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### Efficacy of yoga to improve balance and reduce fall in community dwelling elders who are at risk of fall

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#### ABSTRACT

Identification of older adults who are at a risk for falling is a vital medical concern. Falls are common events in the lives of older people and can result in a range of adverse outcomes, from minor bruises to fractures, disability, dependence and death. With age, balance abilities decline and become harder to control, which results in an increased risk of falling, even in the absence of specific neurological or musculoskeletal problems. TUG a simple screening test for measuring the probability for fall among elders and Modified fall efficacy scale for determination of measuring fear of falling. Yoga, with its gentle movements, can address known fall risk factors (poor balance, impaired mobility, reduced strength and flexibility) and focus on increased awareness and proprioception, resulting in decreased fear of fall and improved balance in older adults. Therefore, the purpose of this study is to investigate the effect of yoga to improve balance and reduce fall in community dwelling elders at risk of fall. 100 subject were taken with consent and 6weeks protocol Yoga was given. Yoga Asanas were uttkatasana, tadasana, vrukshasana, trikonasana, virbhadradasana (position 1 & 2). First 3 week Yoga exercises were performed with support of walls and chair.(in the modified form). In the next 3 weeks yoga exercises were progressed by performing without support and increasing the hold time of asanas. Results obtain were that the functional mobility (TUG), and fear of falling (MFES) showed more improvement. Therefore Yoga is effective to improve balance and reduce risk of fall.

**Keywords:** Community dwelling elders, Yoga, Balance, Fall, Time Up Go test, MFES

## INTRODUCTION

***“Identification of older adults who are at a risk for falling is a vital medical Concern. [1]”***

**Fall-** is “an unaccepted loss of balance that lead to failure of postural stability” Falls are common throughout the life span, but consequences of a fall event vary depending on the person’s age. [2] Balance is the ability to maintain the body’s center of mass within the limits of its base of support when standing and sitting, or while moving to a new base when walking. With age, these abilities decline and become harder to control, which results in an increased risk of falling, even in the absence of specific neurological or musculoskeletal problems. [3, 4] Elderly people have common problems like impaired mobility, cognition falls, etc. Out of this, falls are common events in the lives of older people and can result in a range of adverse outcomes, from minor bruises to fractures, disability, dependence and death. [5] There are many assessment test to find out risk of fall. One of them can be Time up and Go Test (TUG) and Modified Fall Efficacy Scale (MFES). The TUG was a simple screening test that is a sensitive and specific measure of probability for fall among elders. The TUG has an objective measure of basic mobility and balance maneuver that assesses an individual’s ability to perform sequential motor tasks relative to walking and turning [5, 6]. Modified fall efficacy scale: (Determination of measuring fear of falling) has 14 questions of daily living activities. Group exercise is economical of the therapist’s time and thus the cost. Community-based group exercise programmed that are easily accessible, affordable and held at times and frequencies suitable for older people. Supervised general group exercise has also been found to be effective in moderating falls risk factors. [4]

***Physiotherapy is the means, Yoga is the path.”***  
 “Physiotherapy- the Yogic way”, will awaken the physical potential and lead the patient to live with a strong dynamic existence. [7] In a recent study of Xiao Jing Yang et.al.RCT of young adults (mean age, 29), balance improved by 228% for the experimental group, while the control group did not change. [8] Yoga, with its gentle movements, can address known fall risk factors (poor balance, impaired mobility, reduced strength and flexibility) and focus on increased awareness and proprioception, resulting in decreased fear of fall

and improved balance in older adults. [8] Tadasana- teach to stand firm and erect ; Vrukshasana- help to learn correct poise and balance; Trikonasana- uniform lateral stretch of all the muscles of the trunk; Uttkatasana often use as a warming up exercise; Virbhadrasana stretches a large number of muscles. So to find out whether yoga has any effect to reduce fall and to improve balance in community dwelling elders [9]. So hypothesis is Yoga may improve the balance and reduce the fall risk in elders. (H<sub>1</sub>) Therefore, the purpose of this study is to investigate the effect of yoga to improve balance and reduce fall in community dwelling elders at risk of fall.

## METHODOLOGY

This study has been designed to find out the effect of 6 week yoga to reduce fall and to improve balance in community dwelling elders. **Experimental** study was carried out by doing purposive (convenient) sampling in aged 65 years and above who are at risk of fall. Duration of study was 18 months. Inclusion criteria were age 65 years and above who are at risk of fall by using TUG and Community dwelling elders male and female. Exclusion criteria were Unstable or limiting cardiac disease; History of neurological disease with residual impairment; Surgery, with in the previous 6 months; History of sever Orthopedics conditions; Uncontrolled DM or HTN. Material used were Wooden arm rest chair, Cone used as marker, Stopwatch.

