Detection of chronic obstructive pulmonary disease among shisha smokers in the Fayoum Governorate

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Background Shisha smoking is a common practice among the population in Arabic countries.
Shisha smoking has a negative effect on lung function; it is probably one of the causes for chronic obstructive pulmonary disease (COPD).

Objective Detection of COPD among Shisha Smokers in the Fayoum Governorate.

Design Prospective study.

Setting Fayoum University Hospital in Egypt between 2016 and 2017.

Patients and methods Of the 300 participants, 200 were shisha smokers for more than 20 years or their age above 40 years and 100 of them were nonsmoker volunteers. History of smoking was taken from the patients with recording of the COPD assessment score and then general and local examination was done followed by flow volume loop and finally by a chest radiography (posteroanterior view).

Statistical analysis: case–control study Coding of the data was done and then entered with SPSS (statistical package for the social sciences) version number 24. After that data was summarized using mean, SD, median, minimum and maximum in the quantitative data with using frequency (count) and relative frequency (percentage) for categorization of data.

Results Out of the 300 male patients included in this study 51% has obstructive airway disease and 19% had restrictive airway disease.
The mean age was 56.20±10.98 years. Number of hagars smoked by the COPD patients were 10.82±9.88 hagars per day with a duration of smoking of 24.87±12.36 years.

Conclusion Shisha smoking increases the risk of COPD and this risk increases with the increase in the duration of smoking and number of hagar smoked was the conclusion of the study.
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Keywords: chronic obstructive pulmonary disease, Fayoum Governorate, shisha smoker

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Introduction

Recently, water pipes of various shapes and names are known in different cultures under different names (e.g. hookah, shisha, narghile); traditionally it was associated with Middle Eastern societies [1].

Shisha smokers usually believe that shisha smoking is less harmful than cigarette smoking [2]. However, smoking tobacco from a shisha carries a lot of the same or greater health hazard as smoking cigarettes [3].

Numerous health hazards are the result of Shisha smoking; for example, it appears to increase the risk of cancer of the different organs such as esophageal, gastric, and lung; various chest diseases such as abnormal pulmonary function, emphysema, and chronic bronchitis; cardiac diseases such as ischemic heart diseases, osteoporosis, obstetrical, and prenatal problems (such as low birth weight and pulmonary problems at birth), periodontal disease, and larynx and voice changes [4].

Fayoum Governorate is full of cafés visited by a large number of youth of variable age groups, who have the habit of shisha smoking all time with each other and we have no data about that and so record the hazards of shisha smoking in this study.

Patients and methods

This study was carried out on 300 participants, of whom 200 were shisha smokers and 100 nonsmokers served as a control group from the Fayoum Governorate.

The Ethics Committee of the Faculty of Medicine, Fayoum University, approved of the study.

Study population

In all, 200 participants were selected into the study from the Fayoum's population. The inclusion and exclusion criteria were as follows.

Inclusion criteria

(1) Age: above 40 years.
(2) Duration of smoking of more than 20 years.
(3) Smoking history: exclusive shisha smokers.
(4) From the Fayoum Governorate.

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Exclusion criteria

(1) Age: less than 40 years.
(2) Cigarette smokers.
(3) Any known chest disease.
(4) Any worker from the industry which generates dust or fumes.

Have no radiological abnormality in chest radiography (CXR).

Methods

Every person included in the study was submitted to the following medical procedures:

(1) Take full history with specific focus on:
   (a) Personal data.
   (b) Shisha smoking history (age of initiation, duration of exposure, number of hagars smoked, stop exposure or not).
   (c) Symptoms of chest disease using the chronic obstructive pulmonary disease (COPD) assessment (CAT) score.
   (d) Past history of any chronic chest disease.
(2) Clinical examination.
(3) Radiological examinations including plain CXR.
(4) Spirometry.

Prior to testing

Check the patient's identification, then height without shoes and weight was measured, and their age, sex, and race were recorded.

In case of inability of the patient to stand to have their height measured, we use arm span as an estimate [5].

Procedures

Position of the patient

(1) At first the patient sits upright, flat feet on the floor with legs uncrossed advise him not to use abdominal muscles for the leg position.
(2) The patient should loosen tight-fitting clothing.
(3) The chair should be with arms as when the patient is exhaling maximally he can become light headed.

