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Full Length Research Paper

Tobacco smoking vs. lipid profile and anthropometric measures: A cross-sectional study among students in the Riyadh College of Health Sciences

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Smoking represents the most readily preventable risk factor for morbidity and mortality. The present work aimed at studying the frequency of smoking among Saudi college students and its relation to dyslipidemia and malnutrition. The study was carried out on the students of the Riyadh College of Health Sciences, from September 2006 to December 2008. 474 male students participated in the present study. All subjects answered a self-administered questionnaire which consisted of socio-demographic data. Anthropometric measurements and laboratory analysis of lipid profile were measured. The frequency of smoking among male college students was 38.19%. Triglyceride level was higher while anthropometric measures were lower, among smokers. There was positive correlation between total cholesterol (TC), low-density lipoprotein (LDL), and triglycerides from one side and anthropometric measures on the other side. There is a high frequency of smoking among college students. The smokers have high lipid profile and low anthropometric measurements. Three fourth of the smokers have a strong desire to quit smoking.

Key words: Cholesterol, smoking, lipid profile, malnutrition, triglycerides weight and height.

Introduction

Cigarette smoking is a remarkable phenomenon in the world today (World Health Organization report on the global tobacco epidemic, 2008). In the past few decades, the world has become aware of the hazards of this habit (The Health Consequences of Smoking: a Report of the Surgeon General, 2004). National estimates of Global Youth Tobacco Survey (GYTS), Saudi Arabia, 2007, reported that at least 29.7% of Saudi students had smoked cigarette at least once (Global Youth Tobacco Survey Collaborating Group, 2003). In USA, an estimated 6 million persons use tobacco at least weekly (National Center for Health Statistics, Centers for Disease Control and Prevention, 2004).

It was noted that people who start smoking at an early age are more likely to continue smoking for a longer period (SAMHSA, HHS, 1995) Cigarette smoking is the largest preventable cause of illness. Many studies have confirmed the relation between hypertension, hypercholestrolemia, ischemic heart disease, and smoking (Connelly et al., 1999).

Smoking and hypercholesterolemia lead to endothelial dysfunction, which is an early stage of atherogenesis (Witztum and Steinberg, 1991) Smoking elevates plasma fibrinogen levels among hypercholesterolemic men and women (Schuitemaker et al., 2004). Recent data showed that the coexistence of smoking and hypercholesterolemia increase serum levels of inflammatory markers (US Department of Health and Human Services, 1997). Compared to nonsmokers, smokers tend to have elevated levels of LDL, very low density lipoproteins (VLDL) and reduced levels of high-density lipoproteins (HDL) (Schuitemaker et al., 2002).

The nexus between smoking and obesity has been proved. With more than half of the western population

being overweight of which 20% are obese and 25% of them happened to be smokers (Albanes et al., 1987). Obesity and smoking are two leading causes of preventable death in developed countries (Marilyn et al., 2008). Hence, the objective of the present work is to study the frequency of smoking among Saudi students and its relation to dyslipidemia and malnutrition.

DATA AND METHODOLOGY

The present study was conducted as a school-based cross-sectional survey study. The study sample consists of all the 494 students of Riyadh College of Health Science –male section; out of which, 474 responded and were willing participate. The study was carried out during the period from September 2006 and December 2008. Their age range is from 18 to 35 years with a mean of 20.88 ± 2.78 years.

All respondents answered a pre-designed self-administered questionnaire during college days. The questionnaire included socio-demographic data, family history of any medical condition, data about physical activity, diet, smoking habit and determinants of smoking. A written consent was signed by each participant after full explanation of the procedure of the study. All procedures were approved by the Ethic Committee of Research; any student with chronic disease that affects growth was to be excluded.

Anthropometric measurements of the participants including weight, height, waist circumference and hip circumference were measured. Weight was measured to the nearest 0.1 kg in light clothing and standing barefooted using a well calibrated balance scale. Height was measured to the nearest 0.5 cm using a wooden meter fixed on the wall while the subject was standing relaxed, barefooted and heels together touching the wall. Waist and hip circumference (WC) were measured twice to the nearest 0.5 cm (Timothy et al., 2003). Body mass index (BMI) was calculated by dividing the body weight (in kilograms) by the square height (in meters) (McGee, 2005).

