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CODEN: IJBABN **Original Research Article**

Correlation between level of physical activity using IPAQ and exercise capacity using 6 min walk test in COPD patients: A cross-sectional study

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Abstract

Purpose of study: Chronic obstructive pulmonary disease patients show an accelerated decline in lung function and progressive impairment of physical performance shows changes mainly in the respiratory system, musculoskeletal system, and psychosocial factors. Sibei Chen *et al* study reported work of breathing is increased due to airway resistance. This leads to a reduced activity like standing, walking this all factors leads to a reduction in physical activity and exercise capacity in patients with chronic lung diseases. Physical activity level and exercise capacity are important determinants of health status and mortality. Literature has varied views on the association of physical activity and exercise capacity. Few studies quoted that there is moderate to a weak correlation between physical activity and exercise capacity. Therefore, we felt the need to find a correlation between physical activity level and exercise capacity in patients with COPD.

Aim and objective: To find out the correlation between physical activity and exercise capacity in COPD patients.

Methodology: A cross-sectional study was carried out in 65 COPD patients age 40 to 64 years and COPD grade I and II according to the GOLD stage. Physical activity level was assessed using International Physical Activity Questionnaire and exercise capacity by 6 minute walk test.

Result: This study demonstrated that in the grade I and II COPD patients: there were two groups of IPAQ, i.e. insufficiently active and minimally active. In both groups of GOLD, insufficiently active IPAQ score correlated with 6 min walk distance and it showed a negative correlation. Also, for minimally active IPAQ in both groups of gold stages, IPAQ score, and walk distance showed a positive correlation. When the mean and standard deviation was compared between the 6-minute walk distance and IPAQ score of GOLD stage 1 and 2, the result showed that it is not statistically significant.

Conclusion: This study concludes that the Physical Activity level does not correlate statically with distance walked in COPD patients.

Keywords: Physical Activity, COPD, IPAQ, Liver.

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1. Introduction

Chronic obstructive pulmonary disease is commonly known as a "Disease state characterized by airflow limitation that is not fully reversible. The airflow limitation is usually both progressive and associated with an abnormal inflammatory response of the lungs to noxious particles or gases."[1] Physical activity is any bodily movement produced by skeletal muscles that result in energy expenditure beyond resting energy expenditure.[2] Further Exercise capacity is known as the maximum amount of physical exertion that a patient can sustain.[3] Mohammed A et.al concluded that chronic obstructive pulmonary disease shows an accelerated decline in lung function and progressive impairment of physical performance as suggested by Watz *et al* Chronic obstructive pulmonary disease shows changes mainly in the respiratory system, musculoskeletal system, and psychosocial

factors.[2] Sibei Chen *et al* study reported work of breathing is increased due to airway resistance. The fear of dyspnea in chronic obstructive pulmonary disease patients which leads to a reduced activity like standing, walking this all factors leads to a reduction in physical activity and exercise capacity in patients with chronic lung diseases. Physical activity level and exercise capacity are important determinants of health status and mortality.[4] Literature has varied views on the association of physical activity and exercise capacity. Few studies quoted that there is moderate to a weak correlation between physical activity and exercise capacity. Therefore, we felt the need to find a correlation between physical activity level and exercise capacity in patients with COPD.

2. Methodology

2.1 Study design: Cross-sectional study.

2.2 Setting: Tertiary health care hospital.

2.3 Sample size: (Total 65 subjects (COPD patients) were included in the study.

2.4 Sampling Technique: convenient type of sampling done to recruit the subjects who are diagnosed cases of COPD in GOLD stage l – ll.

2.5 Inclusion Criteria: -

- Patients diagnosed with GOLD stages I–ll.
- Age 40–64 years.
- Ambulatory patient.

2.6 Exclusion Criteria: -

- Patient on oxygen therapy.
- Cardiovascular disease.
- a resting heart rate of more than 120, a systolic blood pressure of more than 180 mmHg, and a diastolic blood pressure of more than 100 mmHg.[23]

2.7 Ethics approval

The permission from head of institution and institutional ethical committee was obtained. Subjects were screened as per the inclusion and exclusion criteria. The informed written consent was taken from the subjects.

