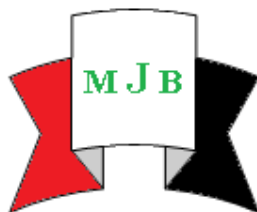


Pulmonary Function Test for Water Pipe smokers and Cigarette smokers in Males in Al- Hilla City during the Year 2014

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Abstract

A traditional pattern of smoking in the Middle Eastern countries is water pipe smoking. Publicly considered as a harmless entertainment. Many studies have shown that water pipe smoking associated with development of respiratory symptoms and varying degrees of reduction in the lung function. The aim of this study is to assess pulmonary functions among different groups of young male smokers: water pipe smokers, cigarette smokers, water pipe plus cigarette smokers, and compare it with a control (nonsmokers) group. This is a comparative cross-sectional study which conducted on 200 male subjects, subdivided into three groups of smokers: 50 water pipe smokers, 50 cigarette smokers and 50 water pipe plus cigarette smokers and a fourth group of 50 nonsmokers as a control group, all participants were apparently healthy and matched for sex, age, and body mass index they were selected from five primary health care centers in Hilla city. Data were collected through structured questionnaire for existence of respiratory symptoms and pulmonary function test was performed by portable electronic spirometer (discovery-2 USA) after gaining the participant consent.

There was no significant differences between the mean ages of the study groups ($p > 0.05$): water pipe smokers (23.96 ± 2.66), cigarette smokers (24.762 ± 2.25), water pipe plus cigarette smokers (24.382 ± 2.09) and nonsmokers (24.922 ± 2.25). The present study revealed that there was a significant reduction in the parameters of the pulmonary function test (forced expiratory volume in one second) (forced expiratory volume in one second / forced vital capacity %) for the three groups of smokers as compared to their expected (predictive) values as compared to the control group ($P < 0.001$). Lung function impairments were very severe in water pipe plus cigarette smokers which constituted 52% while in water pipe smokers it constituted 48%. Water pipe smoking lead to significant reduction in the lungs efficiency and increase in respiratory symptoms among young adult male water pipe smokers in Al-Hillacity. Pulmonary function test parameters were significantly reduced in Water pipe plus cigarette smokers urgent water pipe and tobacco smoking cessation campaign is strongly required.

Keywords: water pipe smoking, lungfunction, adultmales, Iraq.

فحص وظائف الرئة لمدخني النرجيلة والسكان من الذكور في مدينة الحلة لعام ٢٠١٤

الخلاصة

يعتبر تدخين النرجيلة تقليداً شائعاً في منطقة الشرق الاوسط وتعتبر بالنسبة للكثيرين تسلية غير مؤذية، في حين اثبتت الابحاث زيادة اعراض امراض الجهاز التنفسي وانخفاض وظائف الرئة بدرجات متفاوتة لمدخني النرجيلة. هدف الدراسة هو تقييم وظائف الرئة واعراض اعتلال الجهاز التنفسي لعينة من مدخني النرجيلة والسكان للذكور البالغين من مراجعي المراكز الصحية في مدينة الحلة- العراق.

دراسة مقطعية مقارنة لعينة قصدية (٢٠٠) شخص من الذكور البالغين من خمسة مراكز صحية اختيرت بشكل عشوائي وللفترة من الاول من شباط ٢٠١٤ الى الاول من ايار من نفس العام. قسمت العينة الى اربعة مجاميع كل مجموعة (٥٠) شخص حسب عادة التدخين: المجموعة الاولى من مدخني النرجيلة فقط والمجموعة الثانية من مدخني السكاثر فقط بينما اقتصرت المجموعة الثالثة على مدخني النوعين (السكاثر والنرجيلة) اختيرت المجموعة الرابعة من غير المدخنين على الاطلاق. تم جمع البيانات من خلال ورقة استبانة اعدت من قبل الباحثين ملأت بطريقة المقابلة بعد اخذ موافقة المشارك. تم قياس الوزن والطول لغرض حساب مؤشر كتلة الجسم. يتم ادخال هذه البيانات الى جهاز قياس وظيفة الرئة الالكتروني من نوع ديسكفري-٢ منشأ الولايات المتحدة الامريكية الذي استعمل لقياس وظائف الرئة وفق دليل الجهاز للمجاميع الاربعة تم التحليل الاحصائي باستخدام الحزمة الاحصائية للعلوم الاجتماعية نمط ٢٠.

