

DISSERTATION

on

**PREVALENCE OF FALLS AND ASSOCIATED FACTORS IN
ELDERLY POPULATION**

submitted in partial fulfillment of

requirements for

MD DEGREE EXAMINATION

BRANCH-XVI GERIATRIC MEDICINE

THE TAMIL NADU DR. M.G.R. MEDICAL UNIVERSITY

CHENNAI



MADRAS MEDICAL COLLEGE

CHENNAI – 600003

APRIL 2015

CERTIFICATE

This is to certify that the dissertation titled “**PREVALENCE OF FALLS AND ASSOCIATED FACTORS IN ELDERLY POPULATION**” is a bonafide work done by **Dr. GEETHA . J**, Post Graduate Student, Department of Geriatric Medicine, Madras Medical College, Chennai – 600003, in partial fulfillment of the university rules and regulations for the award of MD DEGREE in GERIATRIC MEDICINE BRANCH-XVI, under our guidance and supervision, during the academic period from April 2012 to April 2015.

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DECLARATION

I solemnly declare that the dissertation titled “**PREVALENCE OF FALLS AND ASSOCIATED FACTORS IN ELDERLY POPULATION**” was done by me at Madras Medical College, Chennai – 600003, during the period June 2014 to August 2014 under the guidance and supervision of **Prof. Dr. S. SIVAKUMAR, MD, DTRD**, to be submitted to The Tamil Nadu Dr. M.G.R. Medical University towards the partial fulfillment of requirements for the award of MD DEGREE in GERIATRIC MEDICINE BRANCH-XVI.

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ACKNOWLEDGEMENT

I thank **Prof. Dr. R.VIMALA, MD**, Dean, Madras Medical College, for having permitted me to conduct the study and use the hospital resources in the study.

I express my heartfelt gratitude to **Prof.Dr.S.SIVAKUMAR, MD,DTRD** Professor and Head, Department of Geriatric medicine, for his inspiration, advice and guidance in making this work complete.

I am extremely thankful to **Prof. Dr.G.S.SHANTHI , MD**, Associate Professor, Department of Geriatric medicine for guiding me during the period of study.

I am extremely thankful to **Dr.S.DEEPA, MD**, Assistant Professor, **Dr. K.UMAKALYANI, MD** Assistant professor,**Dr.M.SENTHILKUMAR, MD**, Assistant professor, and **Dr.D.THANGAM, MD**, Assistant Professor, Department of Geriatric medicine, for guiding me academically and professionally during the period of study.

I also thank all the postgraduate students and paramedical staff for their cooperation which enormously helped me in the study. I am also indebted to thank all the patients and their caring relatives. Without their humble cooperation, this study would not have been possible.

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PREVALENCE OF FALLS AND ASSOCIATED FACTORS IN ELDERLY POPULATION

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INTRODUCTION: Fall is an important clinical marker of frailty, as evidenced by its association with other functional problems, such as incontinence, and high mortality rate. Usually falls in elderly are multifactorial in origin, resulting from an interaction between impaired stability and hazards and demand of the environment. Falls are major focus of geriatric medicine because they are common among elderly and have complex interacting causes, serious consequences and require multiple disciplines for effective management.

OBJECTIVES: To determine the prevalence of Falls and associated factors in elderly population

METHODOLOGY: This study includes 200 elderly patients attending geriatric outpatient department in RGGGH, chennai. Patients were selected according to inclusion and exclusion criteria. Relevant history like h/o falls, polypharmacy, associated comorbid conditions were obtained. Cardiovascular, Neurological and Musculoskeletal examinations, vision and hearing screening was done. To assess balance and to test lower limb muscle strength, Fall risk

assessment tools like TUG,4 Stage Balance Test, 30 Second Chair Stand Test were done.

