"CORRELATION OF BALANCE IMPAIREMENT WITH HEALTH RELATED QUALITY OF LIFE IN SUBJECTS WITH MODERATE CHRONIC OBSTRUCTIVE PULMONARY DISEASE"

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ABSTRACT

Background and Objective: Recent studies on western population have shown that there is reduction in the functional balance and health related quality of life in individuals with COPD. Hence there is a need to find is there is an association between balance affected with reduced health related quality of life in subjects with COPD . The purpose of this study is to find the association of balance with health related quality of life in subjects with moderate COPD.

Method: A Correlation study design, selected 128 moderate COPD subjects with age group between 45 to 60 years. All the subjects were evaluated for functional balance using outcome measurements such as Berg Balance Scale, Timed Up and Go Test, Single limb Stance time, Activity specific balance Scale, Elderly fall screening test and health related quality of life using St George respiratory Questionnaire.

Results: Analysis using Pearson coefficient of correlation shown that the balance components such as Berg Balance Scale score, Timed Up and Go Test, Single limb Stance time, Activity specific balance Scale, Elderly Falls Screening, has significant correlation with Health related quality of life that measured using St. George: Symptoms, Activity Score, Impact score and total score.

Conclusion: The present study concludes that the balance components such as Berg Balance Scale score, Timed Up and Go Test, Single limb Stance time, Activity specific balance Scale, Elderly Falls Screening, has found significant correlation with Health related quality of life that measured using St. George: Symptoms, Activity Score, Impact score and total score. Therefore the balance impairment in moderate COPD subject is associated with affecting Health related Quality of life.

KEYWORDS : Moderate COPD, functional balance, Berg Balance Scale, Timed Up and Go Test, Single limb Stance time, Activity specific balance Scale, health related quality of life, St George respiratory Questionnaire.

INTRODUCTION

According to American Thoracic Society (ATS) and European Respiratory Society (ETS), Chronic obstructive pulmonary disease (COPD) is defined as "A preventable and treatable disease state characterized by airflow limitation that is not fully reversible. The airflow limitation is usually progressive and associated with an abnormal inflammatory response of the lungs to noxious particles or gases, primarily caused by cigarette smoking. Although COPD affects the lungs, it also produces significant systemic consequences.[1,2] In India COPD constitute nearly 25-30 % of cases data according to chest clinics.[3] COPD is recognized as a systemic disease associated with a broad array of physical and functional limitations.[4]

Balance and mobility are the important elements of most of the activities of daily living and studies have shown that reduced muscle strength and hypoxia impairs balance.[5] Recent Studies have shown that there is reduced static as well as dynamic balance in patients with COPD.[5,6] This reduction may be because of the combined effect of various systemic factors in COPD.[7] A study on Indian population concluded that COPD subjects had reduced functional balance compared to normal healthy individuals of same age group. So it should be considered as important component of assessment during pulmonary rehabilitation.[8] In subjects with COPD impairments in peripheral muscle function, mobility and exercise capacity are present. However emerging evidence suggests that older adults with COPD show reductions in balance control that may be associated with an increased fall risk in this population.[9]

Health-related quality of life (HRQoL) is a multi-dimensional concept that includes domains related to physical, mental, emotional, and social functioning. It goes beyond direct measures of population health, life expectancy, and causes of death, and focuses on the impact health status has on quality of life. Factors that influence health-related quality of life in individuals with COPD are the existence of other illnesses, such as depression, high blood pressure, the severity of COPD, patients' age, health beliefs and coping mechanisms.[10]

Even though various factor influence on health-related quality of life in individuals with COPD, influence of balance impairment due COPD on health-related quality of life in individuals with COPD is not known. As growing body of evidence suggests that individuals with chronic lung disease have important defects in balance control that may be associated with an increased risk of falls.[11] This study was with research question that does affecting balance is associated with health related quality of life in subjects with moderate COPD? It was null hypothesized that affecting balance is significantly associated with health related quality of life in subjects with moderate COPD. The purpose of this study is to find the association of balance impairment with health related quality of life in subjects with moderate COPD.