ان معدل اعمار العينة الاولى والثانية والثالثة والرابعة: ٢٣.٩٦ و ٢٤.٧٦ و ٢٤.٣٨ و ٢٤.٩٢ ولا توجد فروق احصائية بين معدلات الاعمار للمجاميع الاربعة (الاحتمالية اكبر من ٠.٠٠٥). أظهرت الدراسة الحالية انخفاض ذو دلالة احصائية مهمة معنويًا (الاحتمالية اقل من ٠.٠٠١) في مؤشرات فحص اختبار وظائف الرئة (حجم الزفير القسري في الثانية الواحدة) و (حجم الزفير القسري في الثانية الواحدة /السعة الحيوية الاجبارية) في المجاميع الثلاثة من المدخنين مقارنة مع القيم المتوقعة لهم ومع مجموعة المقارنة من غير المدخنين بينت الدراسة تدهور حاد جدا وبفارق احصائي معنوي لمجموعة مدخني السكائر والرجيلة معا والذي يشكل (٥٢%) يليها تدهور وظائف رئة مدخني الرجيلة لوحدها (٤٨%). وتبين من البحث زيادة ملحوظة في اعراض امراض الجهاز التنفسي لمدخني التبغ، تدخين الرجيلة لوحدها او مع السكائر من قبل الذكور البالغين يؤدي الى تدهور خطيري في كفاءة الرئة وزيادة في اعراض امراض الجهاز التنفسي.

الكلمات المفتاحية: تدخين الرجيلة، وظائف الرئة، الرجال البالغين، العراق

Introduction

Water pipe smoking is currently showing all signs of a being a global epidemic with serious implications for public health and tobacco control worldwide [1]. However, The World Health Organization (WHO) attribute 6 million deaths a year to tobacco use, and expected to rise to >10 million by 2030 , 70% of these premature deaths will be in developing countries, one-third of which will be children. In our society, the general false belief is that water pipe smoke is not harmful or at least not as dangerous as cigarette smoke [2]. Water pipe smoking is implicated in causation of 15 types of cancer especially bronchogenic carcinoma, respiratory illnesses, cardiovascular disease and low birth weight [3]. A typical one hour long water pipe smoking session involve inhaling 100-200 times the volume of smoke inhaled with a single cigarette, depending on the toxicant measured; a single water pipe session equivalent to as many as 50 cigarettes. A pack of tombak is 40 g, and for each session 10 to 20 g of tombak are burned [4]. Even after it has been passed through water, the smoke produced by a water pipe contains high levels of toxic compounds, including nicotine, tar, carbon monoxide, heavy metals and cancer causing chemicals [5] as water pipe smoke contains 36 times the amount of nicotine in cigarette smoke, higher concentrations of heavy metals, higher concentrations of CO [6, 7], and about 350 mg tar [8]. Water pipe tobacco smoking has been primarily associated with adult usage, but recently there has been an emergence of the practice among younger adults and adolescents [9]. Several studies have reported the effects of water pipe

smoking on pulmonary function test (PFT) [10-13]. This study was conducted to estimate the pulmonary function test and respiratory

symptoms among the different groups of smokers: water pipesmokers, cigarette smokers, water pipe plus cigarettes smokers, and compare to nonsmokers.

