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Assessment of trunk mobility and upper extremity functions in Parkinson's patients

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ABSTRACT

Parkinson's disease (PD) is a progressive disorder of the central nervous system (CNS with both motor and nonmotor symptoms). Motor symptoms include the cardinal features of rigidity, bradykinesia, tremor, and, in later stages, postural instability. Nonmotor symptoms may precede the onset of motor symptoms by years. Early symptoms can include loss of sense of smell, constipation, rapid eye movement (REM) sleep behaviour disorder, mood disorders, and orthostatic hypotension. Other symptoms include altered bladder function, excessive saliva, integumentary changes, difficulty speaking and swallowing, and cognitive problems. Hence the aim of the study is assessed trunk mobility and upper extremity function in Parkinson's disease patients. Trunk mobility was assessed by Trunk Mobility Scale. The tests were performed with the patient sit-ting on a chair, with no arm support, feet on the floor and the back kept 10 cm from the chair. Scores of dynamic items range from 0 to 3. The patient that performs requested movement receives score 3. Scores 1 and 2 are attributed to individuals that perform the movements, but with compensations. The score is 1 for small compensations, and movement with no compensation receives score 0. The patient that is unable to make the 2 for great compensations. Great compensations are exaggerated movements, easily noticed by an investigator (for instance, when inclining side-ways, the patient associate trunk rotation and/or flexion and/or extension movements). Small compensations are subtle movements, but that are present when the movement is performed. In the static aspect, the sitting posture analysis may range from 0 (upright sitting position) to 4. The Upper Extremity Functional Index (UEFI) is a patient reported outcome measure used to assess the functional impairment in individuals with musculoskeletal upper limb dysfunction. The original UEFI consists of 20 questions on a 5- point rating scale assessing level of difficulty in performing activities of daily living using the upper extremities including household and work activities, hobbies, lifting a bag of groceries, washing your scalp, pushing up on your hands, driving etc.

Keywords: Parkinson's disease, trunk mobility, bradykinesia, tremor

INTRODUCTION

Parkinson's disease (PD) is a progressive disorder of the central nervous system (CNS with both motor and nonmotor symptoms). Motor symptoms include the cardinal features of rigidity, bradykinesia, tremor, and, in later stages, postural instability. Nonmotor symptoms may precede the onset of motor symptoms by years. Early symptoms can include loss of sense of smell, constipation, rapid eye movement (REM) sleep behavior disorder, mood disorders, and orthostatic hypotension. Other symptoms include altered bladder function, excessive saliva, integumentary changes, difficulty speaking and swallowing, and cognitive problems (slowed thinking, confusion, and in some cases dementia).[1]

Parkinson's disease was first described as "the shaking palsy" by James Parkinson in 1817 recognized as an extrapyramidal disorder by Skinnier Wilson di (1912). Etiology is idiopathic or unknown. Parkinson's disease is a chronic, progressive disease of the central nervous system.[1]

Onset is insidious with a slow rate of progression. Disruption in daily function, roles and activities, and depression is very common in individuals with Parkinson's disease. Parkinson's disease affects more than 2% of the population older than 50 years of age. The incidence and prevalence both increase with age. Sex incidence is about equal. Parkinson's disease is a common that affects an estimated 1 million Americans and an estimated 7 to 10 million people worldwide. More than 2 % of people older than 65 years of age have PD, second only to Alzheimer's disease among neurodegenerative disorders.[1]

The prevalence of the disease is expected to increase substantially in the coming years due to the aging of the population. The average age of onset is 50 to 60 years. Only 4% to 10% of patients are diagnosed with early-onset PD. Young-onset PD is classified as beginning between 21 and 40 years of age, and juvenile-onset .PD affects individuals less than 21 years of age. Men are affected 1.2 to 1.5 times more frequently than women.1, 2of patients are diagnosed with early-onset PD.[1]

An indirect loop through the Basal ganglia involves the sub thalamic nucleus, the Globus pallidus interna, and substantia nigra pars reticulata to the superior colliculus and midbrain tegmentum. This indirect loop serves to decrease thalamocortical activation. The BG projection to the superior colliculus assists in regulation of saccadic eye movements. The BG projection to the reticular formation assists in the regulation of trunk and limb musculature (via extrapyramidal pathways), sleep and wakefulness, and arousal. Other circuits in the BG are involved with memory and cognitive functions.[1]

