



# TIME UP AND GO TEST PERFORMANCE IN PATIENTS WITH GRADE 1 & 2 OA KNEE AND ITS CORRELATION WITH PAIN AND FUNCTIONAL LIMITATION

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## **Abstract:**

**Background:** Knee osteoarthritis (OA) is a joint disease which results from breakdown of joint cartilage and underlying bone. Its most common symptoms are joint pain, stiffness, decreased range of motion, decreased muscle power. OA may cause problems in function and activities of daily living (ADL) in the affected patients. The objective of this study was to find the correlation between pain, and function limitation in patients with grade 1&2 OA knee

**Aim:** To evaluate time up & go test performance in patients with grade 1 & 2 OA knee and its correlation with pain & functional limitation.

**Methodology:** A cross sectional correlational study was carried out among 42 grade 1&2 OA knee patients. Participant with grade 1&2 OA had x-ray (AP & Lateral) of the tested knee within the previous 6 months. Severity of OA was evaluated by Orthopedic according to the Kallegrren and Lawrence scale. Patients were assessed by NPRS, WOMAC Score & TUG test. After evaluation, statistical analysis was done, and then results were obtained.

**Results:** 42 subjects with grade 1 & grade 2 osteoarthritis were evaluated (Male 43% and Female 57%). on evaluation of Time up & Go test evaluation we found that there were 31(74%) patients able to performed TUG test in <10 sec and 11(26%) patients able to performed TUG test >10 sec. 15 (36%) of subjects had G-1 OA & 27 (64%) subjects had G-2 OA. There is positive correlation exist between pain & Time up and go test on pearson's correlation coefficient testing ( $r= 0.8734$ ,  $p<0.0001$ ). There is positive correlation exist between pain & WOMAC on pearson's correlation coefficient testing ( $r= 0.9116$ ,  $p<0.0001$ ).

**Conclusion:** In our study we found that the gait & dynamic balance was affected in very few patients i.e 11(26%) and 31 (74%) patients gait and dynamic balance was not affected with grade 1 & 2 osteoarthritis. There is positive correlation exists between Pain (NPRS) & WOMAC with Time up & go test. So we conclude that as pain (NPRS) increases, the time up & go test time & functional disability also increases (WOMAC), vice versa.

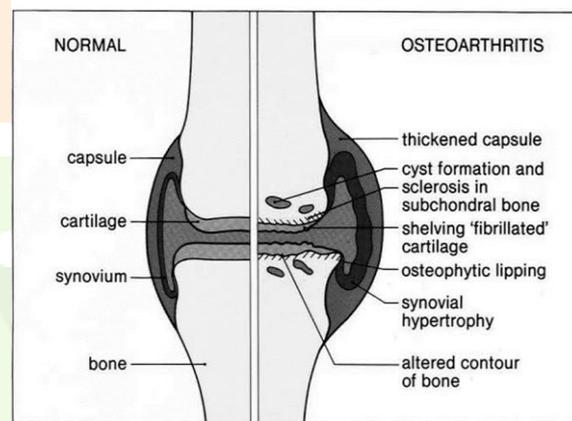
**Keywords:** NPRS, Osteoarthritis, TUG, WOMAC.

## INTRODUCTION

Arthritis is defined as inflammation of a joint characterized by pain, swelling, and limitation of joint movements. Osteoarthritis (OA), the most common type of arthritis. According to Chandra Prakash Pal, Pulkesh Singh Prevalence of OA in India 22%-39% The study carried out by Yuqing Zhang, and Joanne M. Jordan, on the Epidemiology of Osteoarthritis where the prevalence of Osteoarthritis varies according to the definition of Osteoarthritis, the specific joint(s) under the study, and the characteristics of the study population.

