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The relationship between smoking and body mass index among Ahlia University Bahrain students: A cross sectional study

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Background: Smoking and obesity are two important public health problems in worldwide now a days that can lead to mortality and public health concerns; both increase the risk for cancer, cardiovascular disease and metabolic abnormalities. **Purpose:** To investigate the relationship between BMI and smoking status among the Ahlia university students. **Materials and methods:** 81 male students from different colleges in Ahlia University between 18 - 25 years old were divided into two groups: the first group included the 37 smoker students and the second group included 44 the non-smoker students. The outcomes were Fagerstrom tolerance questionnaire related to smoking status and BMI. **Result:** There was a significance negative correlation between BMI and smoking dependence status ($p = 0.002$). Furthermore, there was significant difference ($P = 0.02$) of the BMI between the smokers and non-smokers subjects. **Conclusion:** the study revealed that the BMI is inversely proportional to smoking status, in which the reduction in the BMI level is linked with the chronic consumption of cigarette smoking and vice versa. We believe that awareness sessions should be directed to the college age youth about the smoking hazards as 45.7% of our sample were smokers. In addition, smoking status and quitting strategies should be accounted during body weight management.

Keywords: smoking, body mass index, obesity, student, Ahlia University

INTRODUCTION

Smoking prevalence in Bahrain (19%) is lower than in many developed and developing countries. In which male smokers consider as 33% and females smokers as 8%. The proportion of male smokers in those aged 15 and above is 31.3% and 37.6% in those aged 20 and above. However, the prevalence of female smokers in Bahrain exceeds the most of non-Arab developing countries but lower than the rate for Arab females. In addition, the smoking percentages among medical students are 26.6% in the first year,

25.5% in the second year and 25.4% in the third year. Furthermore, 20% of them using cigarettes and 13 % water-pipes (Hamadeh et al., 1992 and Al-saweer, 2009).

Chronic health condition such as cancer, diabetes and heart disease are caused by many risk factors which the smoking, obesity and heavy drinking are the chief among them. These factors are widespread, however, only the obesity has raised through the past twenty five years (Sturm, 2002).

Smoking has been incriminated as a leading

cause of preventable deaths, killing nearly 6 million people each year, which observed to be variably associated with lower body weight in individuals. However, the relation between smoking and obesity is incompletely understood (Chhabra and Chhabra, 2011).

The percentage of deaths in the United States is about one fifth of the population; due to smoking, 28% lung cancer which it's the biggest cause of mortality and considers as the most popular cause of death from smoking, 37% vascular disease and other respiratory diseases by 26% (Peto et al., 1992, Travis et al., 1995 & Shopland et al., 1991).

Lung cancer is the higher smoking risk than other type of cancer. However, oral, pharyngeal and esophageal cancers considers as a major risk from the combination of both smoking and alcohol consumption (Day et al., 1993 & Gammon et al., 1997).

In United State, low educational level, bad neighborhoods, low revenue with young age are the most reasons for the smokers to steadiness in the smoking pathway. Although, there are other reasons like: modulate the mood and keep the stability of the nicotine level in the brain; to prevent the negative effects from nicotine withdrawal. Thus, lower arousal level, higher impulse level and higher level of stress are the symptoms of the nicotine withdrawal (Bergen and Caporaso, 1999).

Substance abuse, depression and anxiety disorders are the most diffused psychiatric co morbidity conditions. However, nicotine dependence is the commonest psychiatric diagnosis in the United States and it has been confirmed that the addiction to nicotine as the psycho-pharmacologic mechanism that maintains the smoking behavior (Bergen and Caporaso, 1999).

There is an inverse relationship between smoking habit , lifestyle and body mass index(BMI),furthermore the most important causes of obesity now a days are dietary habit and secondary lifestyle (Sneve and Jorde, 2008). Moreover, the inverse relation becomes strong with age and smoking duration (Molarius et al., 1997).

Obesity and overweight is refer to an increase in the amount of body fat and assessed by Body weight and height are obtained as health technicians at medical examination site and its calculated as weight in kilograms divided by height in meter squared (Sturm,2002).

