

COMPARATIVE ASSESSMENT OF LUNG FUNCTIONS OF SHISHA SMOKERS AND NON-SHISHA SMOKERS IN PORT HARCOURT

Tamuno-Opubo, Abiye¹ Austin-Asomeji, Iyingiala² Stanley, Rosemary Oluchi³
Badamosi, Adetomi⁴ Abiye, George⁵ Boma, Benstowe¹
Tamuno-Opubo, Simple Chimenem⁶

¹Department of Human Physiology, College of Medical Sciences, Rivers State University

²Department of Community Medicine, College of Medical Sciences, Rivers State University.

³Department of Internal Medicine, University of Port Harcourt Teaching Hospital.

⁴Department of Community Medicine, College of Medical Sciences, Rivers State University

⁵Department of Anaesthesiology, College of Medical Sciences, Rivers State University

⁶Platinum Premium Medical Centre.

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Abstract: Shisha smoking is a pattern of smoking, publicly considered as a harmless entertainment. This study was aimed at assessing the lung function in 40 shisha smokers and 40 non-shisha smokers. The lung function of each subject was assessed using an electronic spirometer. Subjects were categorized into 4 subgroups. 2 subgroups for shisha smokers and 2 subgroups for non-smokers (males and females respectively). The outcome of the present study on lung function indices of the shisha smokers were all found to be marginally different when compared to those of non-shisha smokers. All the lung function parameters were comparatively depressed in the male subjects. These results show that shisha smoking can be associated with outbreaks in either of or both of restrictive or obstructive pulmonary diseases.

Keywords: Hookah, Shisha, lung function, male, female.

I. INTRODUCTION

Shisha (hookah, waterpipe, hubble-bubble or narghile) is a type of tobacco smoking that has recently gained popularity in many developed and developing countries [1, 2]. Shisha is a type of tobacco smoking invented in the 16th century by a physician named Hakim Abul-Fath Gilani. The device's purpose was to pass smoke through water in an attempt to 'purify' the smoke, an unproven concept that the medical community has repeatedly questioned [3].

Shisha smoking is a type of tobacco consumption that involves smoking flavoured or unflavoured tobacco through a single or multi-stemmed instrument, with smoke designed to pass through water or other liquid before reaching the smoker. The appealing flavours of shisha, as well as the misconception that it is safer than traditional cigarettes, may be driving its growing popularity [4]. Shisha is composed of consumable components such as mu'assel, which is flavored tobacco, and charcoal.

Shisha smoking is becoming increasingly popular in Nigeria's major cities [5]. The trend is quickly permeating society and is commonly practiced by university undergraduates, adolescents, and the elderly in restaurants and hotels, as well as at social gatherings [5]. Variable factors mediating this abrupt trend include smoking for pleasure, smoking for its stimulating effect, experimentation, and perceived safety compared to cigarettes. Shisha smoking has societal significance as a fashion symbol. It appears that shisha smoking has become a cultural norm in Nigerian nightclubs [5].

Previous research has found that shisha smoking has an effect on lung function that may be cardiovascular in nature. These effects include breathlessness due to swelling and narrowing of the lung airways, excess mucus in the lung passages and irritation of the trachea and larynx. Many people believe that smoking shisha is less addictive and less harmful than smoking cigarettes [4, 6, 7].

Several studies have reported the effects of shisha smoking on small airways function and pulmonary function tests, despite the evidence regarding the effects of shisha smoking on health and the fact that shisha smoking is prevalent in developing countries [8]. Shisha smoke contains a high concentration of toxic ultrafine particles that pose the same health risks as smoking cigarettes [9]. Shisha contains a variety of harmful chemicals, including nicotine, arsenic, methane, butane, cadmium, carbon monoxide, formaldehyde, and hydrogen cyanide [2].

Nicotine has been identified as a preventable cause of disease and death all over the world [10]. While its impact on high-income countries is diminishing, it continues to have a significant impact on low and middle-income countries, including Nigeria. For example, annual mortality from tobacco use is estimated to be around 5 million, accounting for one in every five male deaths and one in every twenty female deaths among those over the age of 30 [10]. Shisha smoking, in particular, has been shown to have a hypertensive effect, and it is also a risk factor for respiratory diseases such as chronic obstructive airway disease, lung, esophageal, and gastric cancers [11], obstetric and perinatal complications such as birth defects [12], and infectious diseases caused by viral isolates such as herpes from the waterpipe [13].