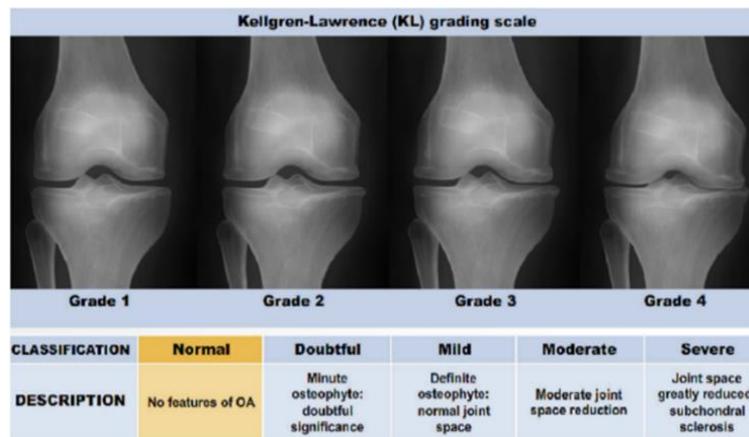
The age standardized prevalence of radiographic knee Osteoarthritis in adults age  $\geq 45$  was 19.2% among the participants in the Framingham study<sup>(15)</sup> OA is more common in women than men, but prevalence increase dramatically with age.

Osteoarthritis is a leading cause of impaired mobility in the elderly.<sup>(2)</sup> Degenerative joint arthritis is the most common joint disorder that is caused by biomechanical stresses affecting both the Articular cartilage and Subchondral bone.<sup>(3)</sup> Osteoarthritis is a degenerative disease in which the synovial membrane that surrounds the joint becomes inflamed and thickened. This chronic inflammation can damage the cartilage and eventually cause cartilage loss, pain, and stiffness.<sup>(4)</sup> The first change observed is an increase in water content and depletion of the proteoglycans from the cartilage matrix. Repeated weight bearing on such a cartilage leads to its fibrillation the cartilage gets abraded by the grinding mechanism at work at the points of contact between the opposing articular surfaces, until eventually the underlying bone is exposed with further 'rubbing', the subchondral bone becomes hard and glossy. Meanwhile, the bone at the margins of the joint hypertrophies to form a rim of projecting spurs known as Osteophytes. A similar mechanism results in the formation of Subchondral cysts and sclerosis. The loose flakes of cartilage incite Synovial inflammation and thickening of the capsule, leading to deformity and stiffness of the joint. Often one compartment of a joint is affected more than the other. For example, in the knee joint, the medial compartment is affected more than the lateral, leading to a Varus deformity (genu varum)



**Figure 1- pathological changes in OA Knee**

**Kallgren-Lawrence (KL) grading scale:** The Kallgren–Lawrence (KL) described in 1957 that severity of the disease can also be graded according to the radio graphical findings.<sup>(16)</sup> The radiographic severity of Osteoarthritis was graded according to the Kellgren–Lawrence criteria, where grade 0 = normal; grade I = doubtful narrowing of joint space and possible osteophytic lipping; grade II = definite osteophytes and possible narrowing of joint space. grade III= moderate multiple osteophytes, definite narrowing of joint space, some sclerosis, and possible deformity of bone contour. grade IV = large osteophytes, marked narrowing of joint space, severe sclerosis, and definite deformity of bone contour.<sup>(17)</sup>



**Figure no. 2) Kallgren- Lawrence (KL) grading scale.**

The pain of osteoarthritis is usually related to activity. For osteoarthritis of the knee activities such as - climbing stairs, getting out of chair, walking long distance bring on pain. The pain measure used in this study was the numeric pain rating scale (NPRS).

Subjects quantify their pain intensity on a scale ranging from 0 (no pain) to 10 (pain as bad as it can be). The NPRS is efficient for use in clinical practice and has demonstrated good test-retest reliability in patients with lower extremity pain and in literate and illiterate patients with osteoarthritis.<sup>(13)</sup>

**Timed Up and Go Test-**The TUG, developed by Podsiadlo and Richardson, is a tool that has been extensively used with healthy and frail older adults as well as older adult fallers. The TUG correlates well with balance, gait speed, and functional capacity. The test requires the subject to stand from a standard-height arm chair, walk forward 3 m to a target mark (or around a cone) and walk back to the chair and sit. The score is the time required for the task. The TUG has demonstrated excellent intra- and interrater reliability, with ICCs of 0.97 to 0.99. Is a Gait-based functional mobility test that is easy to administer, reliable, and has high sensitivity (87%) and specificity (87%) for predicting fall.<sup>(2)</sup>

**WOMAC -** WOMAC Index was developed in 1982 at Western Ontario and McMaster University .The WOMAC Osteoarthritis Index developed by Bellamy et al .<sup>(12)</sup> is one of the most commonly used, patient-reported outcome measures patients with lower limb osteoarthritis. Womac is indicator of pain,mobility, and self-disability reported. The questionnaire contains 24 items covering three dimensions: pain (5 items), stiffness (2items), and function (17 items). The WOMAC has been extensively tested or validity, reliability, feasibility, and responsiveness to change over time. The WOMAC scores can be linearly transformed to a 0–68, with higher score indicate greater levels of difficulty.