2.8 Methodology

From the pulmonary function test patients fulfilling GOLD criteria l and ll were selected.

Table No. 1: GOLD criteria

Gold Stage	COPD Severity	FEV1/FVC Ratio	FEV1 Range
I	Mild	<0.70	≥80% of normal
II	Moderate	<0.70	50%-79% of normal
III	Severe	<0.70	30%-49% of normal
IV	Very Severe	<0.70	<30% of normal or <50% of normal with chronic respiratory failure present

International Physical Activity Questionnaire was administered to the participant. International physical activity questionnaire is an indicator of physical activity. The specific types of activity that are assessed are walking, moderate-intensity activities and vigorous-intensity activities; frequency (measured in days per week) and duration (time per day) are collected separately for each specific type of activity Questions were asked to the participants in the language best understood by them and the most appropriate answer was documented. And the scoring was done. [5] After scoring subjects were categorised in insufficiently active [Category 1], minimally active [Category 2], a more active category [Category 3].

6 min walk test was carried out according to ATS guidelines. It has emerged as the most commonly used test for the objective assessment of functional exercise capacity. Two cones were kept at both the ends of 30-meter hallway. The turnaround points were marked with a cone (such as an orange traffic cone). A starting line, which marks the beginning and end of each 30m lap. [6]

2.9 Data Analysis

Statistical software STATA version 10.0 was used for data analysis. Tests used for statistical analysis were: 1. Pearson's correlation (r- value). 2. Unpaired t test

3. Results

Total number of samples in this study was 65.