Technique

(1) MiniSpir MIP s.r.l. 00155 Roma (MIR company, Roma, Italy) was the device used.
(2) Calibration was done before measurement.
(3) Nose clips were inserted.
(4) The patient holds the mouthpiece and then asks him to take normal breath.
(5) Then ask him to take a full deep breath performing the forced full expiration (completely empty their lungs in 6 s), then a further quick, full inspiration.
(6) Raise the voice to encourage patient, especially near the end of the maneuver [6].
(7) If forced expiratory volume in the first second divided by forced vital capacity (FEV_1/FVC) was less than 70%, we perform a bronchodilator test by administration of two puffs of salbutamol (200 μg/dose) from a meter dose inhaler system and then flow volume loop was repeated after 15 min later.
(8) If the mentioned ratio (FEV_1/FVC) continued to be less than 70% with reversibility of FEV_1 was less than 12%, the diagnosis of COPD was established.
(9) Quality.

   Definition of acceptable maneuver:
   (a) Start explosively with no hesitation or sigmoid curve.
   (b) Perform the maneuver with maximal inspiration and expiration.
   (c) No glottis closure or cessation of airflow occurred during the maneuver (e.g. by hesitation or blocking the mouthpiece).
   (d) No coughs especially during the first second, inspirations during the trace or any evidence of leaks.
   (e) Exhalation for more than 6 s with 50 ml exhaled in the last 2 s.
   (f) The best three measurements must fulfill the reproducibility criteria.
   (g) The best two values for FEV_1 and FVC should be within 5% or 150 ml of eachother, whichever is greater.
   (h) Then the best two values of FEV_1 and FVC can be taken from the different maneuvers.
   (i) Only eight trials were done; this was the upper limit as forced exhalations are tiring and the patient is unable to do better values after this point [5].

Interpreting spirometry

(1) Obstructive disorder when the FEV_1/FVC ratio is less than 0.7, then is subclassified into mild obstruction if FEV_1 greater than or equal to 80, moderate obstruction if 50 less than or equal to FEV_1 less than 80% is predicted, severe obstruction if 30 less than or equal to FEV_1 less than 50% is predicted, and very severe if FEV_1 less than 30% is predicted [7].
(2) Restrictive disorder is characterized by decreased FVC, normal, or increased FEV_1/FVC ratio (in case no lung volume study is available):

(a) Mild restriction when FVC is 70–80% of the predicted.
(b) Moderate restriction when FVC is 60–69% of the predicted.
(c) Moderately severe restriction when FVC 50–59% of the predicted.
(d) Severe restriction when FVC is 35–49% of the predicted.
(e) Very severe restriction when FVC less than 35% of the predicted.

(3) Small airway assessment was done using forced expiratory flow (FEF) 25–75% as follows:
(a) Mild affection if values were 65–50%.
(b) Moderate affection if values were 50–35%.
(c) Severe affection if values were 35–25%.
(d) Very severe affection if values were less than 25% [8].

Statistical analysis used: case–control study

Coding of the data was done and then entered with the statistical package for the social sciences (SPSS Inc., Chicago, Illinois, USA) version number 24. After that data was summarized using mean, SD, median, minimum, and maximum in the quantitative data with using frequency (count) and relative frequency (percentage) for categorization of data.

Nonparametric Kruskal–Wallis and Mann–Whitney tests were used for comparisons between quantitative variables [9].

χ^2-test was used for comparison of data category.

Exact test was used instead of the χ^2 when the expected frequency was less than 5 [10].

Spearman's correlation coefficient was used for correlations in between quantitative variables [11].

Results

With regard to demographic characteristics of the study population we found that the mean age was 56.20±10.98, with the mean duration of smoking being 24.87±12.36. The mean number of hagars smoked was 10.82±9.88 hagars per day.

The smoking history of the case group was classified as: 162 (81%) cases were current smoker, 38 (19%) cases were ex-smokers (Figs 1–3).

Regarding to the result of spirometry of the study group, the mean FVC (%) of the study group was 76.34±21.06, mean FEV_1 (%) was 70.57±25.41. Mean FEV_1/FVC was 71.44±14.35. Mean $FEF_{25–75}$ (%) was 58.06±30.73.