WOMAC is available in over 65 languages and has been linguistically validated.<sup>(13)</sup> Higher scores on the WOMAC indicate worse pain, stiffness, and functional Limitation. The pain of osteoarthritis is usually related to activity. For osteoarthritis of the knee activities such as -climbing stairs, getting out of chair, walking long distance bring on pain. As according to kellegren & lawrence scale of osteoarthritis as the grade increases the deformity & impairment and functional activity performance is decreases. There were extensive research work on severe OA knee performance hence the present study was conducted to evaluate time up and go test performance in patient with grade 1 & 2 OA knee and its association with pain & functional limitation.

## **METHODOLOGY**

**Study Design -** Cross Sectional Study

**Study Type-** Correlational Study

**Study Setting-** Dr. Ulhas Patil College And Hospital Jalgaon.

**Duration Of Study-** 6 Months

**Target Population-** 45-65 Years Of People With Grade 1 & 2 Oa Knee

**Sample Size -** 42

**Sampling Technique-** Convenient Sampling

**A) Inclusion Criteria**

1. Subjects with informed consent
2. Subjects who have been Diagnosed as OA knee according to the Radiographic Assessment by Orthopaedician
3. Grade 1 & 2 OA Knee (Unilateral) Subject According to Kallgren -Lawrence Scale
4. Both Male and Female
5. OA Knee Pain from last 1-2 months, Crepitus on joint movement, Morning Stiffness
6. Age group between 45 -65 years.

**B) Exclusion Criteria**

1. Neurological disease that affect Balance & Motor performance
2. Abnormal Gait deviation because of Musculoskeletal Dysfunction of Cervical & Lumbar Spine affecting balance
3. Limb length Discrepancy
4. Subjects who were using cane or any assistive device
5. Subjects are excluded who Exercise daily

