A survey on relationship between lung spirometry indices and characteristic features among clients referred to TOHID hospital in city of SANANDAJ in 2011

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Introduction: Regular check – UPS are good tools to assess individual risk factors. Conditions affecting the lower respiratory tract ranging from acute to chronic problems threaten the life of patients. It is reported that chronic obstructive pulmonary disease as the fifth cause of death in united states of America. Considering that the pulmonary patients are the most abundant patients referring to medical centers, lung function assessment tests including spirometry do have a key position in the diagnostic and treatment process. Therefore, this study was performed to determine the relation between spirometric indices and characteristic features in clients referred to TOHLD hospital in SANANDAJ city in Kurdistan, IRAN. **Method:** The study was a descriptive analytical one. The statistical population was all patients referred to the spirometry unit in TOHID hospital in SANANDAJ. Census and purposive sampling method was used in 400 patients with respiratory problems and self made questionnaires were used to specify characteristic features. After measuring the height, weight, age and sex of the clients and recording the data's in a computer connected to a spirometer, a respiratory test based on ASP criteria's was performed for all patients in the early hours (9Am – 12MD) in a sitting position. The results were analyzed using spss software (using analysis of variance tests, x^2 tests and Pearson correlation coefficient**). Results:** Study 400 samples, using chi – square test shows a statistically significant difference between males and females. Also 32 percent of the samples had poor economic status 37.6% were suffering from dyspnea of breath, 25.1% had cough and 19.4% sputum and 17.9% had wheezing. Among those with FEV1/FVC less than 70%, 6.8% had lung obstruction (74.1% server, 22.2% moderate and 3.7% mild), and those with FEV1/FVC over 70%, 35.7% showed FVC above 80% and normal spirometry. **Discussion:** Results showed that in patients with respiratory problem with obstructive spirometric pattern, lowest percentage (3.7%) related to the age group 31-40 years, and the largest percentage (29/6%) belonged to the age group older than 70 years, while in restrictive breathe pattern the maximum percentage belonged to the age group 60-51 years, and with p=0.000 spirometric results showed significant correlation. So with increasing age, we see growth in obstructive pulmonary disease. Other studies confirm this finding. Spirometry is one of the most important tools of lung disease screening. Also educating the patient and his/her family is an important component in planning treatment for all lower respiratory system problems.
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Introduction

Due to lifestyle, increased smoking air pollution and hazardous occupational and industrial exposures respiratory disease incidence is increasing (1). The disease is usually exposed in the fifth Decade of life. Some of lung functions like vital capacity and expiratory volume decries by aging, but chronic obstructive pul monary disease exacerbate many of these negative changes and finally leads to blocking of the airways. Research shows that nearly 17 million Americans have asthma, and more than five thousand of them die of the disease in a year (2). The study of sharifian shows that the normal vital capacity among the people living in the province of Kurdistan in Iran is less than the normal recorded in references of other countries (3). Spirometry shows that during the first second expiratory flow and volume with pressure decreases. Also a decrease in flow with expiratory pressure between 25% to 75% of vital capacity is seen. More over the maximum