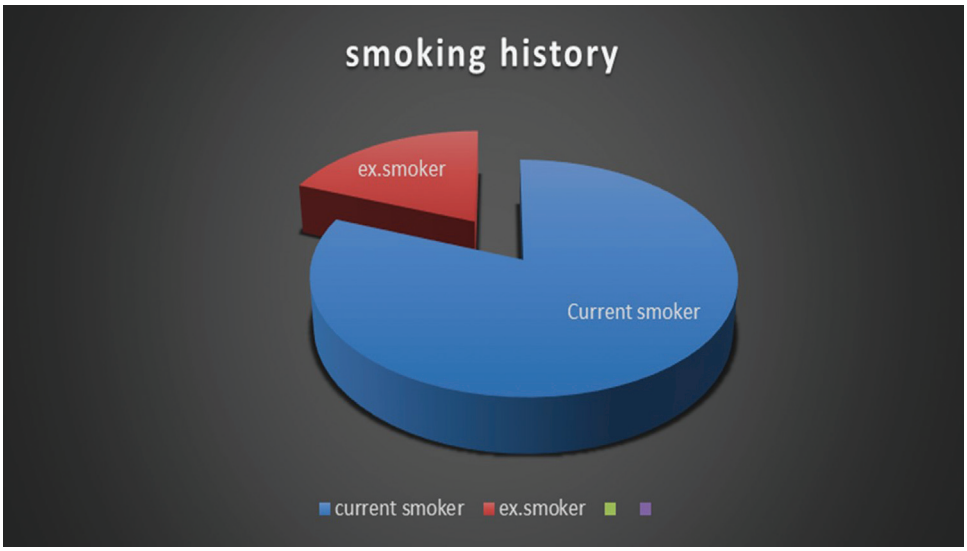
Figure 1

MiniSpir MIP s.r.l. 00155 Roma (Italy) that was used in our study.

Figure 2

The calibration device.

Figure 3



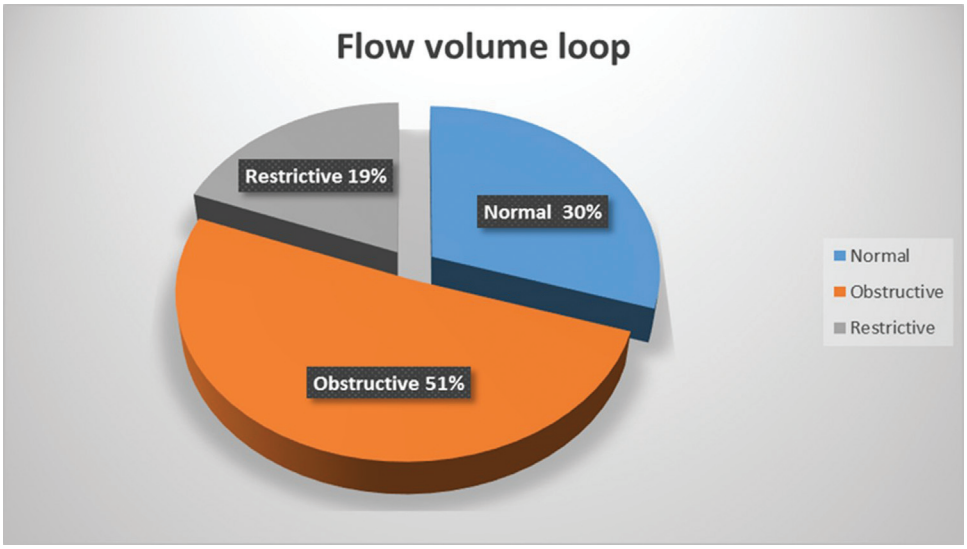
According to smoking history, the case group was classified as: 162 (81%) cases of current smoker and 38 (19%) cases of ex-smokers.

Mean CAT score of the study group was 20.58±6.31; 94 (47%) cases with no small airway affection and 106 (53%) with small airway affection classified as: 14 (7%) cases with mild affection, 22 (11%) cases with moderate affection, 24 (12%) cases with severe affection, and 46 (23%) cases with very severe affection.

Interpretation of the flow volume loop of the shisha group was 60 (30%) cases with normal airway, 102 (51%) cases with obstructive airway disease, and 38 (19%) with restrictive airway disease (Fig. 4).

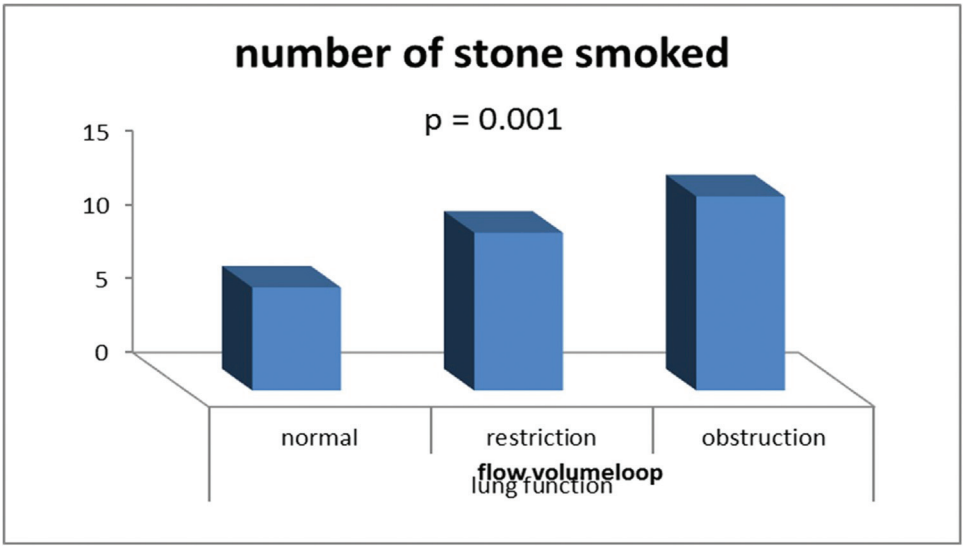
In comparison between the case and control groups the flow-volume loop parameter shows a significant difference in the statistics between the case and control groups in FVC, FEV_1, FEV_1/FVC, and $FEF_{25–75}$ when *P* less than 0.001.