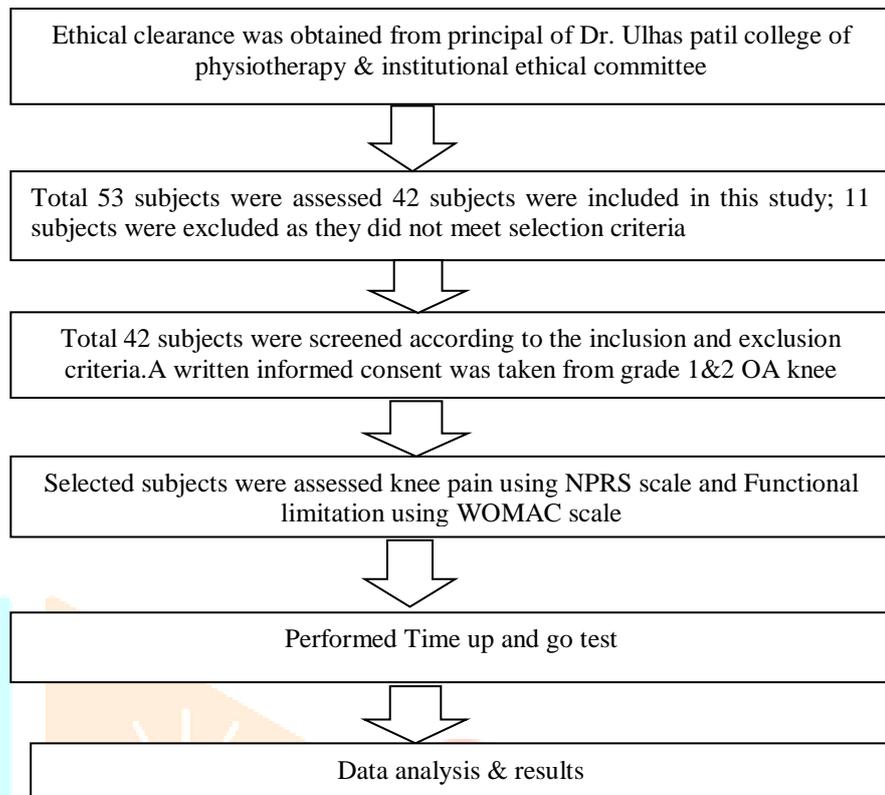
**Materials**

1. Pen
2. Paper
3. Inform consent form
4. Inch tape
5. Chair
6. Stop Watch
7. Marker pen
8. WOMAC Scale

**Outcome Measures:-**

1. Time Up & Go Test
2. WOMAC Scale
3. NPRS Scale



**PROCEDURE****Evaluation of knee pain.**

Subject were evaluated knee pain using NPRS.

The pain measure used in this study was the numeric pain rating scale (NPRS).

Subjects quantify their pain intensity on a scale ranging from 0 (no pain) to 10 (pain as bad as it can be)

**WOMAC Osteoarthritis Index**

The Western Ontario and McMaster Universities Arthritis Index (WOMAC) is widely used in the evaluation of Hip and Knee Osteoarthritis.

In this questionnaire consisting of 24 items divided in

**1. Pain** (5 items): during walking, using stairs, in bed, sitting or lying, and standing upright.

**2. Stiffness** (2 items): after first waking and later in the day.

**3. Physical Function** (17 items): using stairs, rising from sitting, standing, bending, walking, getting in / out of a car, shopping, putting on / taking off socks, rising from bed, lying in bed, getting in / out of bath, sitting, getting on / off toilet, heavy domestic duties, light domestic duties.

The WOMAC takes approximately 12 minutes to complete, and can be taken on paper The test questions are scored on a scale of 0-4, which correspond to: None (0), Mild (1), Moderate (2), Severe (3), and Extreme (4).

The scores for each subscale are summed up, with a possible score range of 0-20 for Pain, 0-8 for Stiffness, and 0-68 for Physical Function. Usually, a sum of the scores for all three subscales gives a total WOMAC score. Higher scores on the WOMAC indicate worse pain, stiffness, and functional Limitation.

**Time up & go test performance**

A standard chair with armrest was used for test. The participant was asked to stand up, using armrest chair, if necessary, walk past a line 3m away, turn around, and come back and sit down in the chair. Subjects were timed from the point when their buttocks rose from chair to when their buttocks touched the chair when returning to the seated position.



**Figure no 3) TUG test performance**



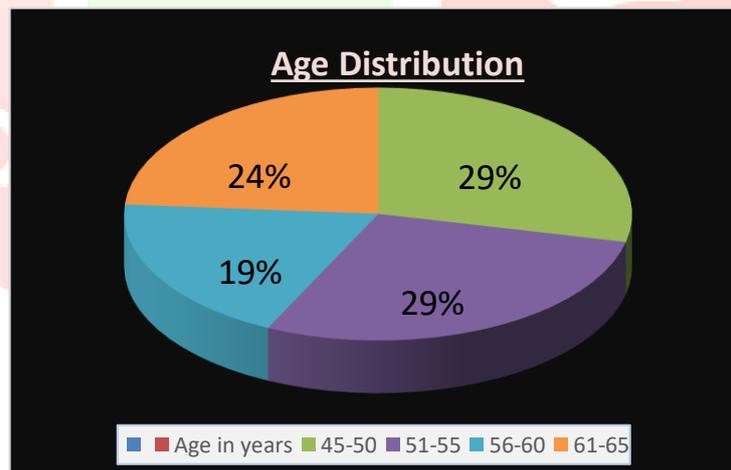
**Figure no 4) TUG test performance**

**STATISTICAL ANALYSIS**

The entire data of the study was entered and cleaned in Ms Excel before it was statistically analysed in “Graph pad Instat version 3.05”. All the results are shown in tabular as well as graphical format to visualize the statistically significant difference more clearly