expiration is decreased (4). Conditions affecting the lower respiratory system problems ranging from acute to chronic threaten the life of the patients. Patients having problem in lower respiratory system, should be carefully examines and all clinical and therapeutic measures should be taken so that despite their problems they can have normal activity and increased quality of life. Educating the patient and his/her family is one of the most important steps in treatment procedure of patients with lower respiratory problems (2). Pulmonary function studies are performed to evaluate the patients breathing. These studies are used to assess the treatment process, obstructive and lung restrictive diseases prognosis, separating the patients from mechanical ventilation and preoperating evaluations (5). It is reported that chronic obstructive pulmonary disease is the fifth leading cause of death in the United States of America (2). Spirometry is an important tool for screening lung diseases. In spirometry or lung function tests, lung volume and capacity and the amount of air in the respiratory tract is measured (3). In the past, this test was only used for physiological studies, whereas in the last three decades has been proposed as a main tool for lung experts (6). Main patters for ventilation obtained by spirometry are obstructive pattern restrictive pattern, and mixed pattern. The main specialty of obstructive pattern is a decrease in the velocity of the expiration flow the main thing about the restrictive pattern is its decrease is lung volume specially FVC. In mixed pattern a disease may cause two obstructive and restrictive patterns simultaneously. For example: For a worker suffering from Asbestos, the spirogram pattern is restrictive. If the worker is a smoker, he has problems in his air ways and therefore. The respiratory pattern is a mixed one (7). The spirogram chart is actually the rate of the change in lung volume during the normal breathing and deep inspiration and expiration (8). No special readiness is needed before the tests. It is preferable for the patient not to smoke at least one hour before the test and not having any workouts for at least six hours prior to the test. Also the patient's cooperation is so much important during the test (9). Considering that the pulmonary patients are the most abundant patients referring to medical centers, lung function assessment tests including spirometry do have a key position in the diagnostic and treatment process. Therefore this study was performed to determine the relation between spirometric indices and characteristic features in clients referred to "TOHID" hospital in SANANDAJ in Kurdistan province in IRAN.

Method

This study is a descriptive – analytic one. The statistical population included all clients who were referred by a physician to the spirometry unit in TOHID hospital in sanandaj for diagnosis or screening. Census and purposive sampling method was used for 40 volunteer patients with respiratory problems who referred to respiratory unit in TOHID hospital. For all these 400 volunteers the sample. Volume was measured with statistical evaluation p= 0.05, confidence interval 95% and precision 0.05. after turning on the computer connected to the spiromenter, and running the related software, the spirometr was calibrated and some quantities like the altitude, temperature and the relative humidity of the testing location, age, height and weight of the client are recorded and after explaining the test conditions for the clients and taking their permission, the questionnaires were completed through methodical interview, and the spirometer measures were. Recorded and printed. For all clients the same spirometer was used. Research units were all conscious, and ready for cooperation. They have not had any heavy meal for at least 3 hours prior to the test. During the test they were in sitting position, wearing comfortable clothing. Then a respiratory test was performed for all patients using AST criteria's. In order to prevent confounding factors all tests were performed with the same spirometer in the early hours (9AM – 12 MD) in a sitting position and in the same location. Data's were collected through the two – part question aires: first part containing personal characteristic features and second part containing the spirometeric results. In order to determine the scientific reliability of the data collecting tools, the retest technique was used by the researcher. In this technique 10 questionnaires were completed through interviews with clients having respiratory problems and after 2 hours, in the same condition, spirometery test was performed again and the results were recorded and printed. The test results in two states were 98% the same. In spirometry test after locating the mouth piece in the mouth and nose clips on the nose, the patient begins to exhale. After patient respiratory condition was stabilized after at least three normal and symmetric breathing, the patient was asked to have a deep inhale and a deep exhale with pressure, respectively. So the FVC is obtained the volume of air that can forcibly be blown out in one second is FEV1 by liter per second, and the TOTAL volume of air blown out is FVC. The spirometer apparatus used in this research was made in Germany by Jaeger by 1996. The related software was run under windows 98. Then the data was analyzed with spss win software. The following criterion was used to interpret the results:

Table 1: frequency distribution for the majority of clients with respiratory problems by their demographical characteristics

Frequency / Demographical characteristics	majority	No	percentage
Gender	Male	243	60.8
Age group	21 ~ 30	71	17.8
Marital status	Married	277	69.25
Occupation	House keeper	137	34.3
Family members	3 – 4	154	38.5
Education	Illiterate	179	44.8
Economical status	Not bad	239	59.8
Exercise	No	300	75
Habitat	City	190	47.5
Smoking	No	324	81
Respiratory disease history	Yes	227	56.8
Kind of respiratory disease	Asthma & allergies	142	68.3
Total		400	100

Table 2: frequency distribution for clients with respiratory problems by lung spirometry indice test (FEV1-FVC)