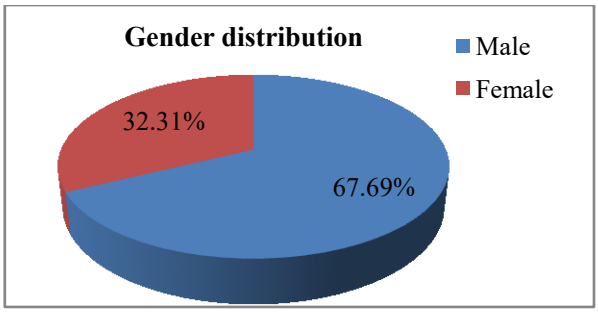

Figure 1: Gender wise distribution of study subjects

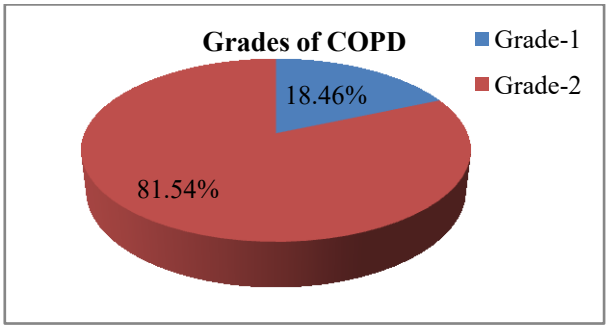

Figure 2: Grade of COPD wise distribution of study subjects

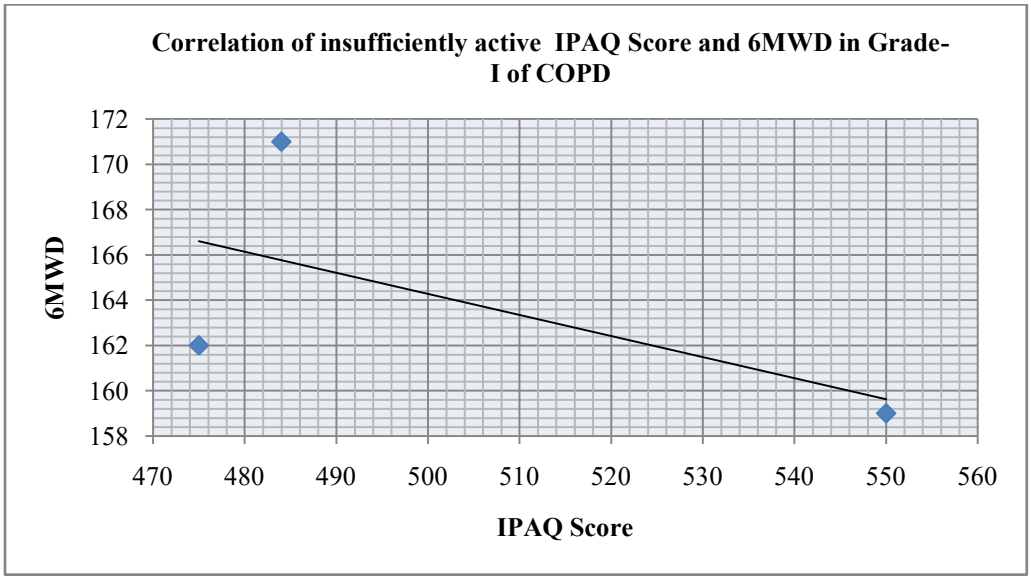

Figure 3: Correlation of insufficiently active IPAQ Score and 6MWD in Grade-I of COPD

Showed the negative correlation between IPAQ score and distance walked (figure 3)

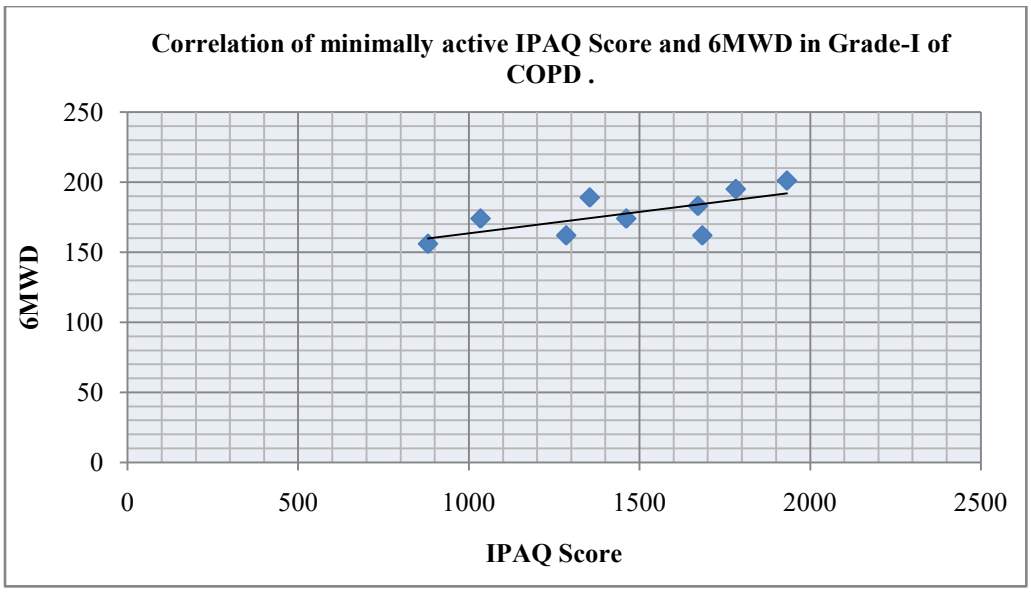

Figure 4: Correlation of minimally active IPAQ Score and 6MWD in Grade-I of COPD

Showed positive correlation between IPAQ score and distance walked. (Figure 4)

In this study there are two groups of IPAQ, insufficiently active which is less than 600 MET's and minimally active which is 600 to 3000 MET's when IPAQ score correlated with 6 min walk distance, In grade 1 stage of COPD insufficiently active IPAQ score correlated with 6 min walk distance shows negative correlation r value 0.6100 i.e. for Low score of IPAQ we are getting more distance walked with p value 0.58 which is not <0.05 hence it is not statistically significant. Further minimally active IPAQ score correlated with 6 min walk distance shows positive correlation r value 0.6762 i.e. for minimally active IPAQ score we are getting more distance in 6 min walk distance with p value 0.04 which is less than 0.05 shows statistical significant.

