokers which maybe due to decreased apetite for smoking (11). Also, quiting smoking can cause an unexpected rise in blood pressure specially in those who are overweight (27). In the present study , non-smoker subjects may include new smoking quitters but there was not any question about quitting period in the questionnaire. Therefor, we are not able to clarify how the above results are affected by this factor.

In addition smokers tend to take more tea and coffee, these and although both of these factors - smoking and tea/coffee - have a synergistic effect on the level and period of blood pressure increase (7), this effect presents first as an temporary drop in their normal blood pressure and then cause the mentioned

increase (19,28). It is likely that the smoker subjects neglect our recommendation on refraining from drinking tea or coffee at least half an hour before blood pressure measuring.

A study was conducted aiming to determine the obvious contradiction of acute and chronic effects of smoking on blood pressure to show that ambulatory SBP in arousal is probably augmented by repeated smoking only in people over 50 years of age (29).

According to some studies, hydrochlorothiazide and propranolol may have a corresponding effect with smoking in people who need high doses of these drugs for controlling their blood pressure (27). The prevalence of drug use was significantly more in non-smokers than smokers ($p = 0.000$), but unfortunately, we did not have anough information about the type and frequency of antihypertensive medication.

Also, the risk alleviation through antihypertensive treatment may be different in smokers and non-smokers women did not show the. significant differences in mean SBP and DBP compared to men while the mean BMI in non-smoker men and women being studied was significantly higher than in smokers.

Studies have shown that nicotine increases serum glucose and cortisol concentrations (28). Similarly, in this population (men, women and total), the mean FBS was higher in smokers than in non-smokers. After adjustment for BMI, it was found that obesity may have a role related to smoking and diabetes mellittus prevalence, especially in men in our society.

According to several studies, smoking affects adversely lipid profile as a strong relationship with hypercholesterolemia and tobacco addiction has been found (13).

Also, a strong positive linear association between smoking and TG has been defined in white men and women (30). In a study on 165 Swedish men, an adverse influence has been shown on HDL in the non-obese smokers (31) and according to other studies an indirect strong association between HDL level and tobacco was seen (32).

Some studies propose that heavy smokers have a lower serum HDL-C and a higher serum LDL-C and TG (12,30,33).

Contrary to HDL-C, TC was significantly higher in smokers in the present study. In the non-obese subjects, the prevalence of hypertriglyceridemia, hypercholesterolemia and low HDL-C were higher in smokers than in nonsmokers, but in the obese persons such difference was observed only for hypertriglyceridemia. In addition, in smokers the HDL/LDL ratio declines (28), which confirms some of our results.

In some subgroups, we did not find any significant differences in lipid profile of smokers and non smokers despite other studies, maybe for our non-smoker subjects are as a sample which included ex-smokers with unknown information about their previous cigarette usages, smoking and quitting periods, as well passive smokers who are in a higher risk for CVD compared to never-smokers (34). It seems that it takes two years for the lipids and blood pressure to decline and these do not change immediately (5) after quitting.

Also, the cigarette numbers and brands smoker subjects consumed are determining factors (28) but unfoutunately we did not obtain any data about these aspects as previously mentioned.

In addition, no significant results were found in women for insufficient sample size because the original population of women smokers in our religious society is low due to cultural tobaco for cigarette smoking despite Western countries (35).

Afterall, it is necessary to conduct a plan for achivement to the reliable profile of CAD risk factors regarding tobacco addiction considering the mentioned information about exact smoking profiles which is currently in progress in our center.

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