Figure 4



Pie chart show interpretation of flow-volume loop of the shisha group with 60 (30%) cases with normal airway, 102 (51%) cases with obstructive airway disease, and 38 (19%) cases with restrictive airway disease.

Figure 5



There is significant difference between number of smoked hagars and flow-volume loop that cases with normal airway mean number of smoked hagars was 6.97±5.09 per day, with the restrictive airway disease mean number being 10.68±6.14 hagars per day and with obstructive airway disease mean number being 13.14±12.21 hagars per day.

As regards the relation between body mass index and flow-volume loop it was as follows: in normal flow-volume loop the mean body mass index was 28.56±5.5, in restrictive airway disease the mean BMI was 28.81±4.36, and in obstructive airway disease it was 25.89±3.93.

The relation between age and flow-volume loop illustrates that there is significant difference between age group and flow-volume loop.

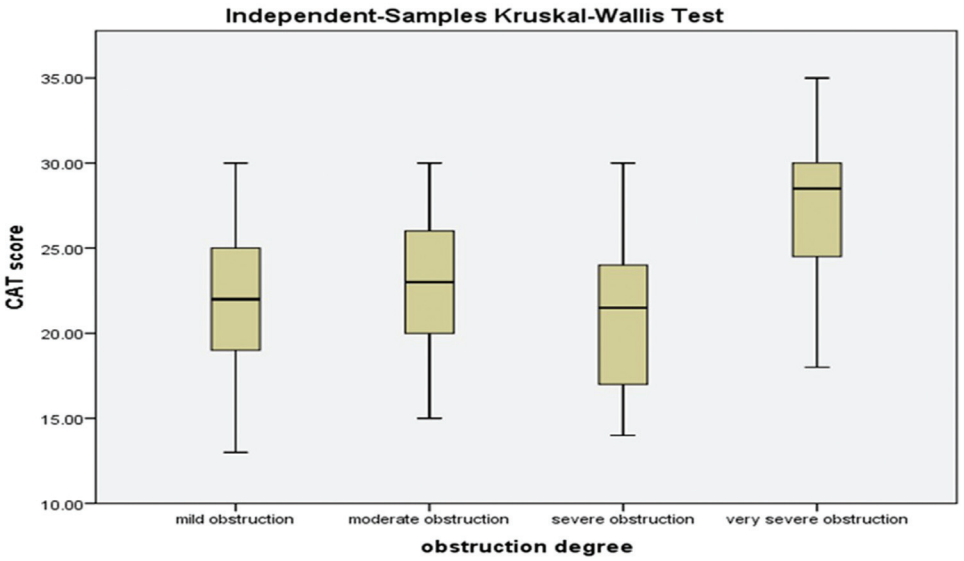
The relation between age group and obstructive airway disease illustrates that there is no significant difference between them.

Regarding the relation between age groups and restrictive airway disease there has been significant difference between them.

The relation between duration of smoking and flow-volume loop shows there is a significant difference between the duration of smoking and flow-volume loop.

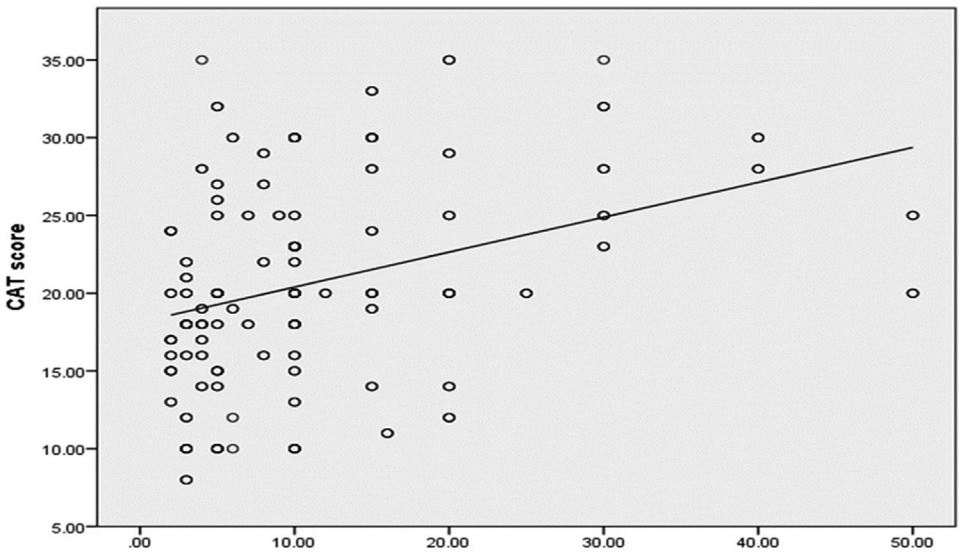
There is significant difference between numbers of smoked hagars and flow-volume loop that cases with normal airway mean number of smoked hagars was 6.97±5.09 per day, with the restrictive airway disease mean number being 10.68±6.14 hagars per day and

