

THE LIPID PROFILE IN CHRONIC OBSTRUCTIVE PULMONARY DISEASE AND CORRELATION WITH DISEASE SEVERITY

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Received date: 31 December 2019

Revised date: 22 January 2020

Accepted date: 12 February 2020

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ABSTRACT

Background: Chronic obstructive pulmonary disease (COPD) is a lung disease characterized by chronic obstruction of air flow that interferes with normal breathing which is not fully reversible. COPD is currently the fourth leading cause of death in the world. And it is projected to be third leading cause of death by 2020. The smoking is major risk factor for COPD. The smoking also affect the lipid profile.

Objective: -To assess the lipid profile in COPD patient. To assess the correlation between the lipid profile and disease severity. **Method and material:** 50 cases of COPD were selected, 50 healthy subjects were selected as control without any chronic illness and not receiving any medication which may affect the lipid profile. The diagnosis of COPD was confirmed by clinical feature, chest x-ray and spirometry following the GOLD guideline (post –bronchodilator forced expiratory volume (FEV1)/forced vital capacity (FVC) ratio <70% predicted). According to that the patient were divided into four groups depending on GOLD guideline which were mild COPD (stage I) FEV1 \geq 80% predicted, moderate COPD (stage II) FEV1 50% - 80% predicted, severe COPD (stage III) FEV1 30% - 50% predicted and very severe COPD (stage IV) FEV1 <30% predicted. The blood sample for fasting lipid profile were sent for cases and control and compare between them then four groups of COPD were compared. **Result:** according to our result the majority of cases were male (88%), and the majority of the patient within age group above 60 years (the mean age of male 60.09 ± 8.06 while for female 56 ± 2.56) most of our patient have moderate to severe COPD (stage II,III). The serum low density lipoprotein (S.LDL), serum triglyceride (S.TG), Serum cholesterol were significantly elevated in COPD patient comparing to control. The serum high density lipoprotein (S.HDL) was significantly lowering in COPD cases comparing to control (P-value<0.05). There were no statistically significant between the lipid profile and COPD severity (P-value>0.05).

Conclusion: there were elevated level of S.LDL, Cholesterol and lower S.HDL in COPD patient compared to control. Also we noticed that S.LDL, S.cholesterole, S.TG are slightly elevated in severe and very severe stage of COPD comparing to moderate stage, but the result was statistically not significant.

KEYWORDS: Lipid profile, COPD, IRAQI Patients.

INTRODUCTION

Chronic obstructive pulmonary disease (COPD) is a lung disease characterized by chronic obstruction of air flow that interfere with normal breathing which is not fully reversible.^[1]

According to the global initiative for obstructive lung disease (GOLD) the COPD is the third leading cause to death in 2020 while according to world health

organization (WHO) it is projected to be the third cause of death in 2030.^[2,3]

Globally, the COPD burden will be increased in coming decades due to continued exposure to the risk factors of COPD and aging of population.^[3]

The tobacco smoking is the environmental risk factor and it is most frequently and clearly associated with COPD, also the exposure to biomass smoke has also

proposed as one of important risk factor for developing the disease specially in non-smoker.^[4,5]

In addition to pulmonary abnormalities COPD has a systemic component that include significant extra-pulmonary effect, such as skeletal muscle dysfunction, weight loss, osteoporosis. the pathogenic mechanism behind the systemic effect are poorly understood but are probably interrelated and multifactorial including systemic inflammation, physical inactivity, tissue hypoxia, oxidative stress.^[6]

The metabolic syndrome and COPD are currently wide spread clinical condition with significant impact on public health.^[7]

A significant association between two disorder has been described on both epidemiological and clinical data support an important link between metabolic syndrome and lung function impairment.^[8]

Metabolic syndrome is a cluster of interrelated metabolic disease including: Dyslipidemia, Diabetes mellitus, Hypertension, Central obesity, Hypercoagulability state and Cardiovascular disease (CVD) and is associated with substantial increase in all cause mortality.^[9]

Dyslipidemia is one of major risk factor for cardiovascular disease.^[10]

Risk factor identified for atherosclerosis of coronaries arteries are: hyperlipidemia, arterial hypertension, cigarette smoking, diabetes mellitus, physical inactivity and decreased plasma level of High density lipoprotein (HDL).^[11]

The dyslipidemia is considered as one of the most important risk factor for developing atherogenesis and to asses the cardiovascular risk, increase low density lipoprotein (LDL), increased cholesterol level, increased triglyceride (TG) and decreased (HDL) are indicator of an atherogenic lipid pattern.^[11]

Smoking is a major risk factor for COPD and smoking affect the lipid profile so dyslipidemia may be found in COPD cases.^[12]