Subjects and Methods:

Study Design: Cross-sectional comparative study

Study Location: This study was carried out at five primary health care centers (PHCC) in Hilla city: (Ibn Tufail PHCC in Auffy village , Al-Hussain PHCC in Abu Garaksubdistrict , Al-Quds PHCC in Al -Tuhmaziavillage, Training Babylon PHCC in Al-Gemaya, Intifadhet Al-Aqssa PHCC in Al-Qadhya). The study period started from the beginning of February 2014 and ended in the beginning of May 2014.

Inclusion criteria: Participants in this study were selected in a convenient way from attendees of the PHCC, only adult males above eighteen years old were included. Males who smoke shisha for two years and more, at least one session per month and current cigarette smokers who smoke at least for two years were recruited to participate in this study. The control group was those who didn't smoke tobacco during their life. Those who smoke both water pipe (WP) and cigarettes considered as one group (both).

Exclusion criteria: Subjects with anatomical abnormalities of the thoracic cage, vertebral column (kyphosis or scoliosis), neuromuscular diseases, pulmonary tuberculosis, bronchial asthma, chronic bronchitis, co-morbidities other than those related to tobacco use (cardiovascular

diseases, diabetes, and neoplasia), imperfect performance of the respiratory maneuvers and subjects who had undergone abdominal or chest surgery.

Data Collection: Structured questionnaire was prepared by the researchers to collect data by interview. The questionnaire included the following information: the socio-demographic characteristics which include (age, residence, occupation, educational level, socio-economic status, marital status). Smoking characteristics include (regularity of water pipe or cigarette smoking, number of session of water pipe smoking per month or number of cigarette per day and duration of water pipe and cigarette smoking).Respiratory symptoms include (productive cough, shortness of breath and wheeze). Respiratory symptoms: Cough and sputum production were assessed as experienced on most days for at least 3 months over each of 2 consecutive years. Dyspnea and wheeze were assessed as experienced during exertion.

Measurements: Height:The height was measured to the subject without shoes using height board with a horizontal head board that contact to the upper most point of the head.

Weight:Weight was measured without shoes and with light cloths as much as possible. The weight was measured by Detecto instrument [USA]Standardization with other types of scales was done and the results were identical to a large extent. Body Mass Index (BMI) was calculated according to the following equation: Weight (kilo gram) /height² (meter²) [14].

Spirometer: PFT was performed by an electronic portable spirometer (Discovery-2

USA), the test was performed by the author himself. To optimize precise technique: in which the participant takes deep breath then forcefully expire it and then holds the breath till the end of the test, the test for present study was based on operation manual of the device with reference to official ATS (American Thoracic Society)[14].The Test was performed at the same time from 8 am to1pm to minimize any physiological variations [15]. The whole procedure was explained to the participant before starting, then the test was done in sitting position with the use of nasal clip, the test was repeated for three times to get the highest value of PFT parameters. At the beginning of the test, the following information entered to the spirometer: Identification number for each participant, date of birth; month, day, year; gender, the smoking habit, height in centimeters, and weight in kilograms.

The spirometer gives the results as printable graph, which includes the following values:

1.The expected [predictive] values which depend on the entered information of the subject.

2. The best [actual] one of three tests values which is based on performance of maximal inspiration and expiration of the subject. The pulmonary function test parameters are:

The forced expiratory volume in one second (FEV1), the forced expiratory volume in one second/forced vital capacity% (FEV1/FVC %)and the forced expiratory volume in one second percent predicted(FEV1% Predicted).

A method of categorizing the severity of lung function impairment based on the FEV1% predictive. (Normal >80%).

Degree of the severity	FEV1% predicted
Mild	>70
Moderate	60-69
Moderately severe	50-59
Severe	35-49
Very severe	<35

Severity of spirometric abnormality based on the forced expiratory volume in one second (FEV1) [16].

Statistical analysis was carried out using SPSS version 20. Pearson's chi square (X2) test and fisher exact test were used to find the association between the categorical

variables. ANOVA test was used to find the mean differences between three groups or more .A p-value of ≤ 0.05 was considered as significant.