Figure 6



The significant difference between chronic obstructive pulmonary disease assessment score and obstructive airway disease.

Figure 7



Significant difference between chronic obstructive pulmonary disease assessment score and number of hagars smoked.

with obstructive airway disease mean number being 13.14±12.21 hagars per day (Fig. 5).

There is significant difference between numbers of hagars smoked and obstructive airway disease as with the increase in the number of hagars smoked, the severity of airway affection increases (Tables 1–10). There is significant difference between numbers of hagars smoked and small airway affection.

There is significant difference between CAT score and obstructive airway disease (Fig. 6).

Table 1 Demographic characteristics of the study population

	Mean±SD
Age	56.20±10.98
Duration of smoking	24.87±12.36
Numbers of hagars smoked	10.82±9.88

There is significant difference between CAT score and number of hagars smoked (Fig. 7).

There is significant difference between CAT score and duration of smoking (Fig. 8).

Discussion

Nowadays shisha smoking is a theme spread among the young, high-income, and urban inhabitants of the world [12].

It is becoming a recent tobacco pandemic, highly affecting the indoor air purity and involves multiple health hazards [12].

In the Middle East, cigarettes are replaced by shisha to become the most popular method of tobacco smoking among the youth, and in several other parts of the world, it is becoming a second type of smoking after cigarettes [13].

Shisha smoking exits large amount of poisonous ultrafine particles and carry health hazards similar to smoking cigarettes [14].

In this study our aim was early prediction of COPD among shisha smokers in the Fayoum Governorate.

We find in our study, 300 male candidates from the Fayoum Governorate. The age selected was above 40 years.

The studied group was divided into two groups. First 200 male shisha smokers considered as the case group and 100 male nonsmoker healthy volunteers as the control group.

The number of the study group was 300 men of different ages (above 40 years old); the mean age of study group was 56.20±10.98.

In agreement with Bahtouee and colleagues, who detected the prevalence of COPD in hookah smokers that work on a total of 490 participants in Bushehr Province, Iran, their ages were 35 years or older with a mean age of 48.49 who were taking hookah for at least 15 years but he differs from this study in that he searches on both sexes that in the exposed group of hookah smoke, (60.4%), 148 were men and (39.6%) 97 were women. In the control group, (49.8%) 122 were men and (50.2%) 123 were women [15].

Meo and colleagues, conducted his study to detect the effect of shisha (waterpipe) smoking on lung Functions

Table 2 Clinical and functional assessment of the cases

	Mean±SD
FVC (%)	76.34±21.06
FEV_1 (%)	70.57±25.41
FEV_1/FVC	71.44±14.35
$FEF_{25–75}$ (small airway affection) (%)	58.06±30.73
CAT score	20.58±6.31

CAT, chronic obstructive pulmonary disease assessment score; FEF, forced expiratory flow; FEV_1, forced expiratory volume in the first second; FVC, forced vital capacity.

Table 3 Classification of the studied group according to small airway affection

	Patients [*n* (%)]
Small airway affection	
No affection	94 (47.0)
Mild affection	14 (7.0)
Moderate affection	22 (11.0)
Severe affection	24 (12.0)
Very severe affection	46 (23.0)

Table 4 Comparison between cases and control groups according to flow-volume loop parameters