The plasma B-lipoprotein cholesterol and triglyceride concentration are higher and HDL cholesterol was lower in smoker than in non-smoker.^[13]

The nicotine can cause release of adrenalin from adrenal cortex leading to elevated level of serum free fatty acid (FFA) which lead to hepatic synthesis as well as secretion of cholesterol also hepatic secretion of VLDL and then elevated level of TG.^[14]

Also the smoking lead to lower the concentration of estrogen hormone which lead to decreased concentration of serum HDL cholesterol, smoking also increases

insulin resistance and then LDL, VLDL and TG are elevated in this hyperinsulinemia due to decrease activity of lipoprotein lipase.^[14]

Other important risk factor in COPD is age, with advancement of age, the lung function will be declined (so the FEV1 decline), and other risk factor add to the disease process.^[15]

The COPD has high prevalence in male than in female, and this is may due to the higher prevalence of smoking in male gender. but the data from developed countries suggest that prevalence is almost equal in male and female due to changing pattern of tobacco smoking.^[16]

Aim of the study

- To assess the lipid profile in COPD patient.
- To assess the correlation between the lipid profile and disease severity.

MATERIAL AND METHOD

Study design: This cross-sectional study was conducted at Baghdad teaching hospital and al-karrkah general hospital. Baghdad Iraq.

Study period

From May 2018 to April 2019, 100 persons were selected (50 cases of COPD all are smoker, 50 healthy subject are control).

Inclusion criteria

According to GOLD guideline.^[17] any patient with symptoms of chronic productive cough or dyspnea and history of smoking where included in our study and is confirmed by spirometry, the value of FEV1 less than 80% of predicted value and FEV1/FVC ratio less than 0.7 (70%) after post-bronchodilator neulizer are included in this study.

50 patients of COPD and 50 persons non smoker healthy subject were selected as control group.

Exclusion criteria

Any patient with suspicions or diagnosis of asthma or cancer in the least five years, persons with comorbidity including D.M, CVD, or persons on anti-hyperlipidemia.^[18,19]

Uncooperative patient, being seriously ill, inability to perform spirometry, patient with familiar hyperlipidemia also excluded.

METHODOLOGY

Verbal permission was taken from 50 cases of COPD and 50 controls on the basis of simple random sampling method.

In addition to detailed history which taken from the patient and clinical examination, both patient and control were subjected for several investigation which are chest

X- ray (posterior- anterior view) was taken to observe the feature of chronic bronchitis.^[20]

The spirometry was done pre and post inhalation of Broncho dilator (Salbutamol).

The computerized spirometry show age, sex, race, weight, height, matched predicated and test value.

The COPD was confirmed by post Broncho dilator FEV1/FVC ratio <0.7 (70%) and the severity of disease was classified by FEV1 predicted according to GOLD criteria (global initiative for obstructive lung disease). Classification.^[21]

After base line spirometry was done, a 200 mcg of inhaled salbutamed was given via metred dose inhaler and the test was reported after 20 minute.

According to GOLD guideline, the increase in FEVI more than 200 ml (12%) from the prebronchodilator FEV1, were not taken in our study.

The patients were classified into four groups based on the severity of their disease according to the GOLD guideline. (table6).

After 8 hours overnight fast, a blood sample were drawn in the morning before breakfast from the subjects for lipid profile including total cholesterol, TG, HDL cholesterol, LDL, the result of VLDL using the equation VLDL cholesterol.^[22]

Statistical Analysis

The data for biochemical analysis was belong to standard statistical analysis using the statistical package for social science (SPSS) 25 software for windows.

Means with standard deviation where calculated for quantitative data.

A level of P-value less than 0.05 was considered significant.

The chi-squared test used for comparing lipid profile in case and control and correlation between lipid profile and severity of COPD.

RESULT

Fifty of COPD patient were studied consist of 44 cases males, 6 cases female. The data was shown is table1.

Table (1): Age and sex distribution.

Age (year)	male	female	Total	%
31-40	1	0	1	2%
41-50	6	2	8	16%
51-60	11	2	13	26%
> 60	26	2	28	56%
total	44	6	50	100%

56% of participant patient within our study were within age group > 60yr old.

26% within 51-60 yr, 16% within age 41-50 yr. and only 2% within age 31-40 yr. old, these data were shown in table 1.

88% of the patient in our study were male, while 12% of the patients were female. All these result in table1.

In our study, the duration of illness of the patients start from 1 year to > 15 years duration, and the majority of cases fall within 6-10 years, this was shown in table 2.

Table (2): Duration of illness in COPD patients.

Duration (year)	male	female	Total	%
1-5	11	3	14	28%
6-10	20	2	22	44%
11-15	8	1	9	18%
> 15	5	0	5	10%
Total	44	6	50	100%

The clinical features of patient during time of study were shown in table 3, and all control group were healthy and non-smoker.