RESULTS: Prevalence of falls in elderly attending outpatient department is 34.5%, out of which males contribute 44% and females 55%. Extrinsic causes for falls – 42% and intrinsic cause-57%. Major risk factors for falls- visual impairment- 33%; arthritis-50%; age>80- 8.5%; polypharmacy- 36.5%;slow gait speed-18%

CONCLUSION: Falls in elderly are multifactorial in origin. Prevalence of falls in elderly ≥ 65 years attending outpatient department in tertiary care hospital is 34.5%.Prevalence of falls is increased in females when compared to males. Visual impairment, lower limb arthritis, incontinence, depression, age >80, polypharmacy are important risk factors for fall.Impaired balance, decreased gait speed , decreased lower limb muscle strength are important predictors of falls in elderly. Increase in number of risk factors increases fall risk in elderly

INTRODUCTION

In elderly, falls and impaired balance constitute major clinical problems. Falls and its consequences are a cause of considerable rates of morbidity and mortality in elderly. In older adults, unintentional injuries constitute fifth leading cause of death. Falls constitute about 67% of these deaths in elderly.

Falls are more common in elderly. They have compound interacting causes leading to serious effects and require multiple disciplines for efficient management. Hence falls are considered as major focus in elderly. Unstable gait and falls are important concerns in older adults because they lead to injury, restricted activities of daily living, increase in health care utilisation and death due to its consequences.

Fall is considered as an important indicator of frailty as supported by its association with numerous problems like incontinence, visual impairment and increased death rate. [1]. Fall is an important health problem in frail and healthy elderly. Falls in older adults are multifactorial in origin. An older person slipping on the floor cannot compensate quickly to save themselves, thereby landing heavily and hence likely to sustain a fracture. The risk of fall increases

with ageing. Common precipitators of nursing home placement includes repeated falls and instability among elderly. Many studies have described epidemiology of falls among elderly in diverse settings and rates may differ significantly among them. With increasing age, the rate of falls and associated complications also increases steadily. The type of injury sustained by an elderly is determined by the way in which a person falls.

Wrist fractures in elderly result from backward or forward falls on an extended hand. Wrist fractures are common than hip fractures among older adults of 65 – 75 years, while hip fractures dominate in ages thereafter. This may be due to slowed reflexes and inability to protect their hip by ‘breaking the fall’ with wrist in individuals > 75 years of age.

According to The National Health Interview Survey, falls are the leading cause of limited activity days among elderly. The U.S. Public Health Service has estimated that 67 % of deaths due to falls are preventable, based on retrograde analysis of causes and situation of serious falls. Falls due to environmental causes can be prevented by identification and elimination of environmental risk factors in home and institutions. Various medically associated falls can be prevented by adequate medical assessment and management for underlying risk factors.

AIMS AND OBJECTIVES

AIM OF THE STUDY

- To determine prevalence of Falls in elderly.
- To determine associated factors for Fall in elderly population.



REVIEW OF LITERATURE

REVIEW OF LITERATURE

DEFINITION

Fall is defined as an unintentional event in which a person comes to rest on the floor or ground that are not caused by loss of consciousness, stroke, seizure, or overwhelming force.

EPIDEMIOLOGY OF FALLS:

FALLS IN COMMUNITY:

Every year, about 33 % of adults living in the community aged >65 years and 50% of elderly aged > 80 years sustain a fall.[2, 3,4]. Recurrent falls occur in half of these individuals. Falls occur more frequently in elderly women than in men. But, above the age of 75 years, this gender difference in prevalence of falls decreases. [5]. In elderly persons aged above 65 years, unintended injury form the sixth most important cause of mortality. Majority of these deaths among persons over 85 years of age, are due to falls and fall related problems [6].The rates of death due to falls are higher in males eventhough, injury due to falls are common in females .

Nearly 7% of persons aged above seventy five years attend emergency department every year for injuries due to fall event. Nearly 40% of these visits results in hospitalization.[8]. 10% of falls among elderly above 75 years are complicated by fracture, disarticulation of

joint, or severe head injury.[9]. Among community-living elderly persons, fracture occurs in 5% of falls and hip fracture occurs in 1% of falls. In persons aged above 75 years, lower limb fractures are common than the fractures of upper limb. Soft tissue injuries like hemarthroses, disarticulation of joint, sprains, and hematomas occurs in 5% of falls requiring medical attention. Minor injuries due to falls occur in 30% - 50% of elderly persons.