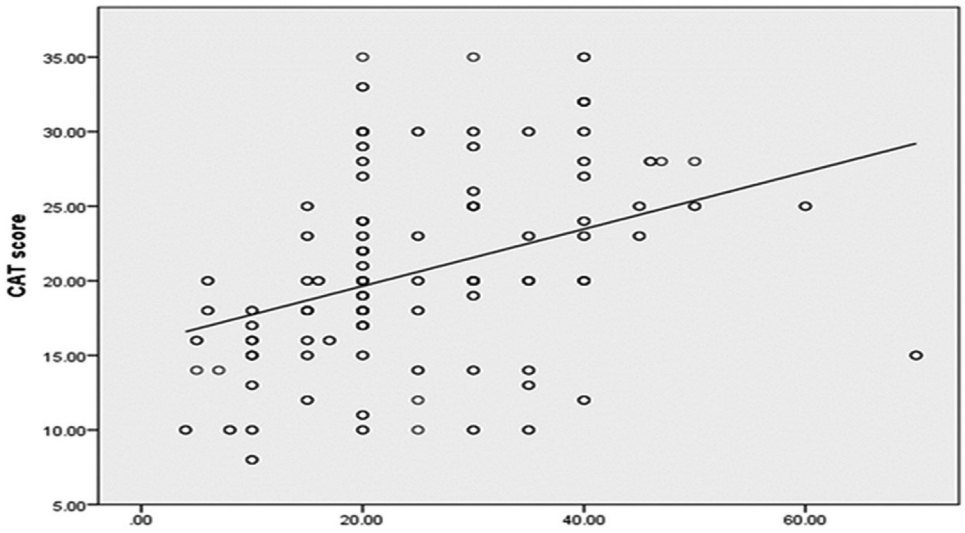
	Patients					Control					*P* value
	Mean	SD	Median	Minimum	Maximum	Mean	SD	Median	Minimum	Maximum	
FVC (%)	76.34	21.06	75.50	30.00	148.00	90.69	6.35	91.50	80.00	104.00	<0.001
FEV_1 (%)	70.57	25.41	71.00	20.00	151.00	90.06	7.16	91.00	73.00	108.00	<0.001
FEV_1/FVC	71.44	14.35	73.00	39.50	100.00	81.24	5.34	80.65	72.30	94.90	<0.001
$FEF_{25–75}$ (small airway affection) (%)	58.06	30.73	61.00	8.00	117.00	82.00	11.57	81.00	65.00	100.00	<0.001

FEF, forced expiratory flow; FEV_1, forced expiratory volume in the first second; FVC, forced vital capacity.

Table 5 Comparison between age group according to the parameters of flow-volume loop

	Flow-volume loop [*n* (%)]			*P* value
	Normal	Restriction	Obstruction	
Age groups				
<46.00	50 (31.2)	8 (21.1)	20 (19.6)	<0.001
47.00–55.00	52 (32.5)	10 (26.3)	15 (14.7)	
56.00–64.00	33 (20.6)	6 (15.8)	32 (31.4)	
>65.00	25 (15.6)	14 (36.8)	35 (34.3)	

Figure 8



Significant difference between chronic obstructive pulmonary disease assessment score and duration of smoking.

Table 6 Comparison between age group and variant degree of obstructive flow-volume loop

	Obstruction degree [*n* (%)]				*P* value
	Mild obstruction	Moderate obstruction	Severe obstruction	Very severe obstruction	
Age groups					
<46.00	9 (26.5)	2 (12.5)	3 (15.0)	6 (18.8)	0.551
47.00–55.00	7 (20.6)	2 (12.5)	4 (20.0)	2 (6.2)	
56.00–64.00	8 (23.5)	8 (50.0)	6 (30.0)	10 (31.2)	
>65.00	10 (29.4)	4 (25.0)	7 (35.0)	14 (43.8)	

Table 7 Comparison between age group and different degrees of restrictive flow-volume loop

	Restriction degree [*n* (%)]				*P* value
	Mild restriction	Moderate restriction	Severe restriction	Very severe restriction	
Age groups					
<46.00	6 (20.0)	0 (0.0)	0 (0.0)	2 (100.0)	0.005
47.00–55.00	10 (33.3)	0 (0.0)	0 (0.0)	0 (0.0)	
56.00–64.00	4 (13.3)	0 (0.0)	2 (100.0)	0 (0.0)	
>65.00	10 (33.3)	4 (100.0)	0 (0.0)	0 (0.0)	

and fractional exhaled nitric oxide (FeNO) among Saudi Young adult Shisha Smokers and applied their search on 146 male candidates in the form of 73 as a control and 73 as shisha smokers whose mean ages were 21.54±0.41 (mean±SEM) (range: 17–33 years) [16].

And it disagrees with Boskabady and colleagues, who compared pulmonary function and respiratory symptoms in waterpipe and cigarette smokers on 673 participants (372 men, 301 women) who were recruited from 10 randomly selected areas in the city of Mashhad using a stratified sampling method, and the waterpipe and cigarette smokers in this population were studied. The participants from each area represented about 5% of the population of that area. Three groups of smokers, including 57 waterpipe smokers (27 men, 30 women, mean age (42.53–12.98 years) [17].

In our study among the exposed group to shisha smokers the COPD patients were 51% with the rate being significantly higher in patients with older age, with increased duration of shisha smoking and number of hagars smoked associated with the CAT score (23.75±5.26), and hyperinflated chest in CXR and by clinical examination.