Venous blood was drawn for blood glucose and lipid profile. 5 ml venous blood sample was taken from each participant. All participants were asked to fast for at least 12 h before taking the sample. Total cholesterol (TC), high-density lipoprotein-cholesterol (HDL-C), and triglyceride (TG) were estimated directly while low-density lipoprotein-cholesterol (LDL-C) was calculated by the Friedewald formula (Executive summary of the Third Report of the National Cholesterol Education Program (NCEP), 2001) The initial venous blood sample was collected in plain tube for serum lipid, and into fluoride oxalate tube for fasting glucose measurements. Blood samples collected were sent to King Saud Medical Complex Research Laboratory for analysis. Serum lipids were performed using enzymatic methods. Total cholesterol concentration was estimated using the cholesterol oxidase/peroxidase method (CV 1.9% at 3.68 mmol/L and 1.5% at 6.27 mmol/L), and triglyceride using the lipase/glycerol kinase method (CV 2.8% at 0.50 mmol/L and 1.6% at 2.34 mmol/L). High density lipoprotein cholesterol (HDLc) was measured (CV 2.25% at 0.89 mmol/L and 3.5% at 1.12 mmol/L) after precipitation of very low density lipoprotein (VLDL) and low density lipoprotein (LDL) by polyethylene glycol PEG 6000. LDL-cholesterol (LDLc) was calculated by the Friedewald Equation. Fasting blood Glucose was estimated using glucose oxidase/peroxidase method (CV 1.3% at 4.66 mmol/L and 1.5% at 14.43 mmol/L).

For statistical analysis, data were collected, presented and statistically analyzed using SPSS statistical package version 15 (SPSS statistical package version 15). Mean, standard deviation and students "t" test were used to compare quantitative data. Frequencies and Chi square test were used to compare qualitative data. Correlation coefficient was used to compare related variables. The level of significance used was 5% level.

RESULTS

Table 1 shows distribution of studied subjects according to age, blood pressure and serum glucose level. There was statistically significant difference between smokers and non-smokers regarding age ($p = 0.009$). The mean age of students was 21.14 ± 3.26 and 20.46 ± 1.66 years for smokers and non-smokers, respectively. There was statistically insignificant difference between smokers and non-smokers concerning systolic and diastolic blood pressure and serum glucose level ($p = 0.11$, 0.17 and 0.2, respectively).

Table 2 recorded significant association in terms of statistics between smokers and non-smokers concerning triglyceride level ($p = 0.004$). On the other hand, there was statistically insignificant association regarding other lipid parameters between smokers and non-smokers.

Table 3 portrayed significant statistical difference between smokers and non-smokers regarding height and waist circumference ($p = 0.03$ and 0.02, respectively). On the other hand, the difference was statistically insignificant as regards weight, BMI and hip circumference.

Table 4 delineated determinants of tobacco use among male smokers. About half of the smokers think that smokers tend to have more friends and buy cigarettes from grocery stores. About three fourths of smokers think smoking should be banned from public places and want to stop smoking, whereas less than two fifth of them have never received help or counseling on how to stop smoking. About two-third of students, noticed anti-smoking media messages in newspapers or magazines, in the past 30 days.

Figure 1, 2 and 3 showed insignificant positive correlation between body mass index and both total cholesterol and low density lipoprotein. On the other hand, there was insignificant negative correlation between body mass index and HDL-C ($p > 0.05$).

DISCUSSION

Tobacco consumption has been linked to a high death rate worldwide. It is considered to be the second major cause of death in the world. Elimination of the risk of smoking needs continuous assessment of risk factors in the community. Smoking, high blood pressure, diabetes, and obesity are among the leading risk factors affecting developing countries (Ahmed and Memon, 2008; Marthers and Loncar, 2006). High blood pressure, diabetes mellitus and obesity are three interrelated health disorders which aggravate each other (Lara et al., 2004). Smoking on the other hand, aggravates the compli-

Table 1. Distribution of studied subjects according to age, blood pressure (mmHg), Glucose (mmol/L) and smoking habit.

Variable	Non-smokers n = 293 (61.81%)	Smokers n = 181 (38.19%)	Total (n = 474)	T	p
Age	20.46 ± 1.66	21.14 ± 3.26	20.88 ± 2.78	2.6	0.009*
Systolic B.P.	117.02 ± 8.7	115.79 ± 7.79	116.26 ± 8.16	1.6	0.11
Diastolic B.P.	76.57 ± 5.61	75.85 ± 5.58	76.13 ± 5.60	1.36	0.17
Glucose	4.87 ± 0.90	4.98 ± 0.91	4.94 ± 0.91	1.28	0.20

Table 2. Distribution of studied subjects according to lipid profile and smoking habit.