**Table no.1:- Age wise distribution**

Graph no 1: Age wise distribution

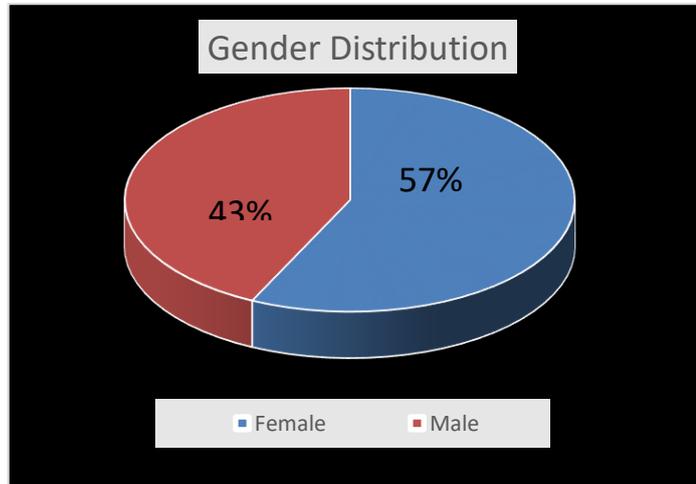


**Comment:** The pie diagram shows Age distribution, Age between 45-65 years of age,12 subjects were between 45-50 years of age, 12 subjects were between 51-55 years of age ,8 subjects were between 56-60 years of age,10 subjects were between 61-65 years of age.

**Table no. 2:- Gender Distribution**

Male	Female
(43%) 18	(57%) 24

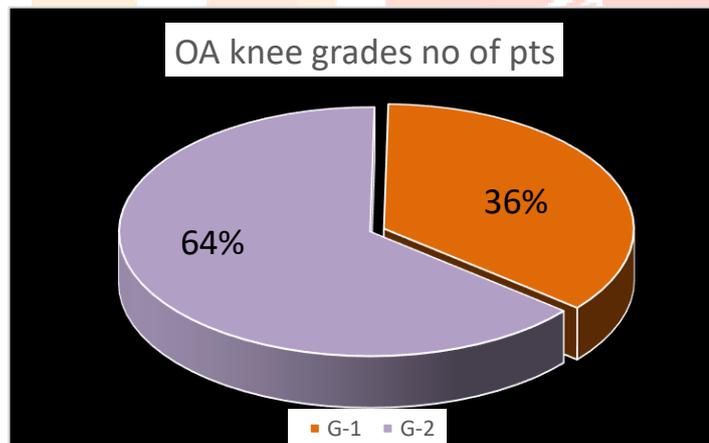
**Graph no 2:- Gender Distribution**



**Comment:** The pie diagram shows gender distribution in our study 18(43%) subjects were male and 24 (57%) subjects were female

**.Table no 3:- OA knee Grade distribution**

Grade	No of patients
G-1	15 (36%)
G-2	27 (64%)

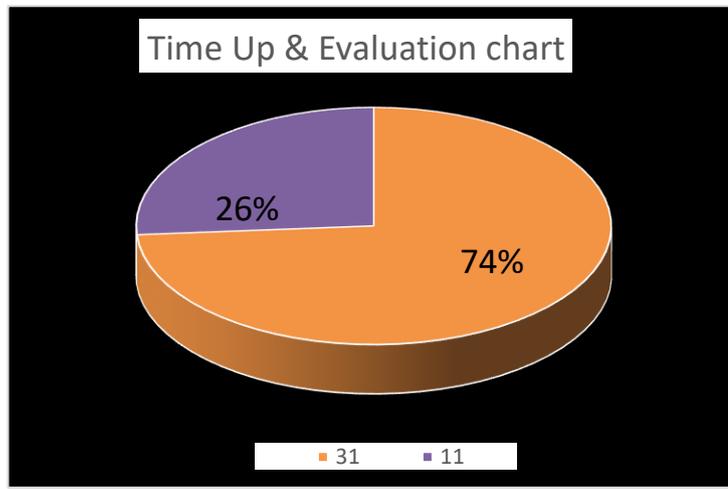


**Comment:** The pie diagram shows OA knee grade distribution in our study 15(36%) of subjects had G-1 OA & 27(64%) subjects had G-2 OA

**Table no.3:- Time Up & Go test Evaluation Pie chart**

Time in sec	No. of Patients
≤10sec	31 (74%)
>10sec	11 (26%)