The growth in the income as a result from oil

producing in the Arabian Gulf has a significance increased in the prevalence of obesity (Alnohair, 2014).The Gulf countries (Kuwait, Saudi Arabia, United Arab Emirates and Bahrain) are the top ten lists worldwide with a highest rate of obesity (Ono et al., 2005).

In Bahrain, the prevalence of obesity is high among middle aged and elderly population due to lack of physical activity which is playing an important role among Bahraini population and the prevalence of obesity grade was:(43%) obesity grade 1, (17%) obesity grade 2 and (8%) obesity grade 3 (Al-Mahroos and Al-Roomi, 2001 & Alnohair, 2014).

1.6 billion adult and more are overweight and 400 million are obese according to World Health Organization in worldwide (Sneve and Jorde, 2008). Mortality, coronary heart disease, osteoarthritis, diabetes mellitus, hypertension and cancer are the risk factor that increased with increasing in BMI (Sturm, 2002).

The proportion of overweight and obese was greater among non-smoker in compare with smoker that underweight and there is an association factor such as gender and economic status has significant effect on BMI (Chhabra and Chhabra, 2011).

Smoking, obesity and other factors causing metabolic syndrome are linked with each other by strong evidence. Moreover, there is a lack of information on whether an association between smoking status and BMI. Thus, the purpose of this study is to investigate these relationships in a sample of healthy Bahraini adults.

MATERIALS AND METHODS

Participant:

81 male students from different Ahlia University Colleges were recruited to participate in this study and their ages ranged from 18 to 25 with a mean age (21.28 ± 2.007) years. To be included in the study, all participants had to be enrolled in an undergraduate program at Ahlia University. In addition, they had to be their smoking status not less than one year. Exclusion criteria were ex-smoker, history of any disease affect BMI and weight such as cardiovascular disease, respiratory disease, thyroid gland disease, diabetes, hyper tension and osteoarthritis and female participant.

Research Design:

This study is cross-sectional non-experimental study designed to investigate the relation between

smoking status and BMI among Ahlia University student.

Ethical Issue:

Prior to any commencement of the study trial (baseline measurements and operation), written consent was obtained from the entire participant. All data obtained and assessed during the period of study trial was kept highly confidential.

The participants have the ability to withdraw from our research study anytime.

Instrument:

1. Weight scale: we used Nevica weight scale to measure the weight.
2. Height scale: To measure the height we used Detecto Stadiometer which is made in Haryana, India under standard steel company (1998).

Procedure:

Male participants were gathered from Ahlia University and they were explained about the purpose and procedure, and they were handed a written consent. Following the completion of consent, the questionnaires were distributed among the volunteers, examiner were there to help them if they had any question or doubts. Once the participant finished completed the questionnaires, their height and weight were taken. Later, the BMI and smoking status were calculated by the examiners and statistical analysis was performed to obtain the result.

Questionnaire:

Fagerstrom tolerance questionnaire used to measure the smoking status, which is consisted of 7 questions asked from the participants, and later on the score were given based upon the answer (Etter and Perneger, 2001 & Hatziandreu et al., 1989).

The classification is smoker and non-smoker.

The 7 questions are:

1. Are you smoker or non-smoker?
2. How soon after you awake do you smoke your first cigarette?
After 30 minute or within 30 minute
3. Which of all the cigarettes you smoke in a day is the most satisfying?
Any other than the first one in the morning or the first one in the morning
4. How many cigarettes a day do you smoke?
1-15 or 16-25 or more than 26
5. Do you smoke more during the morning than during the rest of the day?

No or Yes

6. Do you smoke when you are so ill that you are in bed most of the day?

No or Yes

7. Does the brand you smoke have low, medium or high nicotine content?

Low or medium or high, Mention the brand if possible

The assessment is made by the total score of all the 7 items.