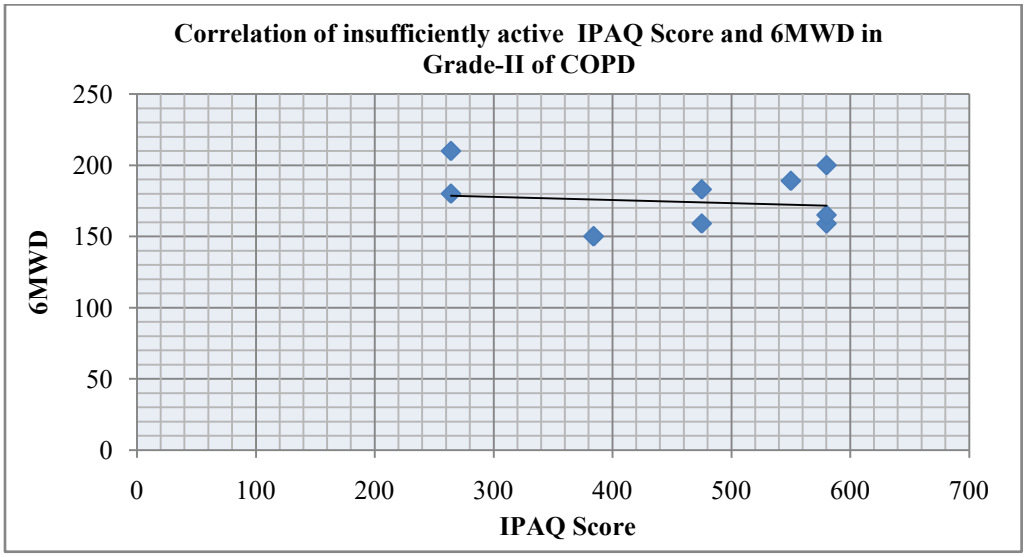

Figure 5: Correlation of insufficiently active IPAQ Score and 6MWD in Grade-II of COPD

Showed negative correlation between IPAQ score and distance walked. (Figure 5)

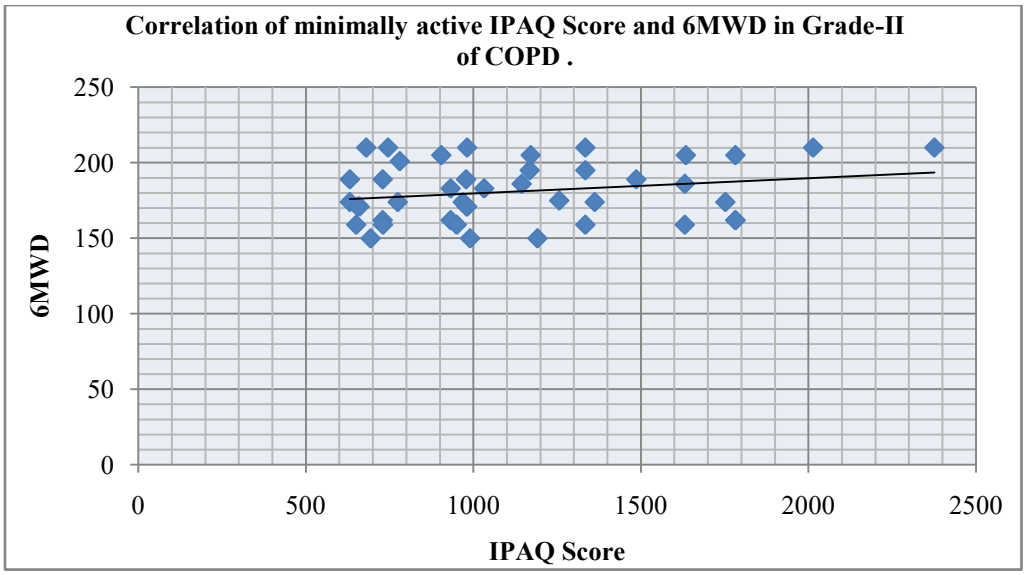

Figure 6: Correlation of minimally active IPAQ Score and 6MWD in Grade-II of COPD

Showed positive correlation between IPAQ score and distance walked. (Figure 6)

In grade 2 stage insufficiently active IPAQ score correlated with 6 min walk distance shows negative correlation r value -0.1292 i.e. for low score of IPAQ we are getting more distance walked with p value 0.72 which is not <0.05 so it is not statistical significant. Further minimally active IPAQ score correlated with 6 min walk distance shows positive correlation r value 0.2225 i.e. for minimally active IPAQ score we are getting more distance in 6 min walk distance with p value 0.1561 which is not less than 0.05 shows no statistically significant.