### Procedure

The approval was obtained from the institution head and ethical committee before starting the procedure and individual consent was taken.

### Screening

- In order to obtain 100 samples, 466 subjects has being screened. During screening 466 subject under gone TUG. The cutoff of TUG was 14 seconds, time required more than 14 sec were included [9] This was followed by filling of the Modified fall efficacy scale, subject who fulfilled the inclusion criteria.

### Yoga exercise

First 3 week Yoga exercises were performed with support of walls and chair. (In the modified

form). In the next 3 weeks yoga exercises were progressed by performing without support and increasing the hold time of asana.

Yoga included as fallows-

- Uttkatasana,
- Tadasana,
- Vrukshasana,

- Trikonasana,

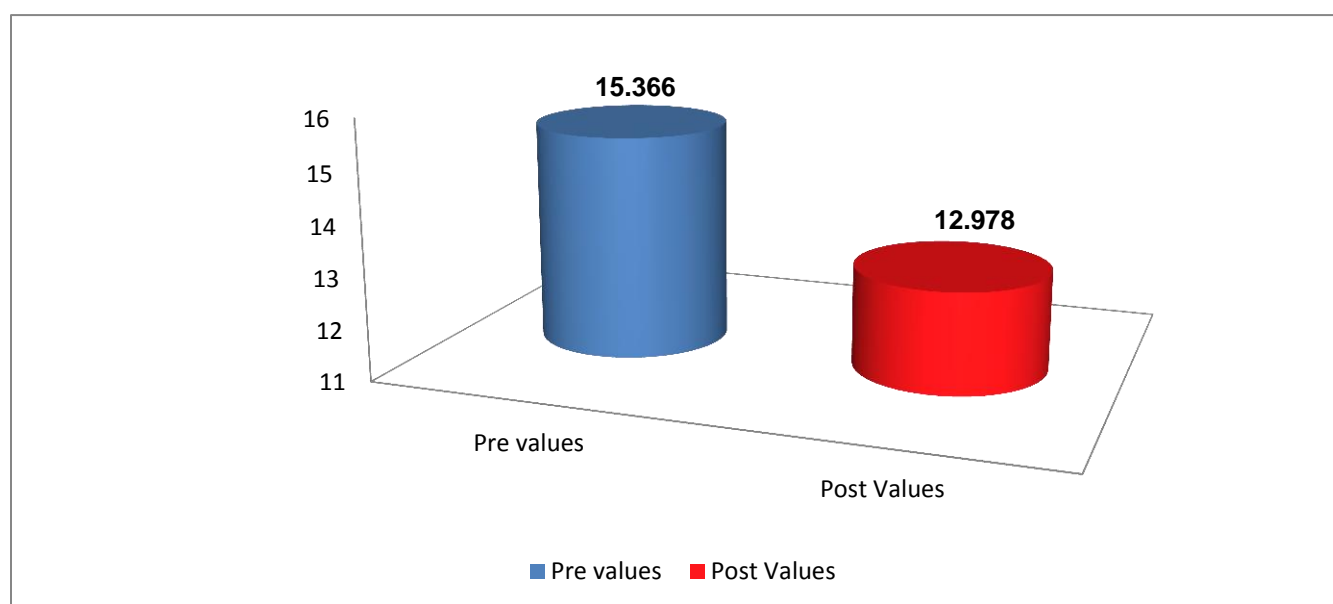
The data was put to statistical analysis as per the following statistical test:

- Paired t-test was used for pre and post intervention values of TUG in the group.
- Wilcoxon test was used for pre and post intervention values of MFES in the group.