One of the hallmark symptoms of Parkinson's disease (PD) is decreased amplitude of joint movement. This affects not only the distal joints, but also the trunk affecting the patients' everyday activities and function. Because trunk mobility is an important part of physical therapy treatment for Parkinson's patients, an accurate measurement of the trunk's range of motion (ROM) is frequently regarded an important component in rehabilitation. Limitations in spine ROM might trigger compensatory processes, resulting in increased mobility requirements in other body areas, muscle asymmetries, and an increased risk of injury.[9]

Evidence indicates that central mechanisms may be responsible for muscle weakness in people with PD.[8] The occurrence of intrinsic muscle stiffness at the local level is one possible reason for these ROM impairments. Rigidity is one of the most common symptoms of Parkinson's disease. It's clinically characterised as a muscle or muscle group's greater resistance to passive stretching. This behaviour can be observed both distally and axially , as well as at rest and during purposeful movement There are links between trunk rigidity and functional mobility and . As a result, axial muscle stiffness could be the root of the trunk ROM impairments seen in Parkinson's disease. Due to a local musculature that has an effect on articular amplitude, patients may have a lower articular amplitude.[8]

PD patients' everyday activities and quality of life may be impacted by changes in tonus and trunk mobility. Axial rigidity might make it difficult to roll over in bed or get out of bed when you're in a sitting positon.[10] all's in Parkinson's disease are frequently linked to the type of activities that the patient engages in. When the patient, for example, tries to shift direction while walking, they are more likely to occur when you first start walking and when you first stand up4,5. Falls are also significantly linked to a higher level of stress. Individuals with PD6 have cognitive impairment. Some authors believe that appropriate trunk control is essential. Because mobility is so vital for postural stability. 2/3 of the body's weight is carried by the upper limbs.[11]

Most research focus on limb rigidity, but they ignore the movement changes that axial rigidity induces in people with Parkinson's disease. Aside from a paucity of research on the subject, techniques for assessing trunk mobility are limited to movement measurement in the transversal plane (rotation). Although some scales link rotation evaluation to forward inclination measurements (sagittal plane), others don't.[10]

The trunk is assumed to play a key part in postural stabilization by allowing for regulated movement of the extremities while performing a job. Trunk growth. The terms "stability and control" are used to describe the ability to maintain control over be a requirement for upper-extremity mobility (UE) and use of the hand. It is thought that proximal independent use due to stability manipulative and purposeful activity with the arms and hands.[12] Several research on the use of trunk restraint in adults have shown that stabilizing the trunk to limit compensatory trunk movements improves shoulder and elbow movements, and hence improves reaching and grasping abilities.[12]

The individuals of Parkinson disease patients are not able to effectively control their body segments to maintain activities of daily living and as after Parkinson's the upper extremity function impairment is highly prevalent. Hence there is need to assess trunk mobility and upper extremity function in Parkinson's disease patients

As Parkinson's disease is associated with decreased mobility, difficulty in performing activities of daily living and decreased motor function. Trunk segment plays an important role in maintaining postural control system. The individuals of Parkinson disease patients are not able to effectively control their body segments to maintain activities of daily living and as after Parkinson's the upper extremity function impairment is highly prevalent. Hence the aim of the study is assess trunk mobility and upper extremity function in Parkinson's disease patients

MATERIALS AND METHODS

METHODOLOGY

- STUDY DESIGN : Analytical
- STUDY SETTING : In and around Pune
- SAMPLE POPULATION : Parkinson's patients
- SAMPLING METHOD : Convenient
- SAMPLE SIZE : 20
- STUDY DURATION : 1 Year

Materials Required

- Consent form
- Pencil
- Pen
- Scale

Inclusion criteria

- Patients diagnosed with Parkinson's disease
- Both male and female
- Age above 45 years
- Parkinson's Disease since 1-2 years

Exclusion criteria

- Patient not willing to participate
  H/o recent fracture/injury to lower limb.
- Parkinson's plus syndrome.
  Cognitive impairment.
- Any other major medical illness.

Outcome measures

- Trunk mobility scale
- Upper extremity functional index

Procedure

Permission was taken from institutional ethical community of Tilak Maharashtra Vidyapeeth Department of Physiotherapy Pune. An analytical study was done by convenient sample of 20 participants which were selected on the basis of inclusion and exclusion criteria. The aim and study was explained to the individual and their consent was taken on consent form the demographic data was filled by individual .years of diagnosis, trunk mobility and upper extremity functional index was noted.