The nation's future generation is unaware of the dangers of smoking, particularly shisha. They believe that shisha is just flavored liquid that has no effect on their health, so they are more likely to smoke shisha [9]. Previous research has found that shisha smoke contains more nicotine than cigarettes, ranging from 2 to 4 percent versus 1 to 3 percent, respectively [9]. Shisha smoke also contains three times as much carbon monoxide as cigarette smoke [9]. Smoking in youth has become a common occurrence in our modern society. South East Asian countries have the highest rates of tobacco smoking, according to the World Health Organization (WHO) [9]. Variable factors mediating this sudden trend include smoking for pleasure, smoking for its stimulating effect, experimentation, or perceived safety compared to cigarette smoking [5]. Several authors have proposed a variety of reasons for its growing acceptance and appeal, including the perception of its less harmful effects when compared to cigarette smoking [1], the perception of it being less hazardous to health due to the addition of fruit flavors, the perception of it being less addictive than cigarette smoking, and its societal relevance as a fashion symbol [5].

However, shisha smoke contains 6.5 times more carbon monoxide, 1.7 times more nicotine, 46 times more tar, and dangerous heavy metals. As a result of sharing shisha mouth pieces, users are at a high risk of addiction, cardiovascular disease, respiratory disease, and infections such as tuberculosis and herpes [5]. The lung function test may indicate deterioration of lung function and its results can be used to prevent the incidence of diseases of the lungs. The test looks for how much air the lungs can hold, how well air is moved in and out of the lungs and how well the lungs move oxygen into the bloodstream.

Shisha is referred to by a variety of names, including argileh, goza, hookah, waterpipe, hubble bubble, and narghile. Its origins are frequently traced to India, though some believe it was first used in South Africa, Persia, Ethiopia, or other countries [14]. There are two theories about the origins of shisha (hookah). The first is that tobacco use became widespread following the Jesuits' introduction of tobacco to mediaeval India. Abul-Fath Gilani, a Persian physician of Akbar, invented the shisha or hookah in the Indian city of Fatehpur Sikri during Mughal India [15]; the hookah spread from the Indian subcontinent to Persia first, where the mechanism was modified to its current shape, and then to the Near East [16]. It could also have originated in Persia during the Safavid dynasty, [15], from where it spread to the Indian subcontinent [16].

In Israel, the most common name is Nargilah. It is derived from nārgil, which is derived from the Sanskrit word nārikela, which means coconut, implying that early hookahs were carved from coconut shells (Lankanewspaper, 2010). It is known as qalyān in Persian. The pipe is referred to as nargile in Serbia, Bosnia and Herzegovina, North Macedonia, Greece, Turkey,

and Bulgaria (Ezgot, 2017). There are usually one or two mouth pieces on the pipes there. The flavoured tobacco, which is made by marinating tobacco cuts in a variety of flavoured molasses, is placed above the water and covered by pierced foil, with hot coals on top, and the smoke is drawn through cold water to cool and filter it. The hookah is known as "lula" or "lulava" in Albania. It is known as narghilea in Romania [16].

Hookah is known as a chillim in Uzbekistan and Afghanistan.

Hookah is known as "Jajeer" in Kashmir [16].

Hookah is known as "Guduguda" in the Maldives [16].

Hookah is known as "Shisha" in Germany, Austria, Nigeria and Switzerland [16].

Hookah is known as "hitboo" in the Philippines and is commonly used to smoke flavoured marijuana.

In the United Kingdom, the hookah pipe is also known as the "marra pipe," especially in the North East, where it is used for recreational purposes.

It is known as huqqa in Sindhi, another South Asian language [16].

Hookah is known as hookah shisha (bnh shisha) in Vietnam, and shisha is known as "shisha tobacco" (thuc shisha) [16].