## RESULTS

**Table 1:-** TUG scores -

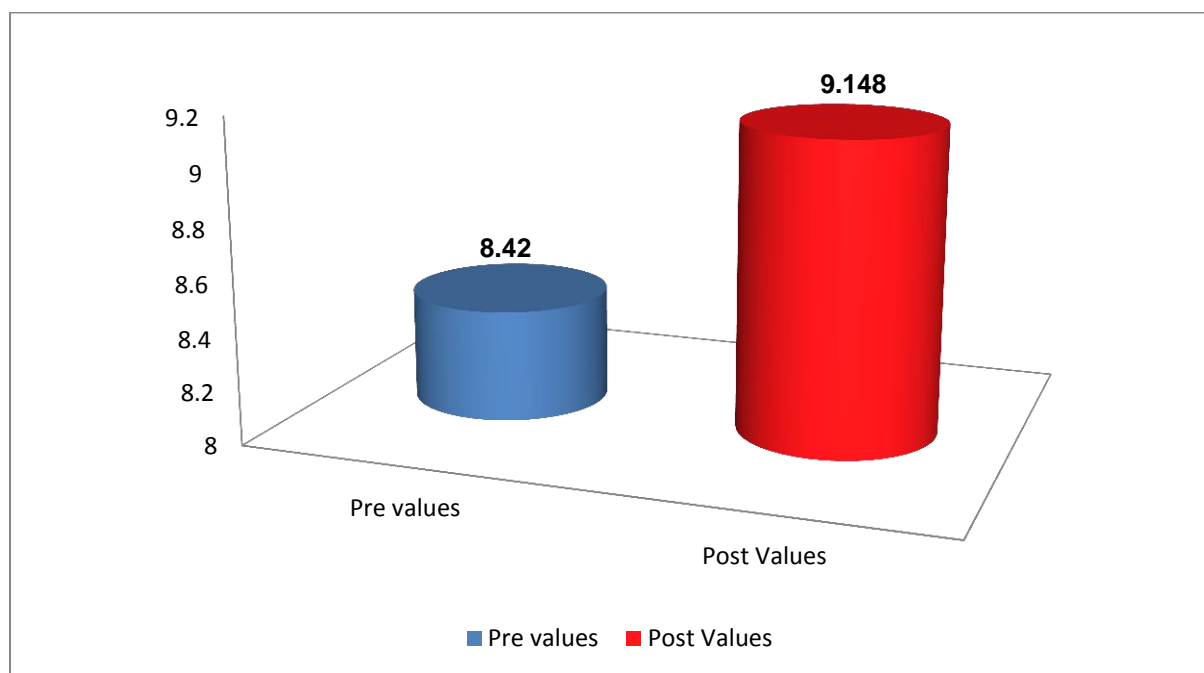
Experimental Group	Pre values	Post values
Mean	15.366	12.978
Standard Deviation	1.380	
95% Confidence Interval	1.996 to 2.780	
t- value	12.236	
p- Value	< 0.0001	



**Fig. 1-** The mean value of TUG score was compared and measured in pre and post group. The statistical difference was considered extremely significant ( $< 0.0001$ )

**Table 2:-** MFES scores for Group -

MFES Experimental Group	Pre values	Post values
Mean	8.42	9.148
Standard Deviation	0.3964	
95% Confidence Interval	-0.8502 to -0.6252	
W- value	-1225.0	
p- Value	< 0.0001	



**Fig. 2-** The mean value of MFES score was compared and measured in pre and post group. The statistical difference was considered extremely significant ( $< 0.0001$ )

## OBSERVATIONS

**Table 1:** The mean value of TUG scores for group in pre and post exercises were compared. It shows that they were significant with the p value  $< 0.0001$  and Confidential Interval is 1.996 to 2.780

**Table 2:** The mean value of MFES scores for group in pre and post exercises were compared. It shows that they were significant with the p value  $< 0.0001$  and Confidential Interval is -0.8502 to 0.6252

## DISCUSSION

The results obtained from our study were that Yoga improve the balance and reduce the fall risk in elders. Fifth most common cause of death is unintentional injury in people aged  $> 65$  years; in addition, 66.7% of unintentional injury is related to falls and their complications. [3] In humans, correct balance relies on the integration of the sense and the ability to control movement. With age, these abilities decline and become harder to control, which results in an increased risk of fall, even in the absence of specific neurological or musculoskeletal problems. [3]

After screening the community dwelling elders we found that they had mild to moderate risk of

falls. However, the majority of previous research has targeted older people with increased risk of falls [10, 11] or, in some cases, unscreened community-dwelling elder. [12] The results of our study add to the existing research by targeting a well-screened group of older people which were identified to have mild to moderate balance dysfunction.