This was in agreement with Waziry and colleagues who studied the waterpipe tobacco smoking and the outcomes of interest were that they found that waterpipe smoking was highly associated with COPD [18].

Table 8 Comparison between duration of smoking and different groups of flow-volume loop

	Lung function													*P* value
	Normal					Restriction				Obstruction				
	Mean	SD	Median	Minimum	Maximum	Mean	SD	Median	Minimum	Maximum	Mean	SD	Median	Minimum	Maximum	
Duration of smoking	20.47	13.26	20.00	4.00	70.00	26.84	12.43	20.00	5.00	50.00	26.74	11.19	22.50	6.00	60.00	<0.001

Also Mahmud and colleagues, do a comparison of frequency of undiagnosed COPD in the current or former tobacco smokers having ischemic heart disease, report that according to the type of smoking, among 30 (24.2%) who smoked hookah 12 (40%) had COPD [19].

In Ahmed and colleagues, who work on 200 smoker volunteers from the Fayoum Governorate who are not known to be COPD with age greater than 40 years with a smoking history of more than 20 pack-years found that 39 smokers out of the 200 smokers with percentage of 19.5% were found to have irreversible airway obstruction (COPD), matched with same the age group of our study and live in the same area, but cases in our study were symptomatic [20].

And that not matched with Ben Saad and colleagues, who reported that 8% of exclusive narghile smoking had large airway obstructive ventilator defect and thus probably presented COPD [22].

As regards the affection of shisha smoking on flow-volume loop, all of the control group had normal airway while the case group was classified as: 60 (30%) cases with normal, 102 (51%) cases with obstructive airway disease, and 38 (19%) cases with restrictive airway disease.

The result was similar to that of Bahtouee and colleagues who found that in 245 participants in the exposed group of hookah smoke, 200 (81.6%) patients had normal airway, 18 (7.4%) patients had restrictive airway disease, 25 (10.2%) patients had obstructive airway disease, and two (0.8%) patients had a mixed pattern [15].

A previous study done by Ben Saad and colleagues, has found right ventricular dilatation in 14% of exclusive narghile smokers. Ben Saad and colleagues found that 8% of exclusive narghile smokers had large airway obstructive ventilator defect and thus probably presented COPD and right ventricular dilatation in 36% exclusive narghile smokers [21,22].

With regard to restrictive flow-volume loop El-Essawy and colleagues, who worked to detect COPD on 200 women exposed to biomass found that 23 women had normal ratio, 13 had obstructive abnormality, and 64 had restrictive abnormality [23].

In the study the mean BMI in cases with normal spirometric parameter was 28.56±5.5, in cases with obstructive parameter (25.89±3.93), and in cases with restrictive parameter (28.81±4.36).

Table 9 Comparison between numbers of smoked hagars and obstructive flow-volume loop

	Obstruction degree				*P* value
	Mild obstruction	Moderate obstruction	Severe obstruction	Very severe obstruction	
Number of hagars smoked					
Mean	8.29	20.50	9.00	17.19	0.006
SD	5.92	19.58	7.02	12.30	
Median	8.00	11.50	7.50	15.00	
Minimum	2.00	2.00	2.00	4.00	
Maximum	25.00	50.00	20.00	40.00	

Table 10 Comparison between different groups of small airway affection according to the number of smoked hagars

	Small airway affection					*P* value
	No affection	Mild affection	Moderate affection	Severe affection	Very severe affection	
Number of hagars smoked						
Mean	8.04	12.00	11.45	8.08	17.26	<0.001
SD	5.63	8.50	13.24	7.74	13.04	
Median	6.00	10.00	8.00	5.50	12.50	
Minimum	2.00	2.00	2.00	2.00	2.00	
Maximum	25.00	30.00	50.00	30.00	50.00	

The restrictive pattern could be explained by the presence of heavy metals such as lead, arsenic, and nickel in shisha smokers which is considered as a risk factor for developing diffuse parenchymal lung disease (DPLD) or pneumoconiosis but needs further assessment.

Also David and colleagues reported that smoking causes subclinical parenchymal lung disease detectable by spirometry and computed tomography imaging, and this supports that smoking is a precipitating factor for DPLD [25].

In this study, regarding the flow-volume loop parameter, we found a significant reduction in FEV_1 (70.57±25.41), FVC (76.34±21.06), and FEV_1/FVC (71.44±14.35).

This matched with Bahtouee and colleagues, in a significant reduction in lung parameters FEV_1 (L) (3.80±0.12), FEV_1/FVC (69.34±1.87) ratio, but not matched in that there was no reduction in FVC [15].