Figure 7: Comparison of Mean 6MWD test between insufficiently active and minimally active IPAQ Score in relation to Gold stage

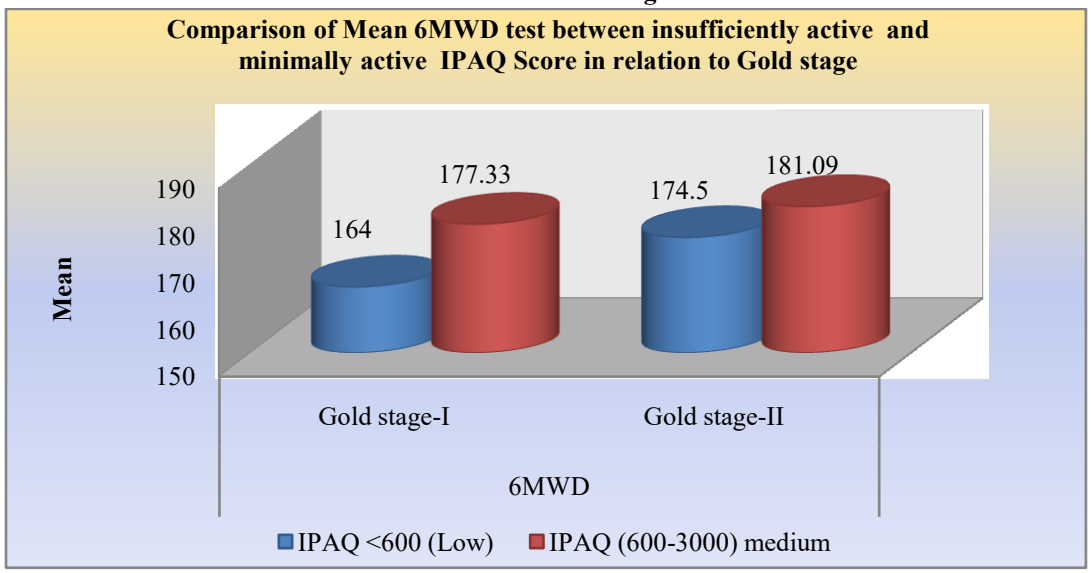

Table 2: Comparison of Mean 6MWD test between insufficiently active and minimally active IPAQ Score in relation to Gold stage

		IPAQ <600 (insufficiently active)		IPAQ (600-3000) (minimally active)		t-value	p-value
		Mean	SD	Mean	SD		
GOLD stage-I	6MWD Test	164	6.24	177.33	15.76	1.3914	0.1934
GOLD stage-II	6MWD Test	174.5	21.06	181.09	19.44	0.9512	0.3460

In GOLD stage 1, Comparison of mean and standard deviation of 6-minute walk distance between insufficiently active and minimally active subject is 164 ± 6.24 and 177.33± 15.76 respectively with t-value of 1.3914 and p value 0.1934 which is not <0.05, therefore, it is not significant i.e. There is no statistical difference between distance walked in insufficiently active and minimally active patients of stage 1. Similarly, IN Gold Stage 2, a Comparison of mean and standard deviation of 6-minute walk distance between insufficiently active and minimally active subjects is 174.5±21.06 and 181.09±19.44 respectively. With t-value of 0.95 and p value 0.34 which is not <0.05, therefore, it is not significant i.e. There is no statistical difference between distance walked in low and minimally active physically active patients of stage 2

Thus, we here conclude that PA level does not correlate statically with distance walked in 6 min walk test. Thus, PA level does not correlate with submaximal exercise capacity.