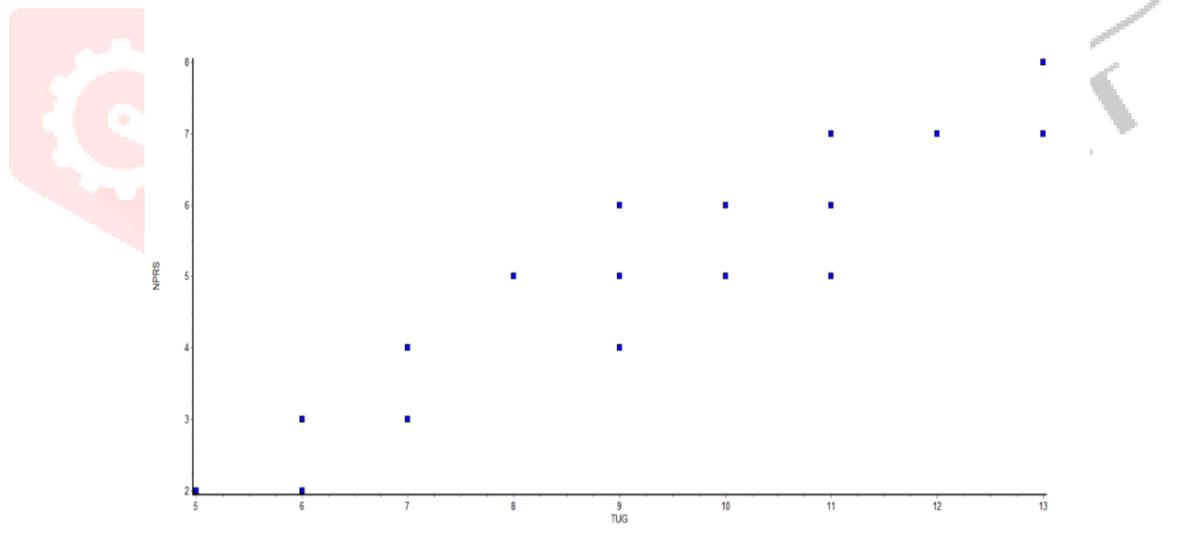
Graph no 4:- Time Up & Go test Evaluation



**Comment:** The pie diagram shows evaluation of Time Up & Go test time in our study 31 (74%) patients were ≤ 10 sec and 11 (26%) patients were ≥ 10 sec.

Table no 4:- Correlation with Time Up & Go Performance with Pain NPRS

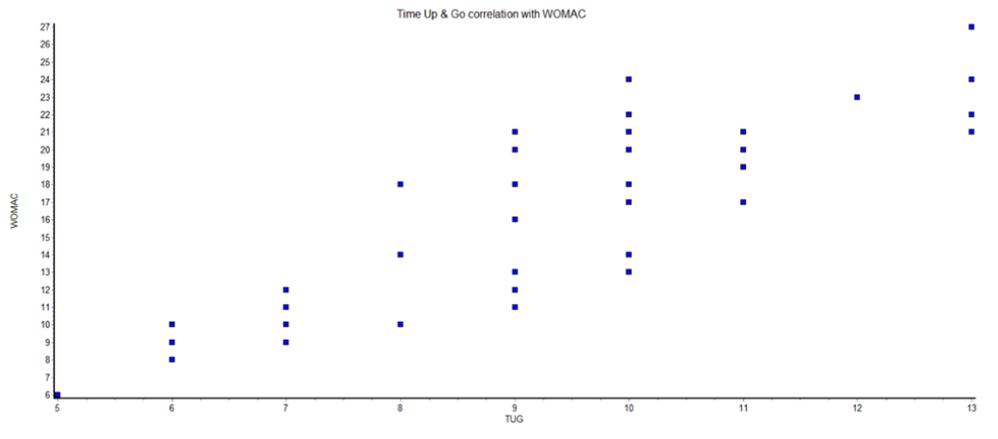
Time Up & Go Test	NPRS	Pearson correlation coefficient	p Value
9.3333 ± 2.115	5.04619 ± 1.492	r = 0.9116	<0.0001



**Comment:** Scatter diagram shows there is positive correlation exist between Time up & go test with Pain NPRS. It Implies that as TUG test time increases, NPRS also increases

Table no.5:- Correlation with Time Up &Go Performance with WOMAC

Time Up & Go Test	WOMAC	Pearson correlation coefficient	p Value
9.3333 ± 2.115	16.285714 ± 5.443	r =0.8734	<0.0001



**Comment:** Scatter diagram shows there is positive correlation exist between Time up & go test with Womac scale. It implies that as TUG test time increases, Womac score also increases.