Lipid profile	Non- smokers n = 293 (61.81%)	Smokers n = 181 (38.19%)	Total (n = 474)	T	p
Total cholesterol	4.18 ± 0.81	4.21 ± 0.87	4.21 ± 0.83	0.37	0.71
LDL cholesterol	2.56 ± 0.70	2.58 ± 0.71	2.57 ± 0.70	0.30	0.77
HDL cholesterol	1.33 ± 0.53	1.33 ± 0.47	1.33 ± 0.49	0.00	1.0
Triglycerides	1.31 ± 0.34	1.47 ± 0.85	1.37 ± 0.70	2.87	0.004*

Table 3. Distribution of studied subjects according to anthropometric measures and smoking habit.

Lipid profile	Non- smokers n = 293 (61.81%)	Smokers n = 181 (38.19%)	Total (n = 474)	t	P
Height (m)	1.71 ± 0.05	1.70 ± 0.05	1.71 ± 0.05	2.12	0.03*
Weight (kg)	73.51 ± 16.59	73.14 ± 15.81	73.74 ± 17.08	0.38	0.70
BMI (W/H in m^2)	25.34 ± 5.56	25.02 ± 5.17	25.22 ± 5.41	0.63	0.53
Waist circumference	85.53 ± 13.76	82.64 ± 13.28	84.43 ± 13.64	2.25	0.02*
Hip circumference	90.02 ± 14.67	87.39 ± 13.67	89.02 ± 14.34	1.59	0.052

cations of both diabetes mellitus and hypertension (Goodarz et al., 2009).

World Health Organization estimated that there are 1100 million smokers all over the world (The world health report, 2002). Percentage of smokers in developing countries is 48% in males and 7% in females, while it is 42% and 24% for males and females, respectively in developed one (Lopez et al., 1994; Centers for Disease Control and Prevention, 2004). These results are consistent with that in the present study, where about 38% of adults are smokers. It was noted in a large number of scientific studies in industrialized nations that the percentage of smokers is continuously decreasing (Guindon and Boisclair, 2003; Taha and Ball, 1982; Routh et al., 1998).

Until the last two decades, there was paucity of reliable information on the prevalence of smoking. Studies were in the form of samples which do not represent the community (Thun et al., 2003). Suffice to say that the figures and statistics of the present study are similar to those of adult males all over the world. The studies conducted in 2000, stated that the percentage of smokers was just over 47% for men and 10% for women, with a global prevalence rate of 29% (Tobacco smoking in the world, 2000). For instance, in a report from Egypt in 2002, the percentage of smokers was 40% among adult males (Mohamed et al., 2005; Khoja et al., 2000).

The Global Youth Tobacco Survey revealed a high prevalence rate of smoking in Saudi Arabia and Kuwait (Khoja et al., 2000; Hashim, 2000; Behbehani et al., 2004); while, the rate of smoking is not more than 30% in industrialized countries according to WHO reports in the late nineties (WHO, 2005). Steep declines in smoking prevalence have occurred in the United States, as a result of smoking cessation (Dusenbury et al., 1992). At the same time, the prevalence of obesity has increased markedly over the same time period (Hedley et al., 2004; Saarni et al., 2004). The Gulf Family Health Survey showed low prevalence rates especially among youngsters and women. This could be explained by the participants in the study, who have not truly declared the actual situation.

This is higher levels of total cholesterol, LDL-C, and triglycerides among smokers than among non-smokers in

Table 4. Determinants of tobacco use among male smokers of Riyadh College of Health Science.

Determinants of tobacco use	Number (181)	Percent
Knowledge and attitude		
Subjects think that those who smoke have more friends	94	51.93
Subjects think that those who smoke look more attractive	66	36.46
Access and availability		
Usually smoke at home	30	16.57
Buy cigarettes in a store	85	46.69
Environmental tobacco smoke		
Subjects live in homes where others smoke in their presence	55	30.39
Subjects stay around others who smoke in places outside their homes	71	39.23
Subjects think smoking should be banned from public places	134	74.03
Subjects think smoke from others is harmful to them	111	61.33
Subjects have one or more of their parents who smoke	38	20.99
Subjects have some or all of them friends who smoke	20	11.05
Cessation:		
Subjects want to stop smoking	128	70.72
Subjects tried to stop smoking in the past year	103	56.91
Subjects have ever received help to stop smoking	71	39.23
Media and advertising		
Subjects saw anti-smoking media messages in the last 30 days	122	67.40
Subjects saw pro-cigarette ads on billboards in the last 30 days	117	64.64
Subjects saw pro-cigarette ads in newspapers or magazines in the last 30 days	124	68.51
Subjects have an object with a cigarette brand logo	25	13.81
Subjects were offered free cigarettes by a tobacco company representative	37	20.44
School		
Subjects had been previously taught in class about the dangers of smoking	104	57.46
Subjects had discussed previously in class reasons why people of their age smoke	76	41.99
Subjects had been previously taught in class the effects of tobacco use	86	47.51