Frequency lung spirometry indice test (FEV1-FVC)	FEV1		FVC	
	No.	percentage	No.	percentage
Normal	---	---	133	35.7
Slight	1	3.7	122	35.1
Moderate	6	22.2	44	10.7
Intense	20	74.1	74	18.5
Total	27	100	373	100

Table 3: frequency distribution for clients with respiratory problem by lung function test based on spirometry indice

Frequency / Lung function algorithm	No.	percentage
Normal	133	33.3
restrictive	240	60
obstructive	27	6.8
Total	400	100

Table 4: the relation between lung function based on spirmetry indice and gender in clients with respiratory problems

Frequency / Lung function	Gender				Total	
	Female		Male			
	No.	Percent	No.	Percent	No.	Percent
Normal	45	33.8	88	66.2	133	100
Restrictive	107	44.6	133	55.4	240	100
Obstructive	5	18.5	22	81.5	27	100

$X^2= 9.36$ DF= 2   P= 0.009

For FEV1/FVC <70%, we had obstructive Algorithm (FEV1> 80% between, FEV1<80% slight, FEV1<60% middle, FEV1 <50% intense) and if FEV1 / FVC> 70% (normal) and FVC>80%, the
client doesn't have any lung problem, and for (FVC<80% Slight, FVC < 60% Middle and FVC<50% intense) the algorithm was interpreted as restrictive (10).Data's were analyzed using relative and absolute frequency distribution for research units. In the analysis, after assigning the frequency distribution for variables, and calculating the dispersion indices, analysis of variance tests, x^2 tests and Pearson correlation coefficient, the means and standard deviation was compared throughout the tests p<005 in all tests was considered significant.

Results

In this research, 400 samples had an age average of 46.33 years with standard deviation equal to ±18.737 among them 201 were employed with an age average of 26 and standard deviation of ±1.898. Also the number of family members had an average of 4.55. Table 1, shows the frequency distribution, of all clients with expiratory problem by their demographic characteristic. In table 4, base on chi – square test a significant correlation was shown between the lung function of the two genders.

In table 5, based on chi – square test a significant correlation was shown between lung function and age group. In table 6, based on chi – square test, a significant correlation was shown between the lung function and the marital status of the clients having respiratory problems. In table 7, based on chi – square test a significant correlation was shown between the lung function and occupation in clients with respiratory problems. In table 8) based on chi – square test a significant correlation was shown between lung function and the level of education of clients having respiratory problems. In table 9, based on chi – square test a significant correlation was shown between the lung function and BMI in clients having respiratory problems.

Table 5: Relation between lung function based on spirometry indice and age among clients with respiratory problems.

| Frequency | Lung spirometry test | | | | | | Total | |
| | obstructive | | restrictive | | normal | | | |
Age group	No	Percent	No	Percent	No	Percent	No	Percent
30 And less	4	3.5	40	35.4	69	61.1	113	100
31-40	1	2.5	24	60	15	37.5	40	100
41-50	6	8.2	51	69.9	16	21.9	73	100
51-60	2	2.8	52	72.2	18	25	72	100
61-70	6	10.7	40	71.4	10	17.9	56	100
71 and over	8	17.4	33	71.7	5	10.9	46	100

X^2= 72.1   DF= 10   P= 0.000

Table 6) Relation between lungs Function based on spirometry indice and the marital status in clients with respiratory problems.

| Frequency | Lung spirometry test | | | | | | Total | |
| | normal | | restrictive | | obstructive | | | |
Marital status	No	Percent	No	Percent	No	Percent	No	Percent
single	53	63.9	27	32.5	3	3.6	83	100
married	75	27.1	181	65.3	21	7.6	277	100
Divorced or dead spouse	5	12.5	32	80	3	7.5	40	100

X^2= 47.6   DF= 4   P= 0.000

Table 7) the relation between the lung function based on spirometry indice and the occupation of clients with respiratory problems.