## DISCUSSION

This cross-sectional study correlation between TUG with pain & functional limitation in patients with grade 1 & 2 OA knee were assessed. OA affects weight-bearing joints, mainly the knee, it leads to a marked decline of muscle function and consequently to a reduction of balance and especially of the ability to perform sit-to-stand tasks, to gait alterations, functional limitation, and loss of independence. Therefore, OA is considered to be an intrinsic risk factor for the occurrence of falls. TUG correlates well with balance, gait speed, and functional capacity.

It was believed that Osteoarthritis was exclusively a degenerative disease of the cartilage, however latest evidence has proven that osteoarthritis is a multifactorial entity, involving multiple causative factors like trauma, mechanical forces, Inflammation, biochemical reactions, and metabolic derangements<sup>(5)</sup>. It is also known that the cartilaginous tissue is not the only one involved. Given its lack of vasculature and innervation, the cartilage, by itself is not capable of producing inflammation or pain at least on early stages of the disease. Hence, the source of pain is mainly derived from changes to the non-cartilaginous components of the joint, like the joint capsule, synovium, subchondral bone, ligaments, and periarticular muscles.

Gait patterns of individual with mild to moderated levels of knee have been investigated in an attempt to identify mechanical factors that are likely to be symptoms of pain and disability.

### Correlation between TUG & Pain

Pain is main complaint among patients with OA knee. McAlindon et al.<sup>(18)</sup> demonstrated that knee pain and age are more important determinants of functional impairment in elderly subjects than the severity of knee.

Varela -Burstein and Miller<sup>(19)</sup> found that the presence of any arthritis or joint pain to be risk factor falls.

Pain associated with OA knee may play a role in balance impairment. The presence of pain may reflexively inhibit the muscle around the knee.<sup>(13)</sup> Which could compromise effective and timely motor responses in postural control. Furthermore, pain may result in reduced loading of the affected joint, potentially jeopardizing an individual's ability to maintain their centre of mass within the base of support. The risk of disability increases with the presence of knee pain in community. Thus, important to understand the factors which contribute to disability in patients with grade 1&2 OA knee. So in our study justified that as the pain increases time taken by individual for TUG performance also increases and vice versa. We found positive correlation between TUG & Pain.

### Correlation between TUG & WOMAC.

Duyngu Cubukcu et.al<sup>(20)</sup> found disability scores were significantly associated with pain, stiffness & functional limitation score as measure by WOMAC.<sup>(14)</sup> A number of cross-sectional community studies<sup>(21)</sup><sup>(22)</sup> found a relationship between radiographic disease severity and physical function. Mandar patel, Megha Sheth<sup>(13)</sup> found correlation between pain, balance and function with OA knee patients. The activities included in the WOMAC physical function section occur commonly on a daily basis and have faced validity for lower limb function. Thus, important to evaluate TUG & WOMAC or functional limitation. our study justified that as the WOMAC score increases time taken by individual for TUG performance also increases and vice

versa. We found positive correlation between TUG & WOMAC. As OA causes joint stiffness may lead to shift in an individual centre of mass & thus must also be recognize as a possible cause of balance deficit. In our study we are found that the more no 31 (74%) of subjects able to performance TUG test in less than 10 second & few no 11(26%) subjects time taken to TUG test more than 10 second.

### **CONCLUSION**

In our study we found that the gait & dynamic balance was affected in very few patients i.e 11(26%) and 31 (74%) patients gait and dynamic balance was not affected with grade 1 & 2 osteoarthritis. There is positive correlation exists between Pain (NPRS) & WOMAC with Time up & go test. So we conclude that as pain (NPRS) increases, the time up & go test time & functional disability also increases (WOMAC), vice versa.

### **LIMITATION**

1) Weight and BMI not assessed & correlated.

### **FUTURE SCOPE**

- 1) Kinetic & kinematic evaluation can be done & correlated with TUG & WOMAC
- 2) Exercise intervention can be done on larger sample size.
- 3) Pain evaluation can be done using pain algometer

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