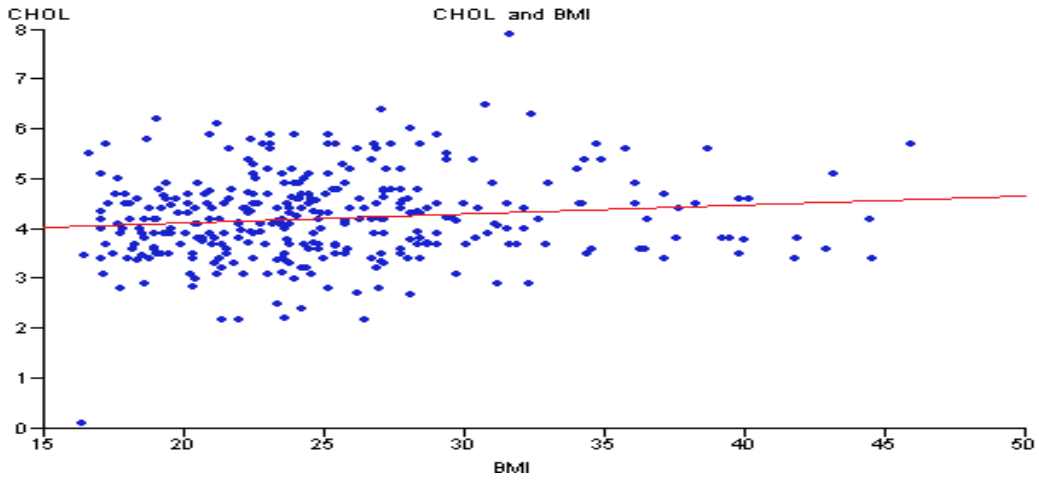

Figure 1. Correlation between total cholesterol and body mass index.

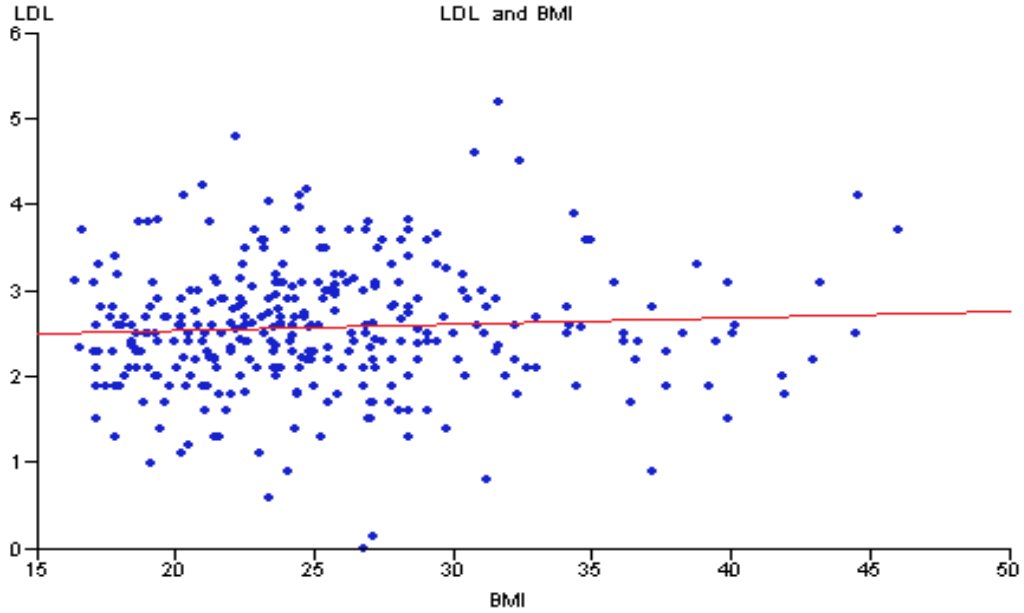

Figure 2. Correlation between low density lipoprotein cholesterol and body mass index.