Trunk mobility will be assessed by Trunk Mobility Scale. The tests will be performed with the patient sit-ting on a chair, with no arm support, feet on the floor and the back kept 10 cm from the chair. Scores of dynamic items ranges from 0 to 3. The patient that performs requested movement receives score 3. Scores 1 and 2 are attributed to individuals that perform the movements, but with compensations. The score is 1 for small compensations, and movement with no compensation receives score 0. The patient that is unable to make the 2 for great compensations. Great compensations are exaggerated movements, easily noticed by an investigator (for instance, when inclining side-ways, the patient associate trunk rotation and/or flexion and/or extension movements). Small compensations are subtle movements, but that are present when the movement is performed. In the static aspect, the sitting posture analysis may Range from 0 (upright sitting position) to 4range from 0 (upright sitting position)



Fig 1

Upper extremity functional index

The Upper Extremity Functional Index (UEFI) is a patient reported outcome measure used to assess the functional impairment in individuals with musculoskeletal upper limb dysfunction. The original UEFI consists of 20 questions on a 5- point rating scale assessing level of difficulty in performing activities of daily living using the upper extremities including household and work activities, hobbies, lifting a bag of groceries, washing your scalp, pushing up on your hands, driving etc.

RESULT

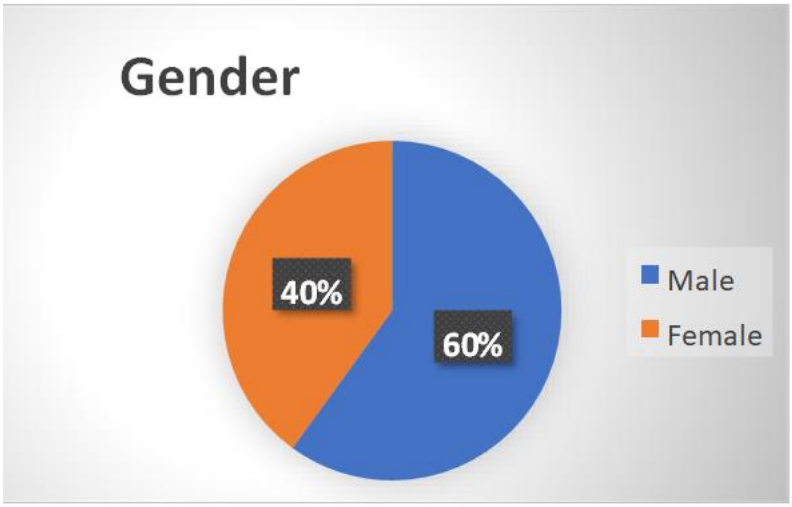
Data was collected and Microsoft office excels and Instat was used for statistical analysis .Average values for various parameters were calculated and the level of significance was set at 5%.

Table 1: Baseline demographic and clinical characteristics of participants

Total no of subjects	**20**
Age	62.75
Male	12
Female	08
PD diagnosed since	1.6 years

Table 2: Gender wise distribution

Gender	**No. of Patients**
Male	12
Female	8

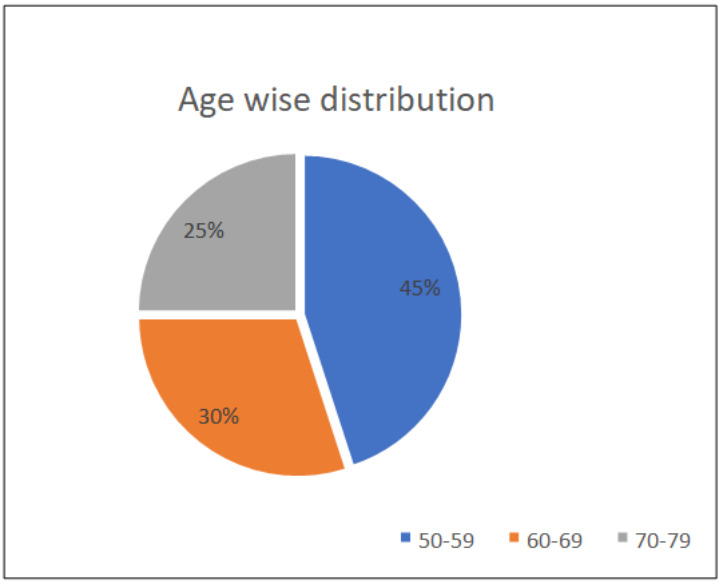


The graph represents that 40% of population was female and 60% of population was male.