According to the World Health Organization (WHO), tobacco use kills more than 7 million people worldwide each year [7]. More than 6 million of these deaths are the result of direct tobacco use, and nearly 0.9 million are the result of secondhand smoke exposure [7]. Nigeria, along with other low- and middle-income countries, bears nearly 80% of the global burden of tobacco-related mortality [7]. A multi-country study of school children aged 13–15 in several Arabian Peninsula countries (Bahrain, Oman, Qatar, United Arab Emirates, Kuwait, and Yemen) found that the prevalence of shisha smoking ranged from 9% to 15% [1]. In this study, the prevalence of shisha smoking was higher than that of cigarette smoking [1].

The prevalence of shisha smoking was 21.5 percent and 18.6 percent, respectively, in two cross-sectional studies conducted among medical students from two universities in Pakistan and South Africa [4, 17]. Another cross-sectional study involving 427 university students at a private university in Kigali City, Rwanda, discovered that 26.1 percent had ever smoked shisha, and 20.8 percent had smoked in the previous 30 days [18]. Some other cross-sectional study of 389 first-year students at a university in the Western Cape, South Africa, found that 40% of those polled were current shisha users [19]. In this study, the average age for first-time shisha smokers was 15.7 years [19]. In a case-control study, it was discovered that waterpipe dependence significantly increases the risk of chronic bronchitis [13].

There are various types of shisha, each with its own size, shape, and composition. It is composed of a head (bowl), stem, vase (water bowl), hose with a mouthpiece, purge valve and tray. The head of the shisha is a container that holds the coal and tobacco during the smoking session [3]. It is typically made of clay, marble, or glass. Tobacco is loaded into the bowl, which is then covered with a screen or perforated aluminium foil. The tobacco is then heated to the proper temperature by placing lit coals on top [14, 16]. The stem is a vertical pipe from the bowl to the vase. The shisha's body rests on top of the vase. The down stem hangs below the water level in the jar. Smoke enters the body and exits through the down stem, where it bubbles through the water. The smoke is cooled and humidified as a result of this. Fruit juice, for example, can be added to or substituted for water. Fruit, mint leaves, and crushed ice can all be added. The hose (one or more) is a thin, flexible tube that allows smoke to be drawn for a long distance and cooled before inhalation. The end is usually fitted with a metal, wooden, or plastic mouthpiece of varying shapes, sizes, colours, and materials. Today, the hoses are typically made of vinyl, making them easy to clean [14, 16]. Many shishas have a purge valve connected to the airspace in the water jar to purge stale smoke that has been sitting unused in the jar for an extended period of time. This one-way valve is typically a simple ball bearing sitting over a port that seals the port solely by gravity and opens if positive pressure is created by blowing into the hose. A screw-on cover keeps the bearing in place. To ensure proper sealing, the cover should be opened on a regular basis and the bearing and seat cleaned of residue and corrosion. A wind cover is placed over the bowl area and has some form of air holes. This prevents wind from increasing the burn rate and temperature of the coal, as well as ash and burning embers from being blown into the surrounding environment. A plate or ashtray sits just below the bowl to catch ashes that fall off the coals [16].

On October 2, 2014, The Nation newspaper reported, 'Normally, the bottom container is meant to be filled with water, but students now fill it with gin and rum.' Also, the flavour is intended to be inhaled without being mixed, but smokers in the area have devised ways to mix it with weed [marijuana] and other hard drugs' [4].

Shisha smoking involves the use of coal to burn flavoured tobacco known as mu'assel. When a person inhales through the mouthpiece, air is drawn through the apparatus into the tobacco and heated by the coal to produce smoke. As a result, the smoke contains both tobacco and coal components. Polycyclic aromatic hydrocarbons (PAH), volatile aldehydes, CO, nitric oxide (NO), nicotine, furans, and nanoparticles are examples [3]. PAH, a carcinogenic compound, is found in both tobacco-containing and tobacco-free mu'assel (Sepetdjian & Saliba, 2010). These high levels are primarily the result of coal combustion.

Shisha smoke is hazardous to one's health. Several studies have found significant amounts of CO, aldehydes, PAH, ultrafine particles, and respirable particulate matter in secondhand shisha smoke [20]. Shisha smoking emits more CO, PAH, and volatile aldehydes than cigarette smoking [21]. Furthermore, direct toxicant emissions from shisha smoked with a tobacco-free preparation were equal to or greater than those from tobacco-based preparations. Thus, smoke from tobacco-free shisha products is hazardous, and has the same toxicant content and biological activity as tobacco-based products, with the exception of nicotine [20].