| Frequency | Lung spirometry test | | | | | | Total | |
| | normal | | restrictive | | obstructive | | | |
Occupation	No	Percent	No	%	No	Percent	No	Percent
House keeper	36	26.1	96	69.6	6	4.3	138	100
Unemployed	17	39.5	25	58.1	1	2.3	43	100
Self – employed	36	46.8	36	46.8	5	6.5	77	100
Retired and employee	16	34.8	25	54.3	5	10.9	46	100
High school or university student	10	83.3	2	16.7	0	0	12	100
Construction worker	11	33.3	17	51.5	5	15.2	33	100
Farmer	7	13.7	39	76.5	5	9.8	51	100

Table 8) The relation between the lung function based on spirometry indice and level of education in clients with respiratory problems.

Frequency / Level of Education	Lung spirometry test						Total	
	normal		restrictive		obstructive			
	No	Percent	No	Percent	No	Percent	No	Percent
Illiterate	31	17.3	133	74.3	15	8.4	179	100
Able to read and write	8	22.9	24	68.6	3	8.6	35	100
Elementary level	36	48	37	49.3	2	2.7	75	100
Secondary level	19	45.2	19	45.2	4	9.5	42	100
Has finished high school	22	51.2	19	44.2	2	4.7	43	100
University education	17	65.4	8	30.8	1	3.8	26	100
TOTAL	133	33.3	240	60	27	6.8	400	100

$X^2= 52.5$ DF= 10   P= 0.000

Table 9) The relation between lung function based on spirometry indice and BMI (body mass index) in clients having respiratory problems

Frequency / BMI	Lung spirometry test						Total	
	normal		restrictive		obstructive			
	No	Percent	No	Percent	No	Percent	No	Percent
Under weight	4	18.2	16	72.7	2	9.1	22	100
Normal weight	85	40.7	107	51.2	17	8.1	209	100
Over weight	30	23.3	91	70.5	8	6.2	129	100
Obese	14	35	26	65	0	0.0	40	100
TOTAL	133	33.3	240	60	27	6.8	400	100

$X^2= 18.25$ DF= 6   P= 0.006

Discussion

This study was performed on 400 patients with respiratory problems. They said to have not a very bad. Economic condition with the majority of 59.8 percent. 32 percent had a poor economic condition. Other researches has also shown the prevalence of chronic obstructive disease among economically and socially disadvantaged people (11). Considering the age group the study showed that 18.3 percent of clients with respiratory problems were between 41-50 years old and 18% were in the range of 51-60. Also 10% were among the age group ranging 31-40 years old. The mean and standard deviation was calculated as 46.33 ± 18.73. In sharifian and others study the Average age of subjects was 33.52 years with a standard deviation of 12.7 years (3). In other studies, the majority of patients with Respiratory problems were among the age group 31-45 years. (12-13-14-15-16). Some other studies confirm this finding (17-18).The research showed that the majority of clients with respiratory problems with a percentage of 44.8% were illiterate. It is good to remember that on of the main factors of incidence and prevalence of TB in the community, is the lack of awareness, illiteracy, and the lack of education among the members of that community (19).The results showed that the majority of research units (81%) did not smoke and only 19 percent of them did have the habit of smoking. In ghaneie study, workers with 36% percent smokers were expected to have only obstructive pulmonary disease, but having 3.7% of net restrictive index and also 0.02% mixed obstructive and restrictive index, showed a damage in their lung parenchyma (20). The results in our research showed that 35.5% of the clients were suffering from asthma and allergy. Also 37.6% of clients had dyspnea, 25.1% coughing, 19.4% sputum, and 17.9% suffered from wheezing. A study in brazil also showed dyspnea and coughing in patients affected to COPD (21). Research shows that exercise, decreases the air ways bronchospasm and inflammation and consequently leads to a reduction in respiratory symptoms (22).Study of spirometry based on ATS showed that those clients with FEV1/FVC less than 70% 6.8% were suffering from a respiratory obstructive pattern and among them 74.1% were in the intense range 22.2% in the moderate range and finally 3.7% suffered from a slight obstructive pattern. Also in clients with FEV1/FVC more than 70%, 35.7% had FVC greater