Inability of individual to get up after fall has occurred is potentially serious effect of fall. It has been reported in many studies that after an episode of fall, nearly 50% elderly are unable to get up without assistance. Some of the associated factors include age >80, reduced upper and lower limb strength, impaired balance, arthritis of joints, and increased dependence in activities of daily living (ADL). Inability of elderly individuals to get up after a fall are at increased risk for complications like pressure sores, dehydration, pneumonia and rhabdomyolysis.

Fear of falling is common among community dwelling elderly women. Older women express their concern over dependency and poor quality of life resulting from a fall and hip fracture.[10]. Many studies have shown that one in four fallers avoid their activities of daily living due to fear of falling.[11]. Hence poor quality of life with

dependency has been reported by many patients [12]. The fear of falling has been related with restriction in instrumental activities of daily living (IADL), poor vision, necessitating help to climb stairs, poor performance on tests of balance and poor self-related health.[13,14]. Self-efficacy shows greater association with functioning in instrumental and basic activities of daily living, greater-level physical and social activities than does self-reported fear of falling.[15]. The most common hazardous effect of falling is restriction of functioning and activity either due to fear of falls or physical impairment from injury due to falls. In a national survey, 18% of limited activity days amongst older adults are due to falls and their sequelae.[16]

Falls has been related with greater risk of nursing home placement, hospitalisation and even death.[17-19]. These may be accounted for by increasing age, ADL disabilities and chronic disorders. Independent predictors of nursing home placement includes non injurious as well as injurious falls and falls with serious injury are more common[20].

NURSING HOME

Nearly 50% of elderly who are ambulatory in nursing home fall each year[21]. Among nursing home residents, the annual incidence of falls is 1.5 falls /bed /year. 1 out of 5 fatal falls occurs in nursing home, among persons 85 years and older. Increased frequency of serious injury,

agitation, depression, and immobility has been associated with the use of physical restraints in nursing homes to avoid high-risk individuals from falls.[22]. The use of physical restraint for immobilization results in decreased stability of vasomotor system and reduced muscle strength, mass and joint elasticity, thereby contributing to falls and injuries.[23]. Even though several restraint reduction programs have caused rise in falls, discontinuation of such restraints has not led to increase in fall injuries.[24,25].

CLINICAL PRESENTATION OF FALLS:

Nearly 50% of falls are associated with medical illness, thus emphasize the significance of vigilant medical evaluation. Various interacting cause of falls are syncope, accident, dizziness or vertigo, drop attacks, drug associated and definite illness and finally orthostatic hypotension.

ACCIDENTAL:

Unintentional fall or Accidental fall take place in less than 50% of falls and most of the falls are due to slip or trip. Other causes include imbalance, misplaced step, legs give way, or knock over. Several elderly persons attributed fall to hastening or not looking to where they go; nevertheless these elderly needs screening for impaired stability which predispose to recurrent falls. Careful assessment of

environment may be done by an occupational therapist. , like identifying cluttered surrounding and hazard that have to to be altered.

DROP ATTACK

Drop attack can be explained as a unexpected fall with no loss of consciousness and without caution.

Causes of drop attack includes

- orthostatic hypotension
- medication-induced asterixis
- Meniere's disease
- impaired postural feedback
- cervical cord impingement due to stenosis or other compressive

lesions.

Vertebrobasilar insufficiency must be considered in the occurrence of 5

Ds –

- Dysarthria
- Dizziness
- Dysequilibrium.
- Dysphagia
- Diplopia

VERTIGO AND DIZZINESS

Unsteadiness , dizziness are common complaints among older adults. Dizziness is often multifactorial and about 85% of persistently giddy elderly have multiple diagnosis: Orthostatic hypotension , vestibulopathies, polypharmacy , cerebrovascular disease and cardiovascular disease, primary gait disorders, cervical spondylotic changes, poor vision , anxiety are some of the commonest. Poor balance in the flow of stimulus from injured mechanoreceptors in cervical spine occurs in cervical spondylosis , thereby causing dizziness. Vertigo can be due to central or peripheral causes and probably an uncommon precipitant of falls in older adults.