4. Discussion

A cross-sectional study was carried out in 65 COPD patients to find out correlation between physical activity level and submaximal exercise capacity. The results showed that when mean and standard deviation was compared between 6-minute walk distance and IPAQ score of GOLD stage 1 and 2, the result showed that it is not statistically significant. Thus, Physical Activity level does not correlate statically with distance walked. Our results are in line with the study done in the year 2013 by author Fastenau *et al*. Functional exercise capacity was assessed by the six-minute walk test and physical activity was measured with an accelerometer-based activity monitor and found that there is discrepancy between functional exercise capacity and daily physical activity in patients with mild to moderate COPD recruited. FEV1 showed no correlation with physical activity level but it showed correlation with functional capacity. Functional exercise capacity and daily physical activity also found no significant correlations between 6MWD and any of the physical activity variables.[7]

DePew *et al*, in the year 2013 conducted a study: "Correlations between Gait Speed, 6-Minute Walk Distance, Physical Activity, and Self-Efficacy in Patients with Severe Chronic Lung Disease". found that the inherent limitation of using any measure of exercise capacity for physical activity is that the patient preferences and priorities toward physical activity are left unaccounted. Patients may choose to live sedentary lifestyles despite relatively high exercise capacities.[8]

The ECLIPSE cohort conducted by Spruit *et al*. in the year 2009 stated that 6 minute walk distance is

dependent on the pulmonary and extrapulmonary factors. Pulmonary factors are airflow limitation by GOLD stage, degree of emphysema by CT, presence of depressive symptoms and dyspnea. Extrapulmonary factors are psychological and muscle strength. A decline in resting inspiratory capacity and the extent of emphysema mildly to moderately increased the odds of having poor 6MWD. A higher percentage of patients with symptoms of dyspnea and depressive symptoms. All these perceived measures showed an increase in likelihood of having a poor 6MWD.[9] Manuela Karloh *et al* in their study "The Glittre-ADL test reflects functional performance measured by physical activities of daily living in patients with chronic obstructive pulmonary disease" found the severity of the disease is associated with the differences in the level of physical activity in daily life more than in functional capacity. And concluded that performance on the T Glittre correlates with walking and sitting time, the number of steps taken, energy expenditure, and movement intensity during walking in real life when monitored by a motion sensor.[10]

6 minute walk distance also depends on the peripheral muscle weakness as stated by Rik Gossellnk *et al*, in the study showed that exercise capacity is severely impaired in patients with moderate to severe airflow obstruction, lung function impairment which contributes to exercise limitation, and peripheral and respiratory muscle weakness. Maximal inspiratory muscle strength was also considered an important factor contributing to exercise capacity. Other factors contributing to generalized muscle weakness are hypoxemia, hypercapnia, steroid treatment, inactivity, and malnutrition. Inspiratory muscle function is further compromised as a result of hyperinflation. Reduced peripheral muscle function may cause loss of endurance, loss of strength of the muscle, or both. If muscle metabolism reaches its limits due to lack of oxygen, the muscle metabolism is forced to deliver anaerobic energy, resulting in intramuscular lactic acidosis terminating exercise.[11] In the year 2014 Anne-Kathrin Rausch-Osthoff *et al* Published a study named "Association between peripheral muscle strength, exercise performance, and physical activity in daily life in patients with Chronic Obstructive Pulmonary Disease "Quadriceps strength (QS) was associated with 6MWD, sit to stand test (STST), and handgrip-strength but not with Physical activity of daily living. Concludet that the peripheral muscle strength may be associated with exercise performance but not with physical activity in daily life. Thus, it affects exercise performance.[12]

Thus, in our study when 65 COPD patients of COPD when correlated with Physical activity level and exercise capacity we found that Physical activity does not correlate with the Exercise capacity.

5. Conclusion

Results of this study demonstrated that in the grade I and II COPD patients: there were two groups of IPAQ, i.e. insufficiently active and minimally active. In both groups of GOLD, insufficiently active IPAQ score correlated with 6 min walk distance and it showed negative correlation I.e. for a low score of IPAQ distance walked is more though it is not statistically significant. Also, for minimally active IPAQ in both groups of gold stages, IPAQ score and walk distance showed positive correlation i.e. for medium physical activity level walk distance correlated is statistically significant. When mean and standard deviation was compared between 6-minute walk distance and IPAQ score of GOLD stage 1 and 2, the result showed that it is not statistically significant.

Thus, the study concludes that Physical Activity level does not correlate statically with distance walked in COPD patients.

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