Results:

Table (1) reveals a significant reduction in actual FEV1 ($p<0.001$) among smokers of water pipe and cigarette as compared to other groups. Table (2) shows the mean differences of predictive FEV1 of the study groups, water pipe smokers and smokers of both water pipe and cigarettes are significantly affected ($p<0.001$). Table (3): explains the mean differences of

FEV1/FVC(%actual) among the study groups smokers of both water pipe and cigarettes are significantly reduced ($p<0.001$). Table(4) demonstrates the mean differences of FEV1/FVC(%predictive) by study groups the water pipe and the smokers of both are significantly affected. Table (5): shows that lung function impairment is severely affected in shisha smokers and in smokers of both types of tobacco (water pipe and cigarettes). Table (6) reflects the high significant prevalence of respiratory symptoms among cigarette smokers and water pipe smokers as compared to nonsmokers.

Table 1 The mean differences of actual FEV1 by study groups

Study groups	N	Mean $\pm$ SD	F-test	P-value
Water pipe smokers	50	2.22 $\pm$ 0.81	20.235	<0.001*
Cigarette smokers	50	2.89 $\pm$ 0.97		
Both	50	2.14 $\pm$ 0.96		
Non smokers	50	3.30 $\pm$ 0.69		

Table 2 The mean differences of predictive FEV1 by study group

Study groups	N	Mean $\pm$ SD	F-test	P-value
Water pipe smokers	50	4.13 $\pm$ 0.31	7.965	<0.001*
Cigarette smokers	50	3.94 $\pm$ 0.43		
Both				
Non smokers				
Both				
Non smokers	50	3.78 $\pm$ 0.39		

Table 3 The mean differences of FEV1/ FVC (% actual) by study groups

Study groups	N	Mean $\pm$ SD	F-test	P-value
Water pipe smokers	50	4.13 $\pm$ 0.31	7.965	<0.001*
Cigarette smokers	50	3.94 $\pm$ 0.43		
Both	50	4.08 $\pm$ 0.40		
Non smokers	50	3.78 $\pm$ 0.39		

Table 4 The mean differences of FEV1/ FVC (% predictive) by study group

Study groups	N	Mean $\pm$ SD	F-test	P-value
Water pipe smokers	50	0.82 $\pm$ 0.01	28.366	<0.001*
Cigarette smokers	50	0.80 $\pm$ 0.02		
Both	50	0.82 $\pm$ 0.01		
Non smokers	50	0.79 $\pm$ 0.02		

Table 5 Association between smoking habits and lung function impairment

Variable	Study groups				χ^2	P-value
	Water pipe smokers (%)	Cigarette smokers (%)	Both (%)	Non-smokers (%)		
Normal or mild (≥ 70)	12 (24.0%)	34 (68.0%)	14 (28.0%)	45 (90.0%)	63.796	<0.001*
Moderate and moderate severe (50-69)	14 (28.0%)	6 (12.0%)	10 (20.0%)	4 (8.0%)		
Severe and very severe (≤ 49)	24 (48.0%)	10 (20.0%)	26 (52.0%)	1 (2.0%)		
Total	50 (100.0%)	50 (100.0%)	50 (100.0%)	50 (100.0%)		

Table 6 Association between smoking status and clinical manifestations

Clinical manifestations	Study groups			χ^2	P values
	Water pipe smokers (%)	Cigarette smokers (%)	Both smokers (%)		
Cough and sputum					
Present	18 (36.0%)	14 (28.0%)	26 (52.0%)	6.297	0.043*
Absent	32 (64.0%)	36 (72.0%)	24 (48.0%)		
Shortness of breath					
Present at rest	5 (10.0%)	9 (18.0%)	8 (16.0%)	6.994	0.136
Present at exertion	22 (44.0%)	30 (60.0%)	27 (54.0%)		
Absent	23 (46.0%)	11 (22.0%)	15 (30.0%)		
Wheeze					
Present	9 (18.0%)	16 (32.0%)	22 (44.0%)	7.87	0.02*
Absent	41 (82.0%)	34 (68.0%)	28 (56.0%)		