ORTHOSTATIC HYPOTENSION

Blood pressure alterations may constitute a main part in the aetiology of falls. Postural hypotension can be identified by measuring heart rate and blood pressure in supine posture , within one minute in sitting posture and then within three minutes in the standing posture. Orthostatic hypotension is diagnostic when there is a fall of greater than 20 mmHg in systolic blood pressure or 10 mmHg fall in diastolic blood pressure. When an elderly individual develops syncope and falls within 2 hours after a meal, it may be due to Postprandial hypotension. It may be due to greater release of vasodilatory peptides from gut and can be reduced by giving acarbose, prior to meal.

DRUGS

The medications precipitating falls include antihypertensives, hypoglycaemics, diuretics, antipsychotics, sedatives and anticholinergic effects from antidepressants. Cardiovascular medications commonly contributing to falls include digoxin and type IA antiarrhythmics, nitrates, calcium channel blockers, ACE inhibitors and beta blockers. Psychotropic medications like tricyclic antidepressants, anticonvulsants, benzodiazepines and, selective serotonin reuptake inhibitors (SSRI) may precipitate falls in older adults. A meta-analysis study showed an association between falls and use of psychotropic medications. Recurrent falls are common in older adults taking multiple drugs.

PHYSIOLOGY OF BALANCE AND GAIT

BALANCE

Balance is an ability to retain the centre of gravity of a body within its base of support with negligible postural sway. Balance is a compound process which is dependent on the combination of vestibular, visual, proprioceptive, neuromuscular responses and central organization that manage muscle activities. Any change in the posture of the body, regardless of its movement with reference to base are detected by special senses. While in upright position, change in the orientation are sensed by cutaneous and proprioceptive sensors in the foot. Linear and angular movement of the optical field are detected by vision and the

sway-related angular and linear acceleration of head are detected by vestibular apparatus. Vestibular input becomes essential when the plane of support is uneven or in movement and proprioception is predominant when the plane is fixed and in level. Ability to maintain upright position is related with postural sway in the anterior-posterior direction. In normal older subjects, both anterior/posterior sway velocity and area are increased. Spontaneous falls can be correlated with increase in anterior/posterior sway but a improved predictor is mediolateral sway.

Postural reactions controlling centre of mass are slowed and difficulty in controlling lateral instability occurs in older adults. Elderly individuals who had sustained a fall often have trouble in controlling their compensatory stepping movements.

In healthy elderly, Peripheral sensation forms significant afferent control means of balance while standing. The factors correlated with increased sway are reduced near visual acuity, slow response time and decreased lower limb muscle strength. Some elderly individuals maintain good postural control and it indicates that age-related change have simply insignificant effect and impaired balance is principally the consequence of pathology.

Disequilibrium syndromes can be identified by assessment of arising, standing, turning and the reaction to perturbation. There are 4 most important disequilibrium syndrome: dysmetria, or incoordination of

movement related with cerebellar disorders; bradykinesia ; sensory deprivation, loss of proprioception; apraxia.

Disease-related balance disorders like Parkinson's disease , cognitive impairment are also common in elderly. Most important is the slowness of central organization due to Alzheimer's or cerebrovascular accidents. This is often not recognized in its early stages and is diagnosed when the patient attends falls clinic. Balance also depends on attention and cognitive process and might be affected by depression as well as anxiety. Even healthy older adults require more attention to recover balance when compared with young adults. With ageing and cognitive impairment, the capacity to execute dual or multiple task is challenged.

GAIT

Gait may be is defined as the pattern of limb movement during locomotion over solid plane. Human locomotion is dependent on superior command and centres for control in forebrain and brainstem . During usual walking, an internally cued, well learned motor act—the supplementary motor area of the frontal cortex engage in significant firing preceding gait ignition. The preliminary action represent sub movement selection of program, which is sent to the primary motor cortex area (M1). The supplementary motor area activity is turned off by

the phasic activity generated by basal ganglia, which provides a insignificant sign to produce submovement and to initiate the supplementary motor area to plan subsequently. The sequence of activation, is different when movement occur in reaction to exterior cues. In this situation the basal ganglia -supplementary motor area pathways could be bypassed with sensory information from surroundings feeding directly into pre-motor area (PMA) through optical, acoustic and proprioceptive pathway, with the pre-motor area later activates the primary motor cortex area. The pedunculopontine nucleus (PPN), region close to the nucleus cuneiformis beneath the cerebellar peduncle receive afferent links from the basal ganglia, cerebellum, motor cortex and project to the brainstem reticular nuclei. The information for gait are then passed beside the non-pyramidal pathways in ventral spinal cord.