Table (3): Clinical feature of COPD patient.

C/F	No. f p (n=50)	%
1. Cough	50	100%
2. sputum	50	100%
3. Sob	42	84%
4. Wheezing	40	80%
5. Crepitation	40	80%
6. Fever	10	20%
7. Decrease breath sound	32	64%
8. Decrease chest moment	31	62%
9. intercostal indwelling	6	12%
10. Pursed lip breathing	8	16%
11. Raised JVP	5	10%
12. Cyanosis	6	12%
13. Ankle odema	8	16%
14. Clubbing	2	4%

Most patients had normal hemoglobin level. Sputum for acid fast bacilli (AFB) was sent in 5 patients whom clinical feature suspected pulmonary tuberculosis and all of them were negative sputum for AfB.

The chest X-ray finding were shown in table 4.

29 patient (58%) were emphysema (hyperinflated), 12 patient (24%) were chronic bronchitis, while 9 patient (18%) had normal chest X-ray and chest X-ray of control group normal.

Table (4): CXR findings.

x- ray findings	No. of patient (n=50)	%
Normal x-ray	9	18%
Chronic bronchitis	12	24%
Emphysema (hyperinflated)	29	58%
Total	50	100%

Most patient in our study were in stage 2, there were 24 patient (48%) whom show moderate air flow obstruction, their mean FEV1 were 62.12 ± 5.99 , 16 patient (32%) were in sever COPD and their mean FEV1 were 37.01 ± 8.48 , and only 5 patient (10%) show very sever obstruction and their mean FEV1 26.22 ± 3.13 , all these data were shown in table 5.

Table (5): Staging of COPD patient according to GOLD guideline.

Severity of OPD	No. of p	%	FEV1 mean \pm SD
Moderate FEV1/FVC (79-50)	24	48%	62.12 ± 5.99
Severe FEV1/FVC(49-30)	16	32%	37.01 ± 8.48
Very severe FEV1/FVC<30)	5	10%	26.22 ± 3.13

We noticed that mean HDL concentration in cases was 31.12 ± 13.5 , against control group who had mean HDL concentration 47.92 ± 7.10 which was statistically significant (p-value<0.05).

The mean TG concentration in cases 161.81 ± 46.39 against the control group 128.99 ± 30.25 which was statistically significant (p-value<0.05).

The mean LDL concentration in cases was 119.10 ± 16.96 , against the control group 90.93 ± 17.76 which was statistically significant (p-value<0.05), and the VLDL concentration in cases 44.20 ± 23.87 , against the control group which were 30.18 ± 17.55 which was statistically significant (p-value<0.05), all these result were shown in table (6).

Table (6): mean \pm SD of serum lipid profile parameters in case of control groups.

Lipid profile	Case	Control	p-value
Total cholesterol	192.46 ± 14.01	158.23 ± 9.33	<0.05
HDL	31.12 ± 13.15	47.92 ± 7.10	<0.05
Triglyceride	161.81 ± 46.39	128.99 ± 30.25	<0.05
VLDL	44.20 ± 23.87	30.18 ± 17.55	<0.05
LDL	119.10 ± 16.96	90.93 ± 17.76	<0.05

It was observed that the TG, total cholesterol, LDL were slightly elevated in sever COPD than in moderate but statistically not significant.

Table (7): Correlation of lipid profile severity of COPD.

Lipid profile	Moderate 79-50%	Severe or very severe < 50%	p- value
Total cholesterol	183.93 ± 19.82	190.01 ± 16.77	0.821
HDL	35.28 ± 12.11	36.23 ± 9.86	0.713
LDL	119.91 ± 17.90	122.84 ± 14.76	0.822
Triglyceride	150.17 ± 41.83	152.77 ± 44.61	0.399

DISCUSSION

In our study 50 cases of COPD were selected by cross sectional method from the respiratory and internal medicine clinic of Baghdad teaching hospital, and internal medicine clinic of al-karkah general hospital.

In our study the mean age of males 60.09 ± 8.06 , while the mean age of females 56 ± 2.56 .

In another study in india, the mean age of male and female participant were 63.32 ± 10.73 and 63 ± 10.18 years respectively.^[23]

In other study the mean age of the males and females was 60.47 ± 11.87 and 60.44 ± 10.84 years respectively.^[24]

In our study we observed that 88% of cases were males while 12% were females, in other study the male was 75% while female 25%.^[24]

In India study the males was 88% and females was 12%.^[25]

The duration of illness in our study range from 1 year to > 15 years and the majority of patient fall within group (6-10 years) who were 44% of cases fall within that

groups, our result can be compared with similar result of one indian study.^[25]

In our study, we found the cyanosis was present in 6 cases (12%) while in other study (28%).^[25] raised JVP was (10%), ankle oedema (16%) while in other study (20%), (24%) respectively.^[25]

In our study most cases fall within moderate to severe stage (GOLD criteria) 24 cases (48% within) moderate stage, 16 cases (32% within sever stage).