Discussion

Unfortunately there is no study carried out in our country to compare with. This study adds to the rapidly growing evidence of the association of water pipe smoking with deleterious health outcomes [3], which has very important implications for both clinical and public health practice[17].In the present study: there is a significant decline in pulmonary function testparameters FEV1, FEV1/FVC% in relation to smoking; these parameters were significantly reduced in the three groups of smokers compared to the control group: water pipe plus cigarette smokers showed the highest reduction in spirometric parameters as compared to other groups, water pipe smokers had higher reduction in spirometric parameters as compared to cigarette smokers.The severity of lung function impairment was: more severe in water pipe plus cigarette smokers than water pipe smokers alone whom in turn more severe than cigarette smokers.These findings agreed with the findings of the following studies:Boskabady M H et al (2012):In Iran proved that All PFT values were significantly lower in WP smokers than in cigarette smokers and both groups are lower than non-smokers [10].Another Iranian

study which was conducted in 2006 proved that PFT parameters reduced remarkably in water pipe smokers [12].Similar study concluded water pipe smoking was associated with a statistically significant reduction in FEV1 and FEV1/ FVC %[18].Al Mutaury et al (2006) demonstrated an earlier effect of water pipe smoking compared with cigarette smoking on PFT values, which supports the results of the present study and could be due to the higher nicotine content of water pipe smoke [19].Nicotine is a poison and not just a long-term poison in the sense that smoking can put you on the slow but steady road to cancer. Nicotine is found in the smoker's blood, to the extent that blood nicotine of a daily water-pipe user is similar to that of an individual who smokes 10 cigarettes per day[20].In contrast to our findings Mohammad Y et al (2008): found that FEV1/FVC and FEV1 alteration are more presents in cigarette smokers; with a significantly higher degree of alteration in cigarette smokers expressed by a greater decrease in FEV1 .while alteration of all these variables in control subjects is very low[11]. Ben Saad H et al(2013): researchers from Tunisia conducted a study revealed that Chronic exclusive water pipe

smoking has less adverse effects on pulmonary function tests than chronic exclusive cigarette smoking as there is significantly lowering in FEV1 and FEV1/FVC% in cigarette smokers more than water pipe smokers[13]. A Turkish study showed a smaller effect of water pipe smoking on PFT values, as compared with cigarette smoke [21]. The present study revealed an increased prevalence of respiratory symptoms among water pipe plus cigarette smokers, except for shortness of breath which was not significant. The differences in the prevalence of symptoms among the three groups of smokers, and the correlations between smoking and respiratory symptoms, were less marked than those of the PFT values. The cause of these findings is perhaps the subjective nature of the data on respiratory symptoms or due to the environmental factors. Mohammad Y et al (2008): showed that there were a higher proportion of respiratory symptoms in water pipe smokers compared with cigarette smokers[11]. Boskabady M H et al (2012): revealed an increased prevalence of respiratory symptom among water pipesmokers, and, to a lesser extent, among cigarette smokers[10]. These findings indicate that the beliefs of most users, and even physicians, regarding the filtering of toxic components of tobacco smoke by water and the less harmful effects of this type of smoking compared with cigarette smoking, should be changed[22]. Going through the literature, there was no study carried out in our country to compare with. So the present study brings our attention to a very critical point: Water pipe smoking has serious harmful effects on lung function especially if it is accompanied with cigarette smoking among adult Iraqi males. There is a marked increase in the respiratory symptoms among the groups of smokers which indicate progressive obstructive changes in the lung tissue [23, 24, 25]. Our results illustrate the need to change the public opinion on water pipe, and to encourage anti-tobacco campaigns through the reactivation of the anti-smoking Iraqi law legislated by Iraqi parliament last year.

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