From a prevention or health promotion perspective, this is an important group to target, as many older people do not seek health professional advice until serious injury has resulted from a fall. Assessment and intervention at a stage when balance dysfunction is mild may prevent this group from progressing to having a serious fall. In addition to potential benefits in preventing falls, improved balance and related performance also are likely to have a positive impact on older people's function and independence. Importantly, one of the significant outcomes of this targeted exercise program is an increased level of physical activity, which can lead to a range of other health benefits in older people. [13]

We found statistically significant in balance improvement and reduction in risk of fall in group. TUG and MFES was found improved and statistically significant in the group by intervening yoga (Table1 & 2)

Improvement was seen in post then pre group, as yoga also helps in reconditioning of various joints, muscles, tendons, ligaments as well as reflex mechanism in order to offer a stable and comfortable posture for higher practice. Mental benefits are bringing about equilibrium in overall functioning including ego, emotions, behavior and perception. Health benefits is body functions, thereby improving overall functions of musculoskeletal, respiratory, neuromuscular, gynecological and skin condition. Spiritual objective is psychophysical. It directs the mind within and works on internal principle of energy conservation for higher upliftment of body mind and soul [14]. Endurance, Flexibility, Risk - taking ability, Breathing control, Corrects the Posture, Increase level of confidence are also improved with the yoga.

Asana used in our study are weight-bearing. In weight-bearing exercises there is an independent joint movements; relatively predictable movement patterns in adjacent joints. Movement of body segments may occur distal and/or proximal to the moving joint. Muscle activation occurs in multiple muscle groups, both distal and proximal to the moving joint. Resistance is applied to multiple moving segments. It is also use as the axial loading. Internal stabilization is by the mean of the muscle action, joint compression, and congruency and postural control. Distal segment is fixed in weight-bearing exercises. [15]

Similar results were found by **Arlene A. Schmid et. al** [16] who found that yoga may be a promising intervention to manage fear of fall and improve balance, thereby reducing fall risk for elders.

The yoga poses given in our study were in standing position along with the breathing control. *Tadasana* helps in symmetrical weight bearing on both the feet and effortless hold, body feels light, energetic and acquires agility and strengthens all antigravity musculature. [15] This asana helps to regulate the breath, control the body, gives stability and firmness. Its inculcates a feeling of determination, dedication and sound decision-making. [14]

*Vrukshasana* helps to correct posture, balance, helps body to get familiar to the gravitational pulls and reduces the BOS. [9]

*Trikonasana* helps in uniform lateral stretch of all the muscles of the trunk. Also provides some

stretching of the inner thighs and legs on which the weight is borne. The upward stare of the eyes offer exercises to those eye muscles that are not ordinarily brought into play during standing or lying positions. [9]

*Virbhadrasana* stretches a large number of muscles around the shoulder joints, knee joints, ankle joints, muscles of the trunk and neck. Inter costal muscles of the rib-cage also get stretched making them supple and free for deep breathing. [9]

*Uttkatasana* is often used as a warm up exercise. The shoulder and knee joints are activated along with the thigh muscles. The ankle joints take the main gravitational pull and become stronger. It helps in increasing leg strength, work on core muscles stabilization which ultimately maintain balance and prevent fall. It also improves the communication between brain and muscle group. Similar result is found by **Mary Lou Galantino et.al** [17] who concluded that yoga i.e. (chair pose) *Uttkatasana* may be beneficial in improving mobility and reducing fear of falling.

**Man-Ying Wang et,al** [18] concluded that musculoskeletal demand varied significantly across the different poses. These findings may be used to guide the design of evidence-based yoga interventions that address individual-specific training and rehabilitation goals in seniors.

In the frontal plane, the *vrkshasana* (Tree) generated the greatest average hip and knee abductor joint moments of force (JMOFs); whereas *Virbhadrasana* (Warrior II) generated the greatest average hip and knee adductor JMOFs. (Warrior II and One-legged Balance induced the largest average ankle evertor and invertor JMOFs, respectively) [18]

The Group exercises given in our study such as Yoga shows improvement and similar result were found by **Anne Barnett, et al**, [9] **Stephen R. Lord et. al**, [20] **John T Chang et.al** [21] and by **Yvonne Robitaille et.al**. [25] According to the ACSM Fitness Society, **Shawn Dolan** describe Yoga and balance exercises are the exercises done in the group. Group exercises also are enjoyable, motivated.

The community dwelling elders become more independent as the balance is improved and reduces risk of fall by detecting and preventing the fall by interventions. Ultimately reduces the burden on the family and caregiver of the cost, time etc. These

finding in the study that Yoga improves the balance and reduce the fall risk in elders.

## CONCLUSION

On our evaluation we found 100 community dwelling elders out of 466 were at risk of fall. The

functional mobility (TUG), and fear of falling (MFES) showed more improvement in group. Yoga has shown significant improvement in balance and reduced the risk of fall in community dwelling elders. Therefore Yoga is effective to improve balance and reduce risk of fall.

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