METHODOLOGY

A correlation study design. As this study involved human subjects the Ethical Clearance was obtained from the Ethical Committee of Padmashree Institute of Physiotherapy, Bangalore, as per ethical guidelines research from biomedical research on human subjects, 2000, ICMR, New Delhi. The approval for the study was obtained from the scientific and Research Ethical committee of RGUHS. The subjects have been selected for the study from ESIC Model Hospital, Bangalore and the study was conducted in this Hospital. This study was registered under Rajiv Gandhi University of Health Sciences for subjects for registration for dissertation for PhD in physiotherapy program. Subjects included in the study were referred by Pulmonologist and the physician diagnosed with moderate COPD based on spirometry test FEV1/FVC < 0.70 and FEV1 ≥ 80%, age group between 40-60 years,[3,11] chest expansion less than 1.5 cms, ability to communicate and follow commands, who had independent mobility. Subjects were excluded with musculoskeletal disorders affecting upper limb, pathological condition affecting muscle, joint and bone Such as rheumatoid arthritis, severe osteoporosis, cardiovascular dysfunction (eg, ischemic heart disease, uncontrolled hypertension), and associated conditions restricting chest expansion. (eg, obesity, severe scoliosis, ankylosing spondylitis), recent chest or abdominal surgery,[13] pathology of spine such as disc protrusion,

spondylolisthesis.

The assessment of balance was done using Berg Balance Scale, Timed Up and Go Test, Single limb stance time and Activity specific balance Scale, Elderly falls screening test, and for health related quality of life was measured using St George Respiratory Questionnaire.

Outcome Measurements:

TUG test: The timed "Up and Go" test was used to provide a timed measure of balance and functional mobility in subjects. The test was performed by asking the subject to rise from a standard armchair, walk 3 meter at a comfortable pace, walk back to the chair, and sit down. Total time taken to complete the test was measured in seconds by using stop watch. A practice trial was performed in order to become familiar with the test and individuals were permitted to use a gait aid if required.

Berg balance scale: Functional balance was measured using the 14 item BBS. Activities such as transfers, reaching, turning around and single legged stance were graded on a scale ranging from 0 (significant impairment) to 4 (normal) with higher scores indicating greater balance control. A cutoff of 45 points may be used to identify a subject at risk for falling (>= 45 low risk of falling, < 45 higher risk).

Single limb stance test: Stand on one leg, place your arms across your chest with your hands touching your shoulders and do not let your legs touch each other. Subjects were given three trials and the best time was taken.

ABC scale: The ABC scale requires subject to indicate their confidence in performing 16 activities without losing their balance or becoming unsteady on an 11-point scale (0%– 100%). Higher scores indicate higher balance confidence or less fear of falling.

Elderly Falls Screening Test: This test has got two parts in which part one is questionnaire with three components regarding the falls, part two is regarding observation on gait patterns with two components and scoring is done from 0 to 1 for all the questions and the total score is measured.

St. George Questionnaire: It is designed to measure health impairment in subjects with COPD. It has two parts, three components and total 50 items. Part 1 (Questions 1-7) addresses the frequency of respiratory symptoms and to assess the patient's perception of their recent respiratory problems. Part 2 (Questions 8-14) addresses the patient's current state (i.e. how they are these days). The Activity score measures disturbances to daily physical activity. The Impacts score covers a range of disturbances of psycho-social function. The copyright permission was obtained to use questionnaire in our study from St. George's University of London.

Statistical Methods

Descriptive statistical analysis was carried out in the present study. Out Come measurements analyzed are presented as mean SD. Significance is assessed at 5 % level of significance with p value was set at 0.05 less than this is considered as statistically significant difference. Pearson coefficient of correlation as a parametric test has been used to correlate the association of means between the variables. The Statistical software namely SPSS 16.0, Stata 8.0, MedCalc 9.0.1 and Systat 11.0 were used for the analysis of the data and Microsoft word and Excel have been used to generate graphs, tables etc.

Results

The study was conducted on total 128 subjects. The gender distribution of the subjects shows that there are 25 females and 103 males subjects in the study. The table-2 shows that the balance components such as Berg Balance Scale score, Timed Up and Go Test, Single limb Stance time, Activity specific balance Scale, Elderly Falls Screening, has significant correlation with Health related quality of life that measured using St. George: Symptoms, Activity Score, Impact score and total score

Table 1: Descriptive Analysis of variables

		N	Minimum	Maximum	Mean ± Std. Deviation
Age		128	44	60	52.32 ±4.27
Berg Balance Scale		128	36	44	40.06±1.74
Timed Up and Go Test		128	15	19	16.58±1.16
Single limb Stance time		128	12	19	16.11±1.68
Activity specific balance Scale		128	75	83	78.95±2.27
Elderly Falls Screening Test		128	2	3	2.21±0.41
St. George: Symptoms		128	50.29	95.03	96.03±11.66
St. George: Activity Score		128	35.80	85.66	59.76±12.23
St. George: Impact score		128	13.03	90.42	41.60±18.90
St. George: Total score		128	26.32	87.50	51.66±14.33
Gender	Female	25	19.5%		
	Male	103	80.5%		