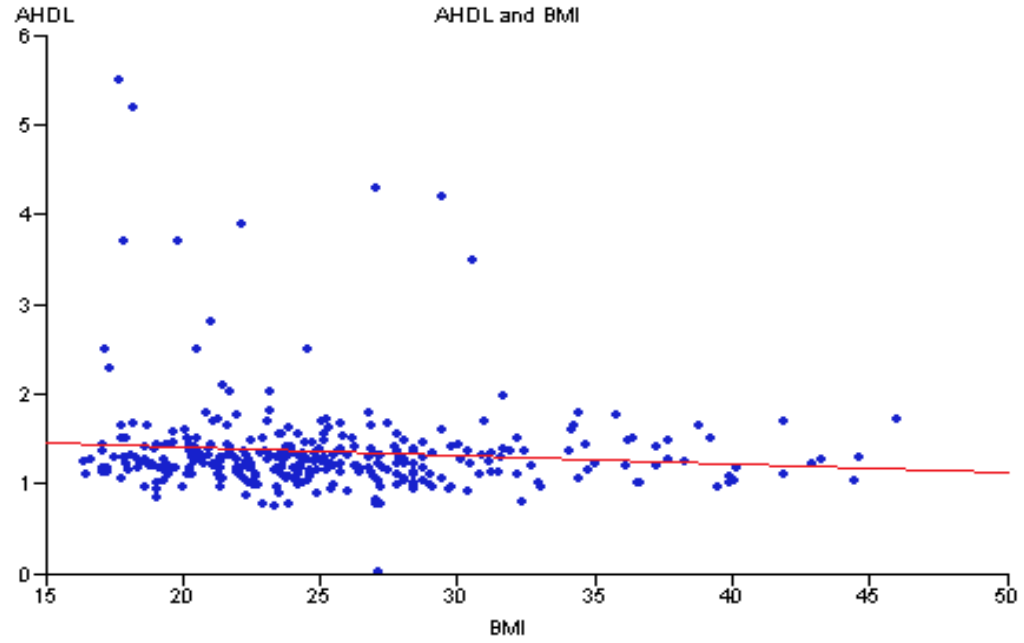

Figure 3. Correlation between high density lipoprotein cholesterol and body mass index.

the present study. Relatively, HDL-C was nearly the same among smokers and non-smokers. On the other hand, waist circumference and hip circumference were lower among smokers than among non-smokers in the present study. This point is an area that needs further research.

Smoking cessation is associated with weight gain. Reductions in smoking prevalence have been suggested as one of the factors associated with an increase in obesity (Williamson et al., 1991). Cigarette smoking acts synergistically to increase CHD risk factors (Sanchez-Castillo et al., 2005) Hence, the prevalence of obesity has been increasing in the United States for several decades (Prevalence ofV overweight and obesity in the United

States, 1999-2004). In 2010, the goal was to reduce the prevalence of obesity among adults to 15% (US Department of Health and Human Services, 2000). Losing weight can help to lower LDL, while regular physical activity can help raise HDL and lower LDL.

In the present study, more than half of the smokers think that those who smoke have more friends. These results were higher than the one recorded by students in Global Youth Tobacco Survey (GYTS) 2007). About half of the smokers in the present study purchase cigarettes from grocery stores. This figure tallies with the results of GYTS 2001 (Khoja et al., 2001; Dixon and Ernst, 2001). Three fourth of students think that smoking should be banned from public places. These results were in accordance with the results of GYTS 2001 and 2007 (Behbehani et al., 2004). More than 70% of students want to stop smoking, however only 40% received help. These results are different from GYTS 2001 and 2007, where more than 80% of students received help to stop smoking. About two thirds of smokers saw anti-smoking messages and pro-cigarette ads on billboards and in newspapers or magazines in the past 30 days. These results are similar to the results of GYTS 2001 and higher than that of GYTS 2007 (global strategy on diet, physical activity and health) (Probhat and Chloupka, 2000). In 2008, WHO introduced the MPOWER package of six proven policies, monitor tobacco use and prevention policies, protect people from tobacco smoke, offer help to quit tobacco use, warn about the dangers of tobacco, enforce bans on tobacco advertising, promotion, and sponsorship, and raise taxes on tobacco (World Health Organization, 2003; WHO Report on the Global Tobacco Epidemic, 2008).

The present study has some limitations. The study was cross-sectional, thus preventing the assertion of a causal relationship between smoking, obesity, WC, HC and lipid profile. The data were sampled from only one college, so there was a possibility of selection bias and some limitation in generalization of results. One of the weaknesses of this study is that it did not define the daily current smokers, the ex-smokers or the occasional smokers which might lead to variation of results.

Conclusion

There is a high frequency of smoking among college students. Waist circumferences were significantly lower among smokers compared with non-smokers, while triglyceride level was significantly higher among smokers compared with non-smokers.

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