Graph 1: Gender

Table 3: Age wise distribution

Age	**No of Patients**
50-60	9
60-70	6
70-80	5

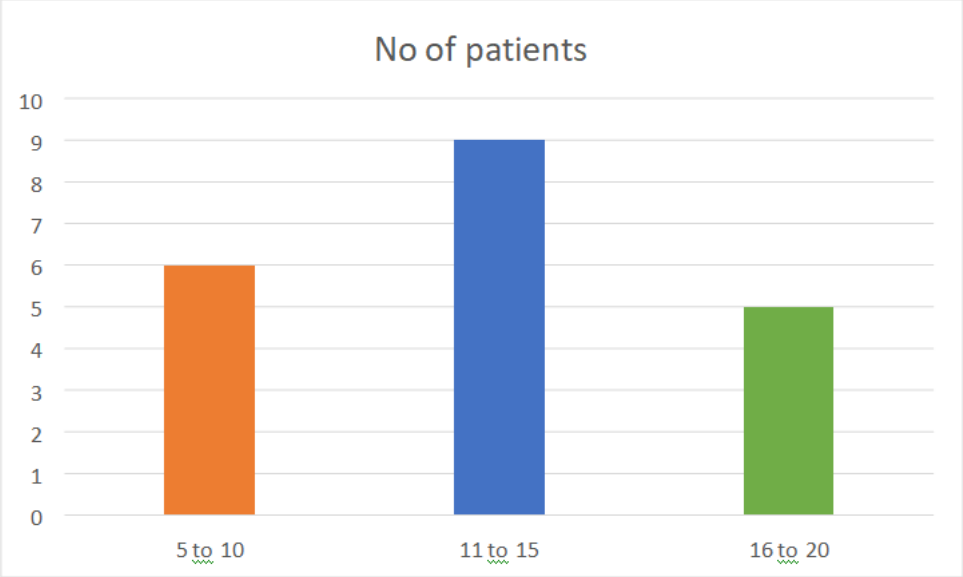


45% of population belongs to the age group 50-59 years, 30% of population belongs to age group 60-69, whereas 25% of population belongs to the age group of 70-79.

Graph 2:Age wise distribution

Table 4: Graphical representation of Trunk Mobility Scale

Scores	No of patients
5-10	6
11-15	9
16-20	5



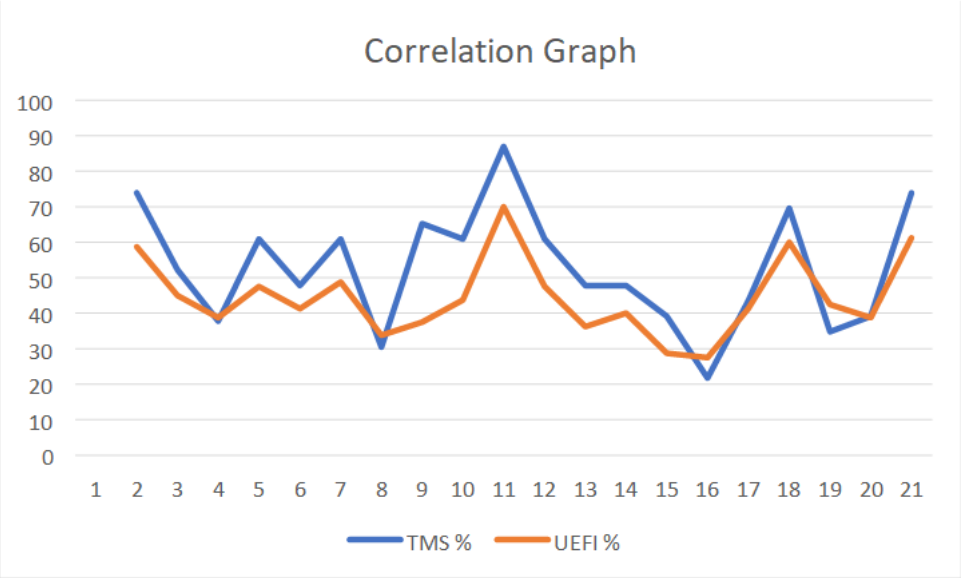
6 patients had the score between 5-10, 9 patients had the score between 11-15 and 5 patients had the score between 16-20 out of 20 of the total population.

Graph 3: Graphical representation of Trunk Mobility Scale

Table 5: Correlation between Trunk mobility scale and upper extremity functional index.