Table 2: Correlation of Balance with Health Related Quality of Life

		Age	St. George: Symptoms	St. George: Activity Score	St. George: Impact score	St. George: Total score
Age	Pearson Correlation r	----	0.666**	0.560**	0.399*	0.514
	Sig. (1-tailed)	----	0.000**	0.000**	0.000**	0.000**
	Correlation	----	Moderate positive correlation	Moderate positive correlation	Weak positive correlation	Moderate positive correlation
Berg Balance Scale	Pearson Correlation r	-0.777**	-0.638**	-0.518**	-0.446*	-0.532
	Sig. (1-tailed)	0.000**	0.000**	0.000**	0.000**	0.000**
	Correlation	Strong negative correlation	Moderate negative correlation	Moderate negative correlation	Moderate negative correlation	Moderate negative correlation
Timed Up and Go Test	Pearson Correlation r	0.774**	0.651	0.559**	0.377**	0.496*
	Sig. (1-tailed)	0.000**	0.000**	0.000**	0.000**	0.000**
	Correlation	Strong positive correlation	Strong positive correlation	Moderate positive correlation	Weak positive correlation	Moderate positive correlation
Single limb Stance time	Pearson Correlation r	-0.775**	-0.609**	-0.524**	-0.387**	-0.488*
	Sig. (1-tailed)	0.000**	0.000**	0.000**	0.000**	0.000**
	Correlation	Strong negative correlation	Moderate negative correlation	Moderate negative correlation	Moderate negative correlation	Moderate negative correlation
Activity specific balance Scale	Pearson Correlation r	-0.698**	-0.706**	-0.552**	-0.444**	-0.549**
	Sig. (1-tailed)	0.000**	0.000**	0.000**	0.000**	0.000**
	Correlation	Strong negative correlation	Strong negative correlation	Moderate negative correlation	Moderate negative correlation	Moderate negative correlation
Elderly Falls Screening Test	Pearson Correlation r	0.231**	0.193**	0.226**	0.226**	0.243*
	Sig. (1-tailed)	0.000**	0.015**	0.005**	0.005**	0.003**
	Correlation	Weak positive correlation	Weak positive correlation	Weak positive correlation	Weak positive correlation	Weak positive correlation

Graph-1 : Correlation of Balance with Health Related Quality of Life

Age, St. George: Symptoms, Activity Score, Impact score and total score
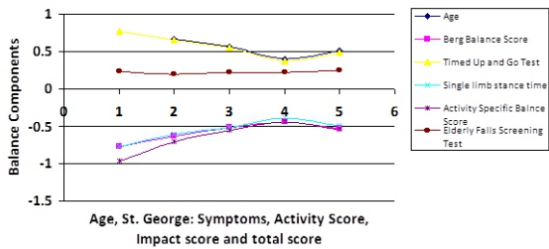
Discussion

The study found that the balance components such as Berg Balance Scale score, Timed Up and Go Test, Single limb Stance time, Activity specific balance Scale, Elderly Falls Screening, has found significant correlation with Health related quality of life that measured using St. George: Symptoms, Activity Score, Impact score and total score.

The association of age of subject with Berg Balance Scale score, Single limb Stance time, Activity specific balance Scale found that there is a significant Strong negative correlation showing that increasing in age there is decrease in the score. The association of age of subject with Timed Up and Go Test shows that there is a significant strong positive correlation showing that increasing in age there is increasing in the score. The association age of the subjects with Elderly Falls Screening Test there is significant weak positive correlation showing that there less impact of age on falls. Association of age of subject with St. George: Symptoms, Activity Score, Impact score and total score there is significant moderate positive correlation. Therefore the age of the subjects has significant correlation with balance and Health related quality of life and the emerging evidence suggests that older adults with COPD show reductions in balance control that may be associated with an increased fall risk in this population.[9]