Parkinson's disease have an effect on gait by irregular cueing from the basal ganglia due to a disorder in inner rhythm formation such that supplementary motor area is not switched off on time, thereby leading to features of Parkinson's disease like bradykinesia, freezing and gait ignition failure and hence Parkinson's disease patients appear to depend a lot on undamaged sensory/ pre-motor area pathway to start their activities.

With ageing, changes in gait patterns occur in elderly such as increased time spent in the double limb support and low gait speed

owing to decreased step length. Decline in walking speed occurs in around 15% in one decade for self selected walking speed and 20% for maximum gait speed. The principal restraining feature preventing elderly walking at a equal pace compared with the young people is the natural decline in lower limb strength due to ageing.

Abnormalities in gait are common in older adults. Factors affecting gait in older adults includes medical, social and physiological aspects. These risk factors individually or in combination predispose older adults to balance and gait abnormality. Physiological factor consists of muscle function as well as position control, neural control that are decreased by ageing or degenerative process. Ageing changes in neuromuscular system includes decline in both type I and II muscle fibres, , the loss of cross-sectional muscle mass, decline in the conduction speed in sensory as well as motor nerves with decrease in proprioception , prolonged contraction and relaxation time are the contributors of gait alterations in elderly. With ageing , there is arrangement of cross-links and decrease in elastic fibres thereby leading to stiffer joint capsules plus ligaments which affects the quality of gait and mobility.

Medical factor consists of previous falls, using psychotropic medications, cardiopulmonary, musculoskeletal, psychological , visual , vestibular and proprioceptive impairments. Social factors also

contributors to reduced mobility in elderly. They include dependence in activities of daily living (ADL), use of assistive devices , low level of physical activity and lack of social support.

PATHOGENESIS

COMMUNITY

Fall occurs when environmental demands or hazards exceeds an individual's ability to maintain postural stability. Postural instability are caused by specific diseases like normal pressure hydrocephalus [NPH],high cervical myelopathy and Parkinson's syndrome. In older adults, diseases of central nervous system constitute for small proportion of falls.

CLASSIFICATION

The pathogenesis of falls can be explained by several classification schemes. Nutt et al.,[26] has devised 4 categories of balance and gait disorder

- (1) lower-level disorder - owing to problems in sensory system or power
- (2) middle-level disorder, relating brainstem or spinal cord
- (3) higher-level disorder, involving basal ganglia, corticospinal tracts or cerebellum
- (4) highest-level gait disorder involving frontal cortex.

Another system classified falls into 4 categories:

- (1) extrinsic factors - trips, slip or misplaced center of gravity
- (2) intrinsic factors- cognitive, or sensory impairments , poor mobility and balance
- (3) falls from non bipedal stance - while using an assistive device or falling out of bed
- (4) unclassified falls (7%).[27]

Even though several classification schemes have been used to classify falls, many of these systems do not explain multi factorial aetiology of falls.