It's a series of questions used to measure the exposure to cigarette smoke and to determine the smoking intensity level in research as well as clinical studies is considerable to be valid. This self-report is still a reliable tool for monitor the changes of smoking behavior in the population (Etter and Perneger, 2001 & Hatziandreu et al., 1989). This measurement was chosen by other smoking research; because it has acceptable reliability and validity (French et al., 1994).

Weight:

Position of the subject:

In the beginning, students were ordered to remove the heavy outerwears with the shoes, so they measured either barefoot or wearing socks. Then they stand on the center of the scale platform with body weight equally distributed between all body parts, face forward with hold the head up, body position in straight line, both of the hand hanging loosely with palms facing inward until the examiner recorded the reading.

Height:

Position of the subject:

Height of the students were gauged by using the Stadiometer, which they were instructed kindly to remove their shoes, stand with their feet together on the center of the base plate, heel against the rod, weight should be evenly distributed on both feet, back in straight line, both of the hand hanging loosely by their sides and facing forward. Next we moved the students head to make the Frankfort plane in a horizontal position and asked the students to look forward, and then Stadiometer head piece was lowered firmly with adequate pressure on the upper point of the head to compress the hair. After that we looked at the lower edge of the head plate cuff and record the reading of the student's height. BMI defined as the individual's body mass and its calculated by use of height and weight of each student via the following equation:

$$BMI = \frac{weight(kg)}{(height(m))^2}$$

Statistical Analysis:

Descriptive and inferential statistics were applied to the collected data using SPSS version 23. Pearson correlation was used to determine the relationship between smoking and BMI. P value was set at 5%.

RESULTS

In 81 male students from different colleges of Ahlia University aged ranged between 18-25 (21.28 ± 2.007) years old were used to investigate the correlation between smoking status and BMI. The participants were divided into two groups; 37 smoker students in group one and 44 non-smoker students in group two. The demographic characteristics of the subjects are presented in

table 1. The BMI and waist circumference were measured as an indicators of the obesity and there was a significant positive correlation ($r = 0.64$, $P = 0.0001$) between the two variables.

The mean value for the BMI for the smoker group was (24.33 ± 5.08) while the mean for the non-smokers was (27.99 ± 5.31). The BMI were compared between the smokers and non-smokers subject and showed a significant difference ($p < 0.05$) between both groups, table 2. In addition, Pearson correlation was applied and showed a significant positive correlation ($r = 0.33$, $P = 0.002$) between the BMI and the smoking status.

Among the 37 smokers of the sample, their smoking dependence score showed 27.03% were very high dependent on nicotine, table 3. Person correlation was applied between the BMI of the 37 smokers and their Fagerstorm scores and there was a significant negative correlation ($r = -0.69$, $P = 0.0001$).

Table (1): the demographic Characteristics of the study subjects (N = 81).

	Minimum	Maximum	Mean	SD
Age	18.00	25	21.28	2.007
BMI	16.52	41.01	26.32	26.32
Waist circumference	55.10	127.00	91.67	13.52

Table (2): Comparison of BMI between smokers and non-smokers

	BMI (Kg/m ²)	MD	95% Confidence Interval		t value	P value
			lower	upper		
Smokers (n= 37)	24.33 (± 5.08)	-3.09	-5.675	-0.523	-2.44	0.02
Non smokers (n= 44)	27.43 (± 5.42)					

BMI is presented as Mean (\pm SD), MD mean difference

Table 3: Smokers status score of Fagerstorm tolerance questionnaire (N= 37)

Dependence score	Smokers n (%0)
Very low	6 (16.2%)
Low	8 (21.62%)
Medium	8 (21.62%)
High	5 (13.51%)
Very high	10 (27.03%)

DISCUSSION

81 students with age ranged between 18-25 years from different Ahlia University Colleges were participated in the current study. They divided into two groups: smokers group consist of 37 students and the non-smoker group included 44 students. The outcomes were Fagerstrom tolerance questionnaire related to smoking status and BMI were calculated. We found that there is a significant difference between smoking status and BMI ($P = 0.02$). Our results are supported by Rasky et al., (1996); Jacobs and Gottenborg, (1981) and Molarius et al., (1997).