The studies have been found that there is decrease in the skeletal muscle performance is seen in COPD which is exhibited by reduced muscle mass, fibre type profile, strength and endurance.[14-17] Muscle strength is thought to be an essential factor in maintaining postural control and minimizing postural sway. Studies have proven that patients with mild COPD shows a significant reduction in skeletal muscle endurance and strength compared with healthy and sedentary subjects.[15-18] Studies shown that the quadriceps fatigability is more in individuals suffering from COPD compared to healthy control subjects.[19, 20] Lower limb muscles Atrophy, weakness, fatigability and metabolic inefficiency is commonly seen in COPD and these unfavorable muscle characteristics, dysfunction of lower limb muscles and dyspnoea are responsible for limitation of exercise capacity in COPD.[21-24] All these factors influence on balance impairment that affects the foundational ability and health related quality of life in subjects with moderate COPD. Therefore in our study when we found the association between the balance and health related quality of life, we found the following findings from the analysis.

The association of Berg Balance Scale with St. George: Symptoms, Activity Score, Impact score and total score there is significant moderate negative correlation showing that decreasing in Berg Balance Scale there is decrease in Health related quality of life. The association of Timed Up and Go Test with St. George: Symptoms (strong correlation), Activity Score (moderate correlation), Impact score (Weak correlation) and total score (moderate correlation) there is significant weak to strong positive correlation showing that increasing in Timed Up and Go Test there is increasing in Health related quality of life. The association of Single limb Stance time with St. George: Symptoms, Activity Score, Impact score and total score there is significant moderate negative correlation showing that decreasing in Single limb Stance there is decrease in Health related quality of life. The association of Activity specific balance Scale with St. George: Symptoms (strong correlation), Activity Score, Impact score and total score there is significant moderate negative correlation showing that decreasing in Activity specific balance Scale there is decrease in Health related quality of life. The association of Elderly Falls Screening Test with St. George: Symptoms, Activity Score, Impact score and total score there is significant Weak positive correlation showing that decreasing in Elderly Falls Screening Test there is less significant effect on decrease in Health related quality of life.

Roca M, Mihăescu .T et al., 2013, In the article regarding Peripheral muscle dysfunction in chronic obstructive pulmonary disease explained that the skeletal muscles function is restricted in COPD, because of decreased endurance and strength. Skeletal muscle weakness has a great clinical importance in COPD, as it is recognized to contribute independently to poor health status, reduced quality of life and increased mortality[25]. Marla K. Beauchamp,et al.,2012 , did a study on Impairments in Systems Underlying Control of Balance in COPD to determine the specific components of balance that are impaired in COPD and to investigate the association among balance, peripheral muscle strength, and physical activity in 37 patients with COPD and 20 healthy control subjects using the Balance Evaluation Systems Test. The study concluded that individuals with COPD exhibit impairments in all balance subcomponents and demonstrate slower reaction times in response to perturbations.[13] Angela T.Chang et al., 2008 a Brief Report on Static Balance is affected following an Exercise Task in Chronic Obstructive Pulmonary Disease in 19 patients using time up and go test, step- up test, and swaymeter and concluded that A submaximal exercise tasks in patients with COPD affects balance during static standing tasks in absence of visual input.[12]

From the analysis it found the balance impairment in moderate COPD subject is associated with affecting Health related Quality of life. Therefore, based on the findings the present study found that there is a statistically significant correlation of balance with health related quality of life in subjects moderate COPD. Hence, the present rejects the null hypothesis.

LIMITATIONS OF THE STUDY

1. Subjects with age group range between 40 to 60 years were considered for the study, thus results cannot be generalized to all the groups.
2. The study was conducted on moderate COPD subjects, finding in mild and severe COPD subjects were not found.
3. Both male and female subjects were considered; therefore the association of balance affecting quality of life is not found specific the gender.
4. Other factors affecting health related quality of life in subjects with moderate COPD is not considered.
5. Duration of COPD subjects were not considered to relate with health related quality of life.

RECCOMENDATION FOR FUTURE RESEARCH

1. Study is needed to find the association with different age group and specific to the male and female subjects.
2. The study need to find the association in mild and severe COPD considering the duration of the COPD.
3. The study is needed to find the association in balance impairment with other factors affecting health related quality of life in subjects with moderate COPD.

Conclusion

The present study concludes that the balance components such as Berg Balance Scale score, Timed Up and Go Test, Single limb Stance time, Activity specific balance Scale, Elderly Falls Screening, has found significant correlation with Health related quality of life that measured using St. George: Symptoms, Activity Score, Impact score and total score. Therefore the balance impairment in moderate COPD subject is associated with affecting Health related Quality of life.

Acknowledgement

Conflicts of interest: None

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