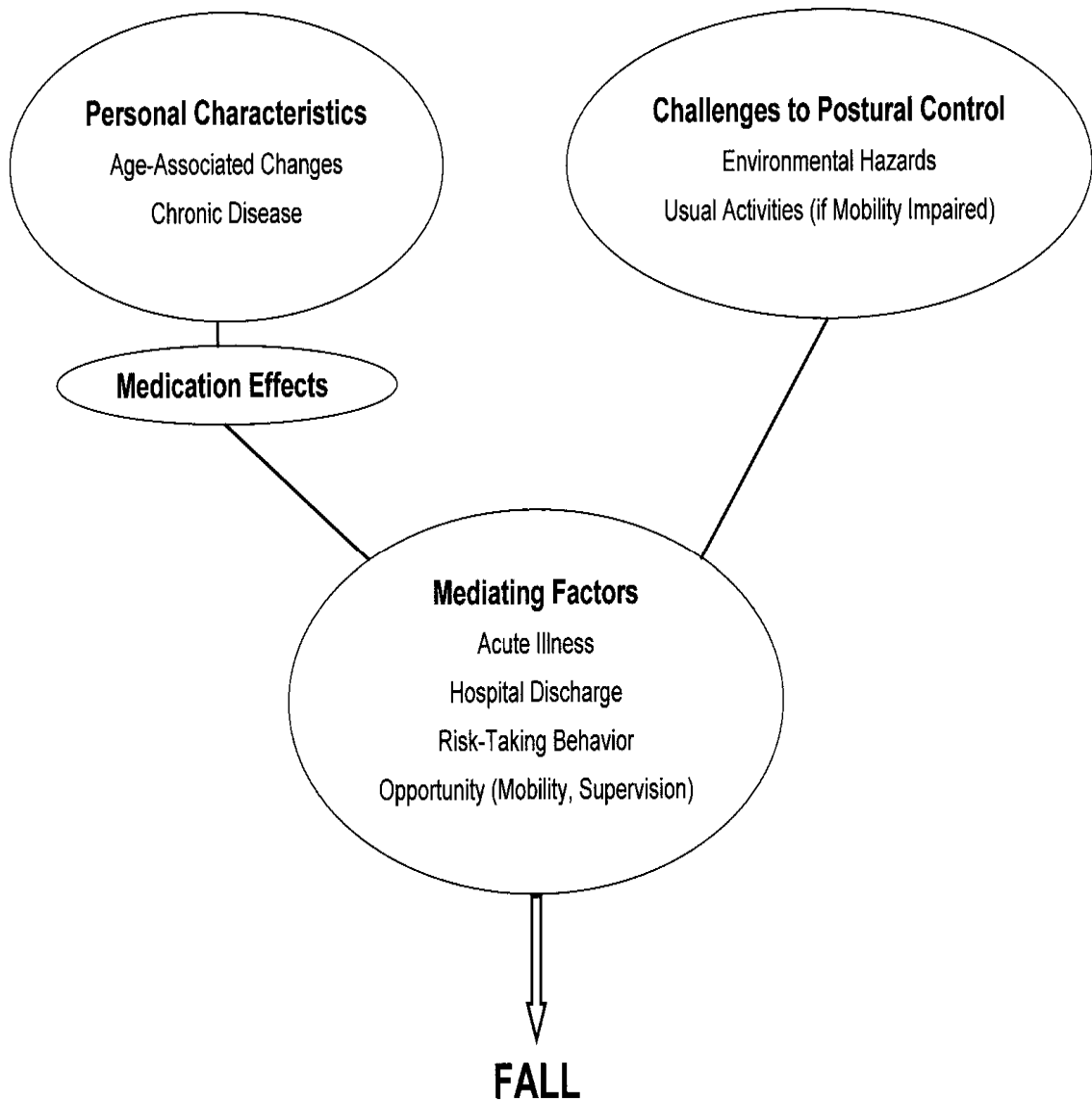
ETIOLOGY

The multi factorial etiology of falls can be addressed by epidemiologic form of host, activity, and environmental factor. The postural strength require input from central integrative, effector neuromuscular mechanism and sensory components in a well integrated way[28] is contributed by host factors. These components are further influenced by circulatory, cardiac , metabolic respiratory, and other condition . Fall etiology can be explained by situational and predisposing factor.

Predisposing risk factor includes inherent features of individual which impairs balance and renders older adults susceptible to novel insults.