In another study 32% of cases fall within stage II, (moderate) while 34% fall within study III (sever stage).^[24]

In one Indian study most cases within moderate to severe airflow obstruction 60% of cases within stage II.^[25]

In our study there was elevated level of LDL in cases which was 119.10 ± 16.6 when compared to control group 90.93 ± 17.76 which was statistically significant (p -value < 0.05). in other study... similar to our result, which show their level of LDL 118.91 ± 12.92 and their level of control LDL 110.55 ± 11.75 which was also statistical significant (p -value < 0.05).^[26]

Some previous researches show the same result.

In Bangladesh, one study show the level of LDL cases elevated which was 116.12 ± 14.26 when compared to control which was 108.95 ± 10.39 which was statically significant. (p -value < 0.05).^[27]

In study performed in a tertiary care hospital in south india, show the mean LDL level were in case (114.89 ± 19.61) while in control was (96.22 ± 19.96) which was statistically significant.^[28]

About the triglyceride (TG) in our study. The mean level of it was 161.81 ± 46.39 which was statically significant (p -value < 0.05) when compared to control which was 128.99 ± 30.25 .

In other study the triglyceride level of cases was 148.32 ± 12.18 while in control was 134.54 ± 11.78 which was statically significant (p -value < 0.05).^[26]

In south India study, also TG was elevated when compared to control & statically significant (p -value < 0.05)^[28] in a study carried out in Bangladesh, the TG in cases also elevated 150.04 ± 29.66 , while in control was 126.14 which was statistically significant (p -value < 0.05).^[27]

Another study also performed in India, was showed elevated level of TG in cases 140.38 ± 43.18 and in control was 134.86 ± 34.26 which was statically significant (p -value < 0.05).^[25]

In our study, the total cholesterol level in cases was 192.46 ± 14.01 when compared to control which was 158.23 ± 9.33 which was statistically significant (p -value < 0.05), this result was corroborated by some study we mentioned it above.^[27,28] while in a study performed in Gunter city of India the total cholesterol level not significantly elevated.^[25]

About HDL cholesterol in our study we noted that its level in cases was lower than in control (31.12 ± 13.15 mg/dl), (47.92 ± 7.10) respectively which was statistically significant (p -value < 0.05).

These result similar to the results of other study mentioned above.^[24,27,28]

In our study the total mean cholesterol level is slightly elevated (190.01 mg/dl ± 16.77) in sever stage of COPD, while in moderate stage (183.93 ± 19.82) but these result statistically not significant (P-value 0.821).

In another study (Indian study) also the result not significantly difference between the level of total cholesterol in moderate to severe and very sever COPD patient (p -value 0.796).^[25]

In other study show elevation of total cholesterol in moderate COPD while low in very sever COPD and their p -value (0.004) which is statistically significant.^[24]

About HDL mean level in moderate stage of COPD comparing to sever and very sever stages of COPD, there was no statistically significant (p -value < 0.713).

As in Indian study HDL and COPD stages were not significantly correlated with one another.^[24]

In another study, the value of HDL cholesterol concentration and COPD stage were not significant change (P-value 0.11).^[28]

About LDL level there was slightly elevated in severe and very severe stage of COPD (122.84 ± 14.76) while in moderate stage (119.91 ± 17.90) but these result statistically not significant (P-value 0.822).

The same result in other study about LDL concentration comparing to COPD stage their (p -value 0.11) which was statistically not significant.^[24]

About TG concentration in our study it is also slightly elevated in severe and very severe stage of COPD (152.77 ± 44.61) while in moderate stage (150.17 ± 41.83) but also statistically not significant (P-value 0.399).

In other study the TG concentration comparing to COPD stage were not significant their (P-value 0.33).^[24]

In another indian study also the same result for LDL and TG comparing to COPD stage.^[25]

CONCLUSION

There were elevated level of serum lipid LDL S.cholesterol and S.TG and lower S.HDL level in COPD patient compare to control.

S.LDL, S.cholesterole, S.TG are slightly elevated in severe and very severe stage of COPD comparing to moderate stage but the result statistically not significant.

COPD more common in male than in female and the median age of male (60.09 ±8.06) while in female (56±2.56).

RECOMMENDATION

According to our result we advise the physicians to screen COPD patient for elevated level of lipid profile (S.TG, S.cholesterol, S.LDL) to reduce the risk of cardiovascular morbidity and mortality. because of small size of our study, the more well designed studies with larger sample size and multiple subgroups are needed to further clarify this association.

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