This was in agreement with Meo and colleagues, who found that there was a considerable decrease in flow volume different values as FEV_1, FEV_1/FVC%, $FEF_{25\%}$, $FEF_{50\%}$, $FEF_{75\%}$, $FEF_{75–85\%}$ in Shisha smokers in comparison to the matched control group with mean FEV_1 (L) 3.80±0.12 and FEV_1/FVC 69.34 ±1.87, but not matched in that there was no reduction in FVC [16].

In disagreement with Ben Saad and colleagues concluded that FEV_1, FVC, and FEV_1/FVC were considerably lower among exclusive cigarette smokers than exclusive shisha smokers with mean FEV_1 (84±12), mean FVC (90±12), and mean FEV_1/FVC (99±7) [21].

Also in disagreement with Kiter and colleagues showed that there was no correlation between waterpipe smokers and FEV_1. The mean FEV_1 was 88.63 +19.14, mean FVC was 93.97+27.43, and the mean FEV_1/FVC was 98.16+13.28.

In our study the relation between numbers of hagars smoked and spirometric parameter was determined. It was revealed that the case group with normal value was smoke 6.97±5.09 hagar per day, the case group with restrictive lung function was smoke 10.68±6.14 hagar per day, the case group with obstructive lung function was smoke 13.14±12.21 hagar per day which revealed an increased risk of COPD with increased numbers of hagars smoked.

We also found that there is a relationship between smoking duration and different types of airway affection as the normal airway was smoke for 20.47±13.26 years, while cases of restrictive airway disease was smoke for 26.84 ±12.43 years, lastly cases of obstructive airway disease was smoke for 26.74±11.19 years.

This means that there is a good relation between duration of smoking and abnormal parameters of flow-volume loop.

This agrees with Bahtouee and colleagues, who found that the relationship between duration and amount of hookah smoking with pulmonary function tests, the prevalence of COPD among the exposed group of

hookah smokers was considerable higher in the patients with older age and long duration of hookah smoking where the hookah smoker group was divided according to the mean number of daily hookah smoking episodes into two categories: (a) more than or equal to three times a day and (b) less than three times a day. In patients with obstructive pulmonary dysfunction, 23 (92%) patients had greater than 3 hookahs/day and two (8%) patients had less than 3 hookahs/day. These results showed that if number of hookah smoked is greater than 3times/day there were increase in the severity of obstructive pulmonary dysfunction.

As mentioned in Salameh and colleagues, there is a high risk of COPD especially if they have smoked for more than 20 waterpipe-years. Waterpipe smoking index was calculated as the mean number of waterpipes smoked per week multiplied by the duration of smoking in years (waterpipe years) [24].

In agreement with Raad and colleagues, it has been reported that there was a significant decrease in FEV_1 and FEV_1/FVC when comparing heavy smokers (>2 waterpipes/day) with light smokers (1–2 waterpipes/day).

We also study the relationship between CAT score and flow-volume loop; it was revealed that the case group with normal flow-volume loop CAT score (16.07 ±4.66), case group with restrictive flow-volume loop CAT score (19.21±6.46), case group with obstructive flow-volume loop CAT score (23.75±5.26), and we also found that there is significant difference between CAT score and number of hagars smoked.

In comparison with other questionnaires done by Boskabady and colleagues, who use a Farsi questionnaire to assess the severity of respiratory symptoms among shisha smokers a high prevalence of all R.S. has been reported, except sputum production among shisha smoking.

In our study we found a relation between small airway affection and shisha smokers which increases with the duration and number of hagars smoked as we found that 94 (47%) cases with no small airway and 53% (106 case) with small airway affection with a mean $FEF_{25–75\%}$ of 58.06±30.73.

This agrees with Mahmud and colleagues, who found a reduction in $FEF_{25–75\%}$ (2.0±0.9 l/s.).

This disagrees with Meo and colleagues, who report that there was no reduction in $FEF_{25–75\%}$ (6.86±2.23 l/s.) [16].

The case group in our study was classified as: 158 (79%) cases with free CXR and clinical examination cases were 42 (21%) with hyperinflated chest in CXR and clinically classified as normal participant having free CXR, restrictive (34 with free CXR and four with hyperinflated chest), obstructive (64 with free CXR and 38 with hyperinflated chest).

Ben Saad and colleagues observed lung hyperinflation in 36% of exclusive narghile smokers, and reported that radiological studies are desirable [22].

The limitations of this study are that there was relatively a small number of study group, residence and women not included, we did not do any comparison with cigarette smokers, and did not analyze types of hagars smoked and duration of each and there was a lack of facilities for better assessment of all lung functions.

Conclusion

Shisha smoking is a leading cause of COPD and this hazard increases with increased smoking duration and number of smoked hagars.

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Conflicts of interest

There are no conflicts of interest.

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