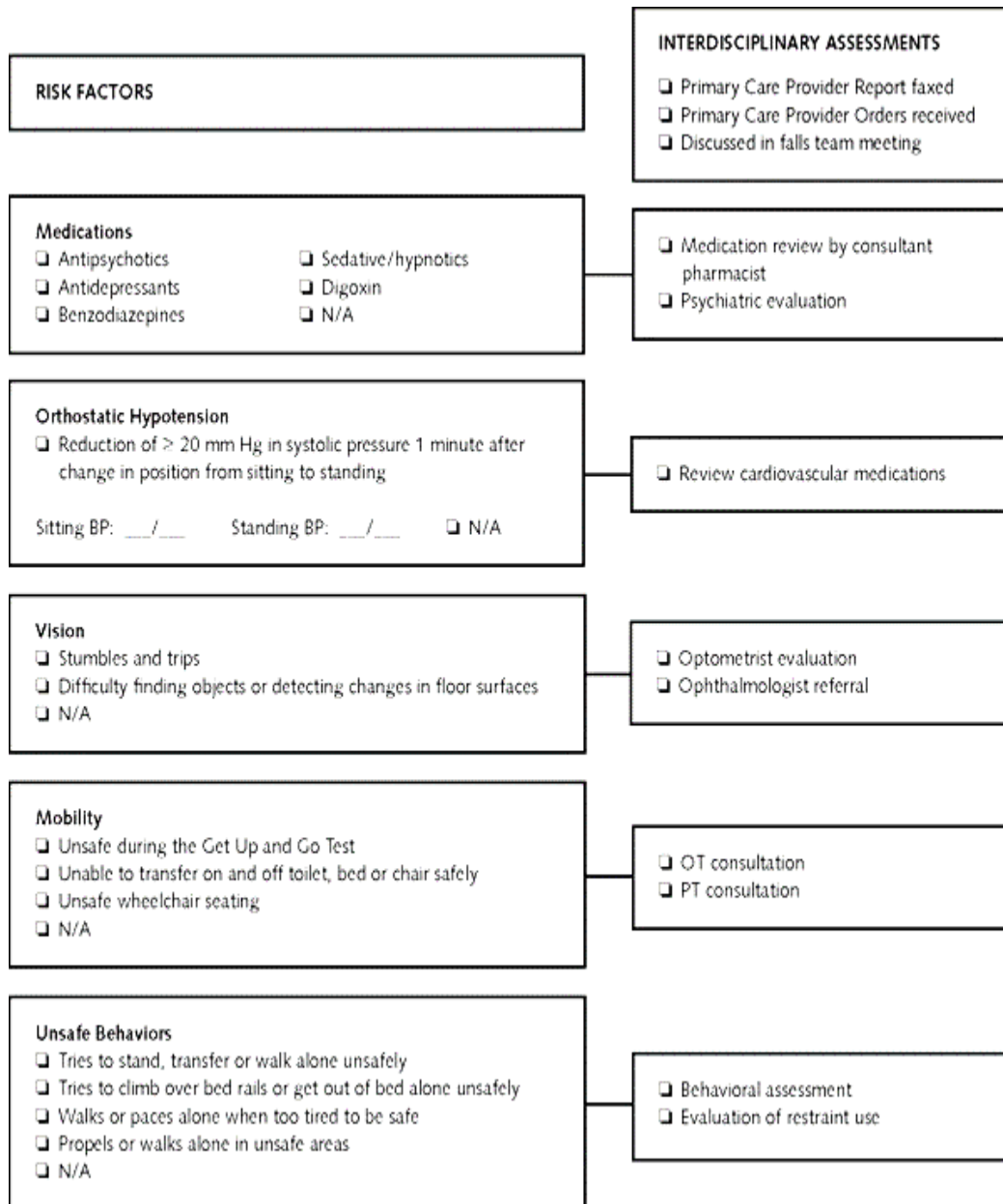
Host , activity and environmental factor during fall constitute situational factors.

FIGURE 1 : ETIOLOGY OF FALLS



RISK FACTORS

FIGURE 2 : RISK FACTORS FOR FALLS



A fall occurs when a person's center of gravity move away from their base of support and no attempt is made to regain the stability.

There are several classification scheme to describe falls. Falls can also be

classified by direct reason which includes balance or gait disorder, postural hypotension, drop attacks, giddiness or environmental factors.