Satisfies oral needs with reduced the appetite are the commonest effect of smoking, so, people tend to smoke either to lower their weight or to keep their weight level stable. Thus, smoking turned into a critical way for controlling the weight(Rasky et al., 1996).

From psychiatric point of view, non-smokers have more health conscious than the smokers, which they put extra effort into keeping the lower weight. However, heavy smoking created a substance abuse behavior such as alcohol consumption and over eating, whilst the light smokers have smaller BMI (Rasky et al., 1996).

Substance abuse, depression and anxiety disorders are the most prevalent psychiatric comorbidity conditions in the United States. However, nicotine addiction is the commonest psychiatric diagnosis than these conditions. Furthermore, smoking cessation suddenly result in physical and neurological withdrawal symptoms (Bergen and Carporaso, 1999).

A 4-year longitudinal study was done by French et al., (1994) on the 10th grade students showed that there is no correlation between weight and smoking initiation among boys, however, girls who over care about their weight tend to start smoking compare to lower weight girls. Jacobs and Gottenborg, (1981), investigated subjects aged between 10-59 years old included men and woman, they found that the smokers are consuming more calories than those who never smoked, so, the smokers have a lower weight

than the non-smokers. Furthermore, longer duration of smoking with age makes the inverse relation between smoking and BMI stronger (Molarius et al., 1997).

Moreover, by using the second national health and nutrition examination survey which presents the health status of the population, it was found that the smokers are more leaner and have low weight than non-smokers of the same age and sex (Albanes et al., 1987).

In a study that was done to evaluate the association between smoking and BMI, they concluded that heavy smokers are associated with increasing in body weight and a changing in metabolic process (de Oliveira Fontes Gasperin et al., 2014). Baumert et al., (2010) reported that the difference in personality and lifestyle characteristics which lead to overweight and obesity are one of the possible explanation for increase body weight among smoker.

Oh and Seo,(2001) concluded that heavy smoker has a significance weight gain due to the higher consumption of alcohol in compare to light smoker, although there is no significance difference in BMI between smoker and non-smoker but they show adverse metabolic fat distribution with high amount of smoking.

Abdominal obesity and metabolic syndrome are risk factors that associated with smoking and there is a group of factor for diabetes mellitus type 2 and cardiovascular disease (CVD) that lead to central obesity, hyperglycemia and hypertension (Chiolero et al., 2008). Filozof et al., (2004), concluded that heavy smoker has a high weight in comparison to light smoker which gave an evidence that the weight loss is not a decrease in fat mass but it may be due to decrease in lean body mass.

The elevation in triglyceride and low high density lipoprotein cholesterol level are the most important components of metabolic syndrome that have a positive association with smoking and visceral adiposity (Park& Kim, 2005).

Increased in body fat level is the commonest health hazards that could inversely affecting human being. This condition can lead to social

impairment and reduced work production among individuals. Moreover, many studies suggested that the weight gain occurs from socio-economic factor including: high fat food consumption, sedentary life pattern, income specifically in Arabic countries and extreme outdoor temperature which impose to stay indoors, use cars for short distance and marry people tend to be overweight (Alnohair , 2014).

CONCLUSION

At the end of this study, it is concluded that there is a significance negative correlation between BMI among smokers and non- smokers. This study concluded that the BMI is inversely proportional to the smoking status. The current study is concentrated on the relation between the BMI and smoking status, while many other factors were not assessed such as physical activity. In addition, small sample size and there was lack of subjects who were obese or underweight and most of the subjects were normal BMI.

CONFLICT OF INTEREST

The authors have no conflict of interest to report.

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AUTHOR CONTRIBUTIONS

SAT and FMA designed and conducted research. DMK, FMA and SAT collected the data and undertook statistical analysis. FAA, DMK, FMA, and SAT wrote the manuscript. DMK and SAT revised and edited the manuscript. All authors contributed toward data analysis, drafting and critically revising the paper, gave final approval of the version to be published.

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