The amount of nicotine—the primary cause of tobacco addiction—in shisha varies greatly depending on the type of tobacco used. As a result, the amount consumed by the user is determined by shisha use characteristics, which are adjusted based on nicotine levels in tobacco used to deliver desired doses [22]. Plasma nicotine levels were found to be increased in hookah users, similar to cigarette smoking, indicating systematic nicotine delivery. However, when compared to cigarette users, these levels were much higher, which could be explained by longer "shisha" sessions with a higher puff number/volume [22].

After smoking shisha, there is a significant risk of contracting herpes, hepatitis, or tuberculosis. Shisha is frequently smoked in large groups rather than individually [3]. Various commensal and pathogenic organisms may be transmitted between smokers via saliva by sharing mouthpieces [3]. Recently, shisha cafes have begun to provide each customer with a plastic disposable mouthpiece, with the goal of limiting the spread of communicable diseases. The moist nature of shisha molasses creates an environment that promotes the growth of many different microorganisms, increasing the risk of infectious disease [3]. Although well-run shisha cafes regularly clean their shisha pipes, the relatively rigid and complicated structure of the shisha apparatus makes cleaning the internal aspects nearly impossible. [3]. In a study, Safizadeh et al. [13] discovered bacterial contamination of the mouthpiece (either fixed or disposable) and/or bowl in 83 percent of cases.

Contrary to popular belief, shisha smoking has similar adverse cardiovascular health outcomes to cigarette smoking, with comparable acute and long-term effects. There are elevated plasma nicotine levels and exhaled CO levels, which are consistent with previously reported data [15]. Some authors concluded that shishah smoke increases the risk of developing coronary artery disease and advocated for efforts to reduce shisha use [15]. Particulate matter concentrations in the air are frequently used to assess the pollution levels caused by tobacco smoke [22]. In bars, cigarette smoking emits high levels of particulate matter, exposing both customers and employees to hazardous levels of pollutants [22]. Similarly, the Environmental Protection Agency (EPA) classified the air quality in shisha lounges as "unhealthy" to "hazardous," with high concentrations of particulate matter. Such air quality poses health risks, particularly for those with pre-existing pulmonary and cardiovascular disease, and poses a potential health hazard for workers who are exposed to secondhand hookah/smoke on a daily and long-term basis [22].

Some of the likely reasons for the increasing popularity of shisha in society are: peer influence, the myth that shisha is less harmful than traditional cigarettes, and the negative influence of social media and celebrities [4]. Other possible explanations for the rise in shisha use include the proliferation of shisha venues, cafes, and bars, as well as subtle shisha advertisements in the food and lifestyle sections of some newspapers [4]. Curiosity was found to be the most common reason (61.4 percent) among university students in Pakistan, followed by pleasure-seeking (46.9 percent), peer pressure (22.8 percent), boredom (17.8 percent), and stress (10.8 percent) [18]. Shisha smoking was linked to problems among friends at a Malaysian university [18].

When compared to cigarette smokers, shisha users have a lower interest in quitting and a higher belief in their ability to quit [1]. Sharing a shisha is a common practice, particularly among young people, and cafés and restaurants have capitalized on this by including shisha on their menus [23]. In the 1990s, "Ramadan tents" were a type of café that served as a social gathering place during the Muslim holy month of Ramadan [23]. Shisha became the focal points of these settings, legitimizing their use in social settings. Shisha cafés and restaurants are springing up all over the world, encouraging this type of tobacco consumption [23]. The widespread belief that drawing tobacco smoke through water renders shisha smoking less harmful than cigarette smoking contributes to its growing popularity and acceptability [24]. Traditional and new media, as well as the Internet, are giving more air time to shisha tobacco smoking, often in a positive light.

According to one study of cigarette and shisha-related YouTube videos, user-generated shisha videos were less likely to acknowledge the negative health consequences of smoking than cigarette videos [23]. Furthermore, marketers and vendors of shisha and shisha tobacco are advertising their products through blogs and postings by interest groups on the Internet and social media [23]. Shisha was reported to be popular among both men and women, and to be smoked by minors. According to an article published in *The Nation* on October 2, 2014, *'it is now everywhere on campuses today. We even have a hookah competition in which students from different schools post pictures on Facebook, Instagram, and Twitter to compare the thickness of smoke'* [4].