than 80% with a normal spirometry. In the study of sharifian and others, the vital capacity (FVC) mean for the research population was 3.6 liter with a standard deviation of 0.96. Also the vital capacity mean was calculated as 4.33 litre for men with a standard deviation of 0.89, and 3 liter for women with a standard deviation of 0.46. in sharifian and other's study FEV1 was calculated as 3.12 liter with a standard deviation of 0.88 (3). In our study, results showed that 60% of clients belonged to the restrictive pattern and 6.8% belonged to the lung obstructive pattern. Considering that obtaining FEV1/FVC is the most useful way to show the obstruction of air ways. According to the study of sharifian and others, in Kurdistan Province FVC was less and FEV1/FVC was more and the obstruction of airways had more prevalence (3).In our study, a significant correlation was shown between the results for men and women. Men had more lung function quantities and more obstructive pattern percentage. Also as shown in table (4) The restrictive Pattern percentage was 44.6% and 55.4% for women and men respectively and more significant was the percentage of obstructive pattern as 18.5% and 81.5% for women and men respectively. These results was consistent with Behtoby study that there is a significant correlation between gender and suffering from the chronic lung obstructive disease.As the disease was more shown among the men than women (23). Also a meta – analysis study and a systematic review, shows a rapid annual decrease of FEV1 in smoker women (together with aging) comparing to men. This study implies the smoker women are more apt to COPD than the smoker men (24). On the other hand in developing countries, in addition to smoking, in halation of fuel's smoke, especially among women cooking in kitchens without proper ventilation is on the main reasons to suffer from this disease (25). Also the results of our study showed that among those clients suffering from obstructive respiratory disease, the least percentage (3.7%) belonged to the age group 31-40, and the maximum percentage (29.6%) belonged to the age group 70 and more, whereas among clients suffering from restrictive respiratory disease the maximum percentage was among those belonging to the age group of 51-60, and also with p=0.000 the respiratory results showed a significant correlation, as suffering from obstructive pulmonary disease, increases with aging. Other studies also show that developing the disease increases with aging (23). In Thaidents study, the difference between the average age of those suffering from COPD (64.1 years old) and patients suffering from Asthma (43 years old) was significant (26). In another study in Holland, among those with FEV1<80% the minimum range belonged to the age

group 35-40 (27). The obstructive pulmonary pattern was minimum with a percentage of 3.6% among single clients and considering p=0.000, there showed a significant correlation. This difference is also due to their younger ages in the age groups. The relation between the occupation and lung function with p=0.000 shows that farmers and house keeper women had a maximum percentage of 76.5% in the restrictive pattern, and workers had the maximum frequency in obstructive pattern. As regards, the majority of rural women in Kurdistan province use traditional ovens for cooking and baking breads, they are all apt to catch pulmonary diseases. Also other studies show that obstructive airway disease is very prevalent among workers with long experience in welding. Also among these workers, the change rate of lung capacity in age group over 40 years, has been a decrease in the lung capacity and FEV1/FVC in workers with an experience more than 20 years who are older than 40, has been less than 75%. This is an implication of obstructive disease among them (28).A farmer with chronic farmer's lung pneumotis, inducing by the inhalation of biologic dust, 4 to 8 hours after the causing contact, shows very acute symptoms like ague, coughing shortness of breath. Also a fire extinguisher agent and those caugh in the fire are apt to inhalining smoke. Statistics show that this kind of smoke inhaling may lead to cardio respiratory failure (29).The respiratory results showed that 74.3% of illiterate clients had restrictive pattern and p= 0.000 was significant. Findigs show that, smoking does have an important role in onset and development of chronic obstructive pulmonary disease and despite the role of oxygen therapy, medications and rehabilitation in the disease relative improvement; quitting smoking is one of the main factors in preventing the disease progression (30-31). Findings of this study showed no correlation between smoking and respiratory algorithm based on spirometry indices, but we know that smoking does have harmful effects on. Short term and long term physical health of smoker, and leads to a reduced quality of life (32). Tzanakis and his associates showed that Greek smoker clients who were sprometry tested, considering FEV1/FVC<70%, had COPD with a percentage of 8.4% (33). The study showed that 63.9% of clients with respiratory problems were of restrictive pattern and the majority of them (69.2%) were suffering from asthma and allergies. Also with p=0.002 a significant correlation was shown. The study showed 77.8% of lung function to be of obstructive pattern and among them the majority (55%)were suffering from asthma and allergies. Among 68.3% of clients suffering from asthma and allergies, 63.4% had a restrictive pattern7.7% had an obstructive pattern and 28.9%