TMS in %	UEFI in %
73.91	58.75
52.17	45

37.78	38.75
60.86	47.5
47.82	41.25
60.86	48.75
30.43	33.75
65.21	37.5
60.86	43.75
86.95	70
60.86	47.5
47.82	36.25
47.82	40
39.12	28.75
21.73	27.5
43.47	41.25
69.56	60
34.78	42.5
39.13	38.75
73.91	61.25



Graph shows that there is a correlation between trunk mobility scale and Upper extremity functional index which implies that if there is reduced trunk mobility leads to upper extremity function affection in Parkinson's patients. r=0.8799 correlation coefficient p value <0.0001 (considered extremely significant).

Graph 4: correlation between trunk mobility scale and Upper extremity functional index

DISCUSSION

Parkinson's disease is the second most common degenerative disorder of nervous system characterized by large number of motor and non-motor symptoms having severe consequences on gait and balance. Facilitation is recommended in geriatric care to improve the social, psychological, intellectual, and cognitive performance of older people [(1)].Trunk control is known to be a crucial factor in the balance control, gait and functional independence. In several neurological disease abnormal posture and abnormal trunk control strongly impair motor abilities. As regards the trunk, forward flexion and lateral and anterolateral postures has been observed.[1]

The aim of the research was to access the trunk mobility and upper extremity function in Parkinson's patient as there is axial rigidity present which can be responsible for functional impairments of balance and motor control. As Parkinson's disease is associated with decreased mobility, difficulty in performing activities of daily living and decreased motor function. Trunk segment plays an important role in maintaining postural control system .The individuals of Parkinson disease patients are not able to effectively control their body segments to maintain activities of daily living and as after Parkinson's the upper extremity function impairment is highly prevalent.

Hence the aim of the study is assess trunk mobility and upper extremity function in Parkinson's disease patients. Trunk mobility was assessed by Trunk Mobility Scale. The tests were performed with the patient sit-ting on a chair, with no arm support, feet on the floor and the back kept 10 cm from

the chair. Scores of dynamic items ranges from 0 to 3. The patient that performs requested movement receives score 3. Scores 1 and 2 are attributed to individuals that perform the movements, but with compensations. The score is 1 for small compensations, and movement with no compensation receives score 0. The patient that is unable to make the 2 for great compensations. Great compensations are exaggerated movements, easily noticed by an investigator (for instance, when inclining side-ways, the patient associate trunk rotation and/or flexion and/or extension movements). Small compensations are subtle movements, but that are present when the movement is performed. In the static aspect, the sitting posture analysis may range from 0 (upright sitting position) to 4.

The Upper Extremity Functional Index (UEFI) is a patient reported outcome measure used to assess the functional impairment in individuals with musculoskeletal upper limb dysfunction. The original UEFI consists of 20 questions on a 5- point rating scale assessing level of difficulty in performing activities of daily living using the upper extremities including household and work activities, hobbies, lifting a bag of groceries, washing your scalp, pushing up on your hands, driving etc.

The total participants assessed were 20 with a mean value of 62.75 and a SD of ± 9.93. Out of 20 patients 60% were male and 40% were female and the mean duration of the disease was 1.56 years.

Graph 1 shows the baseline demographic and clinical characteristics of participants in which the mean age of total number of patient were 62.75 and the mean duration of the disease was 1.6 years.

Graph 2 Shows that 45% of population belongs to the age group 50-59 years, 30% of population belongs to age group 60-69, whereas 25% of population belongs to the age group of 70-79.

Graph 3 shows that 6 patients had the score between 5-10, 9 patients had the score between 11-15 and 5 patients had the score between 16-20 out of 20 of the total population.

Graph 4 represents that there is a correlation between trunk mobility scale and Upper extremity functional index which implies that if there is reduced trunk mobility leads to upper extremity function affection in Parkinson's patients. r=0.8799 correlation coefficient p value <0.0001 (considered extremely significant).

In this research 2 scales were used out of which the first one is Trunk mobility scale and the second one is Upper extremity functional index. Similarly Stieger et al. also conducted a research on trunk movement alteration in Parkinson's patients and according to the study the impairment of axial movement is the most common cause of disability in Parkinson's disease patients. Trunk rotation contributes to many postural activities, such as rolling over, walking, turning during walking.

CONCLUSION

Our study concluded that reduced trunk mobility leads to upper extremity function affection in Parkinson's patients.

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