Furthermore, many shisha smokers were drawn to this tobacco use method because of Maassel's aromatic and smooth smoke, as well as the variety of flavours [1]. In the United States, various flavours of hookah tobacco are available, with fruit flavours being the most popular [22]. Similarly, fruit-flavored tobacco was preferred over unflavored tobacco among university students [22]. Candy/sweet and menthol are the second and third most popular flavours among US women, with fruit flavours remaining the top choice. Chocolate, clove/spice, alcohol, and other beverages are among the other flavours [22]. This suggests that flavoured tobacco, which provides the user with a pleasant taste and smell, plays a significant role as a "motivator" for using hookah.

Despite the remarkable success of public health policy in reducing cigarette smoking in many countries, shisha smoking has thrived in the aftermath of strict tobacco control policies and regulations that were primarily geared toward cigarettes. Shisha venues and products are exempt from tobacco control policies in many developed countries, while a lack of enforcement of existing policies in developing countries has contributed to the proliferation of these venues [1]. Some users argue that because they do not inhale the smoke (it remains in their mouth cavity) they are protected from nicotine absorption/addictive effects. Nicotine, on the other hand, could be easily absorbed through the mucosal lining of the oral cavity [22]. Furthermore, receiving "positive" shisha attributes like socializing, relaxing, and the good taste/smell of the smoke appears to encourage and maintain shisha use [22].

The most pressing issue is whether shisha smoking is safer than smoking cigarettes. Eissenberg and colleagues conducted the first controlled, crossover, head-to-head comparisons of cigarette and shisha smoking [25]. Thirty-one regular shisha and cigarette users were enrolled in the study and allowed to smoke one cigarette or one shisha for 45 minutes. Expired post-exposure carbon monoxide (CO) levels were measured, as were nicotine and carboxyhemoglobin (COHb) plasma levels, as well as heart rate and puff topography. The expired CO level in the shisha group was 10-fold higher, and the peak COHb level was 3-fold higher than in the cigarette group, according to these authors. Peak nicotine levels in cigarette smokers and shisha smokers, on the other hand, were comparable [25]. The increase in expired CO measured in shisha smokers was observed even when a tobacco-free alternative was used. Blank et al. [26] and Shihadeh et al. [27] demonstrated that expired CO levels are comparably elevated in both tobacco and tobacco-free shisha use in two separate studies. This observation suggests that CO exposure in shisha use is related to the charcoal used to heat the tobacco, and it adds weight to the argument that shisha smoking is not safe in the absence of tobacco. Shisha smoking is just as dangerous as, if not more dangerous than, cigarette smoking. Hookah smoking clearly poses a significant inhalation risk, is far from benign, and is not a safer alternative to cigarette smoking [15].

The aim of this research was to do a comparative assessment of lung function of shisha smokers and non-shisha smokers in Port Harcourt. The specific objectives were to compare the Forced Expiratory Volume in 1 second (FEV₁), Forced Vital Capacity (FVC), FEV₁/FVC ratio, and Peak Expiratory Flow (PEF) among shisha and non-shisha smokers in Port Harcourt.

II. METHODS

Study Area

This study was conducted in selected lounges and nightclubs within Port Harcourt city and its metropolis and the Rivers State University during the period September 2021 to February 2022.

Study Design

The cross-sectional study design was adopted in this study

Study Sample

The study population size is about 80 subjects comprising of 40 shisha smokers from selected nightclubs and lounges and 40 students of the Rivers State University who are non-tobacco users and shisha smokers who served as control group. The Shisha exposed group was made up of 40 volunteers (20 male and 20 female subjects). It consisted of different social demographic groups in the general population of Port Harcourt. The control group was selected randomly. It consisted of 40 volunteers, healthy males and female students of the College of Medical Sciences of the Rivers State University. The necessary sample size formula was used in calculation of the sample size:

$$\text{Sample size (n)} = \frac{(Z\text{-score})^2 \times S.D (1-S.D)}{(\text{margin of error})^2}$$

Keys:

Confidence level = 95%

Z-Score (Z) = 1.96

Margin of Error (ϵ) = 11%

Standard Deviation (S.D) = 0.5

Therefore, Sample Size (n) = 80

Inclusion Criteria

Subjects who have been smoking shisha for up to 2 years and subjects who has never smoked shisha or used any form of tobacco.