were of normal pattern. Research shows that based on spirometry, 2 or 3 times exercise per week for 4 weeks and each time 30 to 40 minutes can lead to an improvement in lung function (34).Some other studies showed that consistent exercise can improve the function of respiratory system (35). In our study no significant correlation between daily regular exercise and spirometry respiratory pattern was shown. In ziaei and his associators study, the change in respiratory tests of professional basket ballists was shown more than the change in semi – professional athletes and the non – athletes. The changes was significant in FVC and FEV1, but no significant correlation was observed in semi professional groups and non sportsmen (36). On the other hand physical activity is regarded as a factor in creating bronchospasm (37). Research study results of ando and his associates in 2003 showed that pulmonary rehabilitation can lead to a decrease in clinical symptoms and an improvement in 6 minutes walking activity in patients suffering from chronic pulmonary diseases (38). Also being overweight is an independent risk factor for asthma although the mechanism has not been specified (29). This study also showed that there is a significant correlation between the lung function based on spirometry indice and body mass index with p= 0.006, where as the obese clients has a better lung function and this may be the cause of other risk factors like economic conditions, good occupation, no smoking and their level of education which is in relation of the clients life style.

Conclusions

Lung function tests are valuable tools for measuring lung function. (39)Spirometry results are useful if no mistake has been made in the measurement process. In fact, the results of spirometry, as a paraclinical diagnostic, non – invasive and simple test are very much dependent to the quality conditions of the apparatus like calibration leaks in spirometer, FVC maneuver, patients proper readiness before the test and using an experienced, trained and motivated operator (1).The results of the study indicate that among the 400 samples suffering from respiratory problems, the majority were men, married, illiterate (44.8%) and lived in the city. Also the older clients were more affected to the disease.

It is shown that contacting with smokes and fumes from burning wood, charcoal, excreta and crop residue in a closed space is responsible for 2.7% of life years lost for breakdown around the worlds (29).In the study the majority of clients suffering from respiratory problems, did not smoke. Most of the research units were suffering from shortness of breath, coughing and sputum. 6.8% of clients suffered from obstructive pulmonary pattern and

74.1% suffered from chronic restrictive pulmonary pattern which can be an indicate or of server lung damage. Also 37.5% of research units had FEV1/FVC greater than 80% in this study the majority of women in the age group 50-60 suffered from restrictive pattern. But in men the majority (74.1%) in the age group over 70 suffered from obstructive pattern. This finding was confirmed in other studies, where as with aging, the rate of pulmonary obstructive disease increases, and obstructive pulmonary disease is more prevalent among men. Also no significant correlation is shown between lung function disorders and smoking. Also the study showed that client's occupation affects the lung function disorders. In our study farmers belonged to the restrictive pulmonary pattern and workers suffered from lung function disorders with restrictive pattern. Based on results of this study it is expected that aging increases the risk of lung diseases. At the time being, the number of deaths from chronic diseases and diseases of aging is increasing rapidly. The cost and duration of treatment for these diseases is 20-30 times of acute diseases and the effectiveness of care on longevity and efficiency of elderly people is very low (40).So it is so important that authorities pay special attention to this point because our country will face with two phenomena in the future: aging of the society (increase in average age of the population) and absolute increase in the percentage of elderly in the age pyramid. To achieve this goal it is necessary to recognize the geriatric status in different social, economic, cultural and health areas.

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