Exclusion Criteria

Subjects with known cases of pulmonary and airway diseases were excluded.

Ethical consideration

Before being recruited for the study, verbal consent was obtained from each subject. The study was performed in accordance with the Declaration of Helsinki, and the protocol was approved by the Ethics Committee of the Rivers State University. A detailed interview of the subjects was conducted, followed by history taking to determine whether to include the subject in the study or not.

Data Analysis

The data were entered into the computer and analyzed by using the Statistical Package for Social Sciences (SPSS for Windows, version 20.0). Student z-test was applied to test the difference of the means between the two quantitative variables. The level of significance was assumed at $p < 0.05$.

III. RESULTS

The results in Figures 1 and 2 are the comparison of body mass indices (BMI) (Kg/m²) between Shisha Smokers and Non-Shisha Smokers males and female respectively in Port Harcourt. Although, both intra-gender comparisons were not significant ($p > 0.05$), the male shisha smokers had reduced BMI while the females had raised BMI when compared to their respective counterparts.

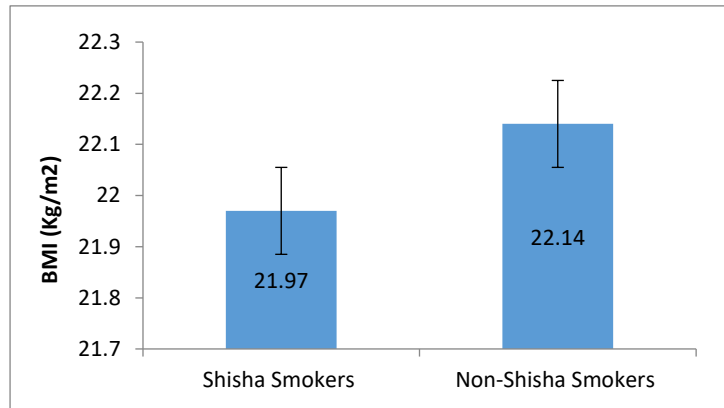


Figure 1: Comparison of Body Mass Index (BMI) (Kg/m²) between Male Shisha Smokers and Non-Shisha Smokers in Port Harcourt

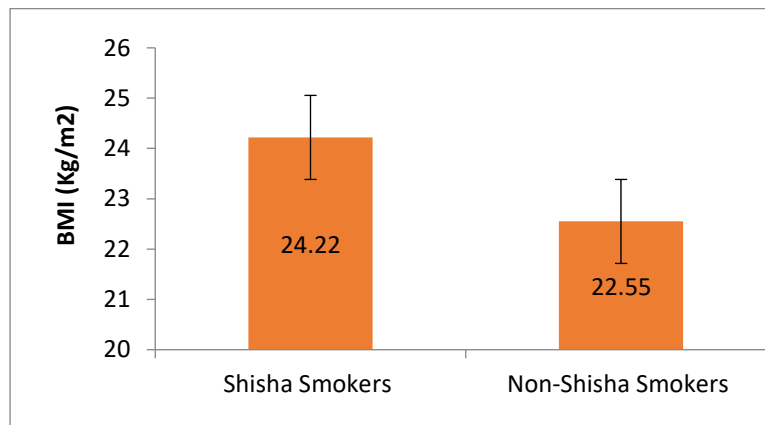


Figure 2: Comparison of Body Mass Index (BMI) (Kg/m²) between Male Shisha Smokers and Non-Shisha Smokers in Port Harcourt

The results shown in Figures 3 and 4 are the changes in blood pressure levels between Shisha Smokers and Non-Shisha Smokers for male and female subjects respectively. The systolic blood pressure (SBP) levels were seen to be higher in the Shisha smokers for both genders and this was statistically significant ($p > 0.05$) in the female Shisha smokers. The changes in the diastolic blood pressure (DBP) levels were found to be marginal for the both sexes but that, the male shisha smokers had lower DBP while the female had raised levels when compared to their respective non-shisha smoking counterparts.

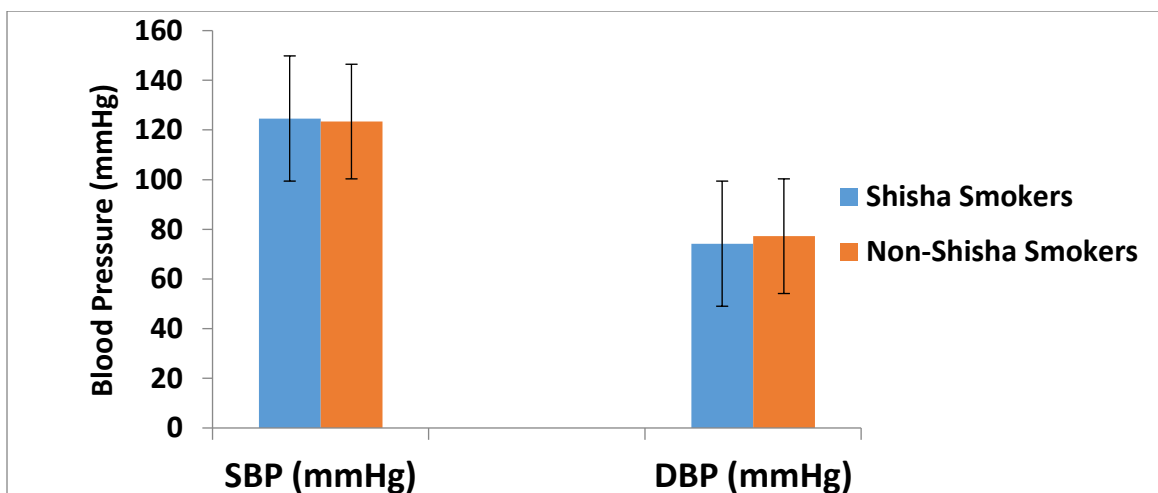


Figure 3: Changes in Blood Pressure Levels (mmHg) between male Shisha Smokers and Non-Shisha Smokers in Port Harcourt

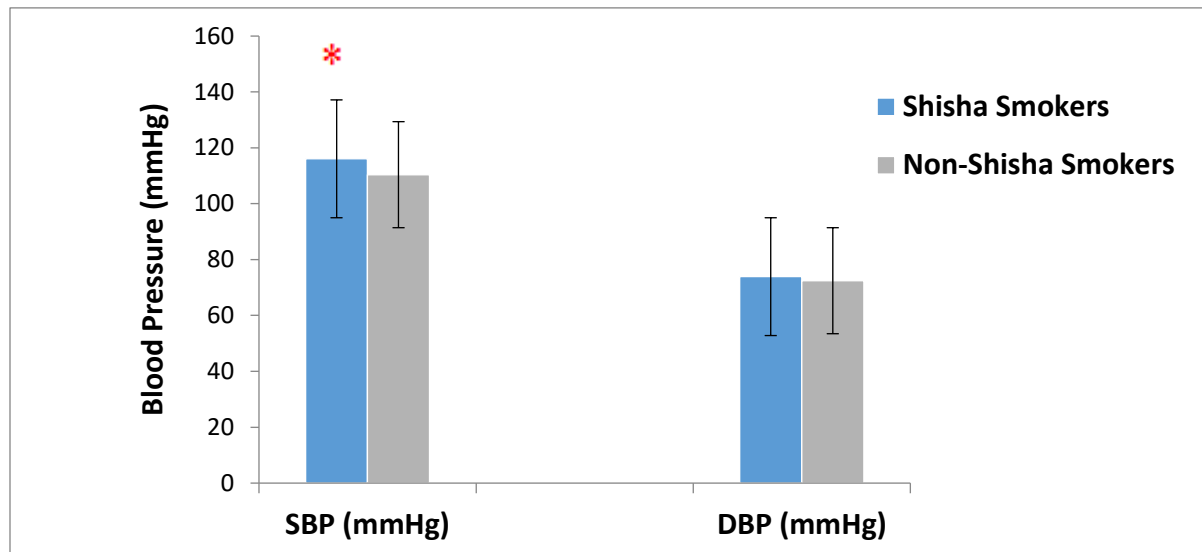


Figure 4: Changes in Blood Pressure Levels (mmHg) between female Shisha Smokers and Non-Shisha Smokers in Port Harcourt.

*Significant at $P < 0.05$ when Shisha Smokers' values are compared to those of Non-Shisha Smokers.

The results in Table 1 represent the comparison of some lung function indices between Shisha Smokers and Non-Shisha Smokers in male and female subjects respectively in Port Harcourt. The lung function indices evaluated include Forced vital capacity (FVC), Forced expiratory volume in one second (FEV_1), Forced expiratory volume in six seconds (FEV_6), the percentage of the FVC expired in one second (FEV_1/FVC ratio) and peak expiratory flow (PEF).

The differences in the lung function indices of the Shisha smokers were all found to be marginally different ($p > 0.05$) when compared to those of non-shisha smokers. Although, all the lung function parameters were comparatively depressed in the male subjects.

Table 1: Comparison of some Lung Function Indices between Shisha Smokers and Non-Shisha Smokers in male and female subjects respectively in Port Harcourt

S/N	Parameters	Study Groups			
		Male Subjects		Female Subjects	
		Shisha Smokers	Non-Shisha Smokers	Shisha Smokers	Non-Shisha Smokers
1.	FVC (%)	65.17 ± 28.64	81.10 ± 32.11*	62.56 ± 31.70	67.43 ± 32.30*
2.	FEV1 (%)	65.77 ± 15.27	74.70 ± 24.59*	64.51 ± 22.27	63.01 ± 17.84
3.	FEV6	3.18 ± 1.23	3.94 ± 1.48	2.51 ± 1.25	2.78 ± 1.27*
4.	FEV1/FVC	89.77 ± 20.04	98.34 ± 24.67*	96.74 ± 10.03	88.30 ± 21.89*
5.	PEF	81.80 ± 30.23	96.83 ± 24.66*	82.35 ± 21.45	80.72 ± 24.71*

Values are expressed as Mean ± SD; n=40

*Significant at $p < 0.05$ compared to those of shisha smokers.

IV. DISCUSSION

Shisha smoking is a type of tobacco consumption that involves smoking flavoured or unflavoured tobacco through a single or multi-stemmed instrument, with smoke designed to pass through water or other liquid before reaching the smoker [4]. Although the practice of shisha smoking started in the Middle East, it has spread to several other parts of the world, including Nigeria. In Nigeria, the prevalence rate of shisha smoking, especially among the youth, is rising, making it a matter of public health concern. The rising prevalence of shisha smoking in Nigeria can be attributed to the increase in the openings of new shisha lounges/bars, subtle advertisement of shisha in public places, social acceptance of shisha smoking, peer influence, and public misconceptions about the safety profile of shisha use[28].

Consequently, the present study evaluated the pattern of lung function indices in shisha smokers in our environment and discussed them in the following paragraphs.

The result of the present study on age distribution of shisha smokers in Port Harcourt indicated that the shisha smoking subjects were about their mid-twenties and the age of commencement is earlier in females than in males. This finding is consistent with a previous report (Lasebikan et al., [28] which also reported that the age of initiation into shisha smoking was lower among women than in men but that addiction and frequency is higher in men. This is suggestive to say that the prevalence and addiction to shisha smoking in our locality may be more in younger people before or within their early twenties.

The outcome of the present study on lung function indices of the Shisha smokers were all found to be marginally different ($p > 0.05$) when compared to those of non-shisha smokers. Although, all the lung function parameters were comparatively depressed in the male subjects.

Decreased levels of FEV₁/FVC ratio, FEV₁, FVC and PEF have been implicated in either of restrictive or obstructive or mixed pulmonary diseases [2, 29, 30]. This also implies that the male subjects are more likely to develop mixed pulmonary diseases whereas the female subjects may be at the risk of either obstructive or restrictive pulmonary diseases.

The above outcome thus reveals that, addiction to shisha smoking may have a possibility of inducing either of or both of restrictive or obstructive pulmonary diseases in such subjects.

V. CONCLUSION

The present study shows a possible prevalence and addiction to shisha smoking in younger people before or within their early twenties. The above outcome thus reveals that, addiction to shisha smoking may have a possibility of inducing either of or both of restrictive or obstructive pulmonary diseases in such subjects. Considering the above findings of the present study, shisha smoking could increase the risk of infection and can be associated with outbreaks in either of or both of restrictive or obstructive pulmonary diseases.

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