FIGURE 3: INTERACTING RISK FACTORS

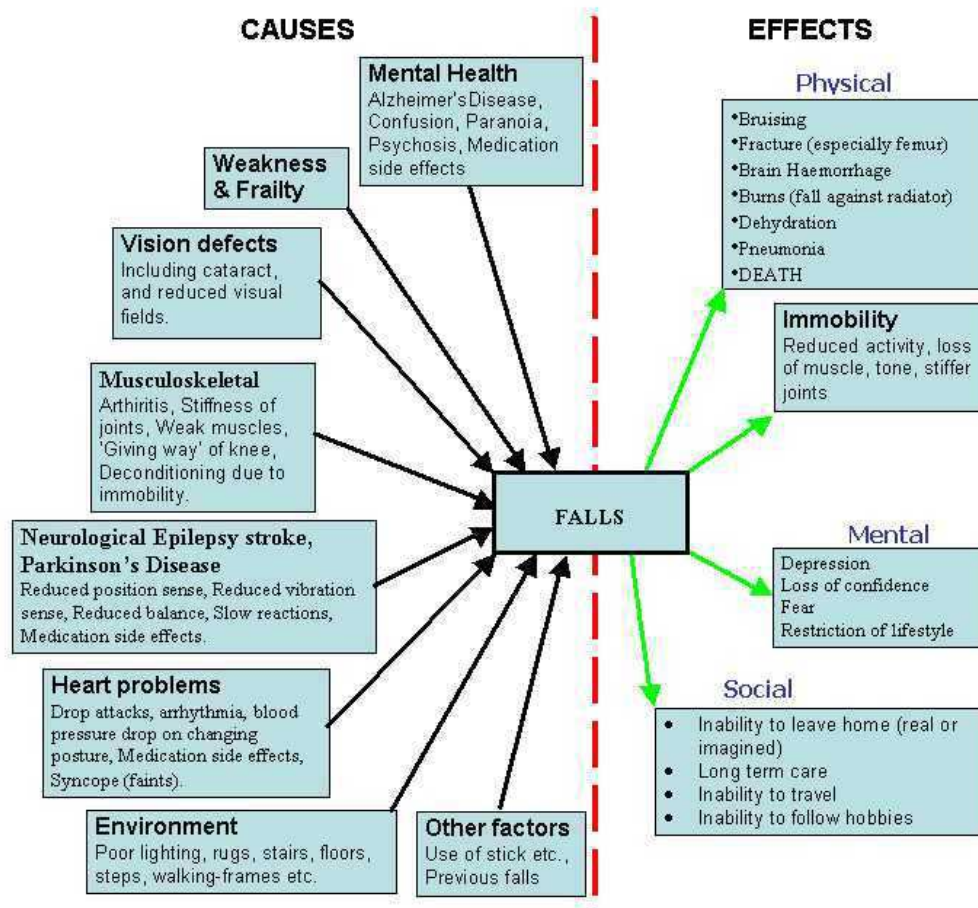


Falls are often due to interactions of multiple factors. Inherent individual characters, in combination with behavioural as well as pharmacologic factor, alters resting balance or can have an effect on elderly postural response to challenge caused by surroundings, or by activities like transfer or walking.

Major risk factor for falls includes cognition and altered mobility. Risk factor pattern and preventive intervention varies in elderly according

to their mobility capacity. Active elderly sustain falls and injury for diverse reason than elderly who have difficulty in standing and walking , who might fall for diverse reasons . Risk factors for adverse falls also differs from factors contributing to falls due to other causes. An older adult with impaired cognition and mobility until an individual develops diarrhoea, leading to dehydration and dizziness. There occurs overlap between risk factors for fall and factors contributing to other geriatric giants. Falls in dynamic elderly might harm themselves at the time of challenging actions . Elderly who have restricted mobility might fall out of chairs as well as bed or may still be let down by care givers.

FIGURE 4 : CAUSES AND EFFECTS OF FALLS



Falls in older adults are largely due to intrinsic factors because falls in elderly occurs in surroundings and during performing activities that doesnot lead to falls in young adults. Indoor environmental factors causing falls are loose rugs, uneven walkways, poor lighting and lack of clutch bar in bathroom. Outdoor hazards are common in active elderly but less frequently assessed. Other factors that are at risk for falls comprise

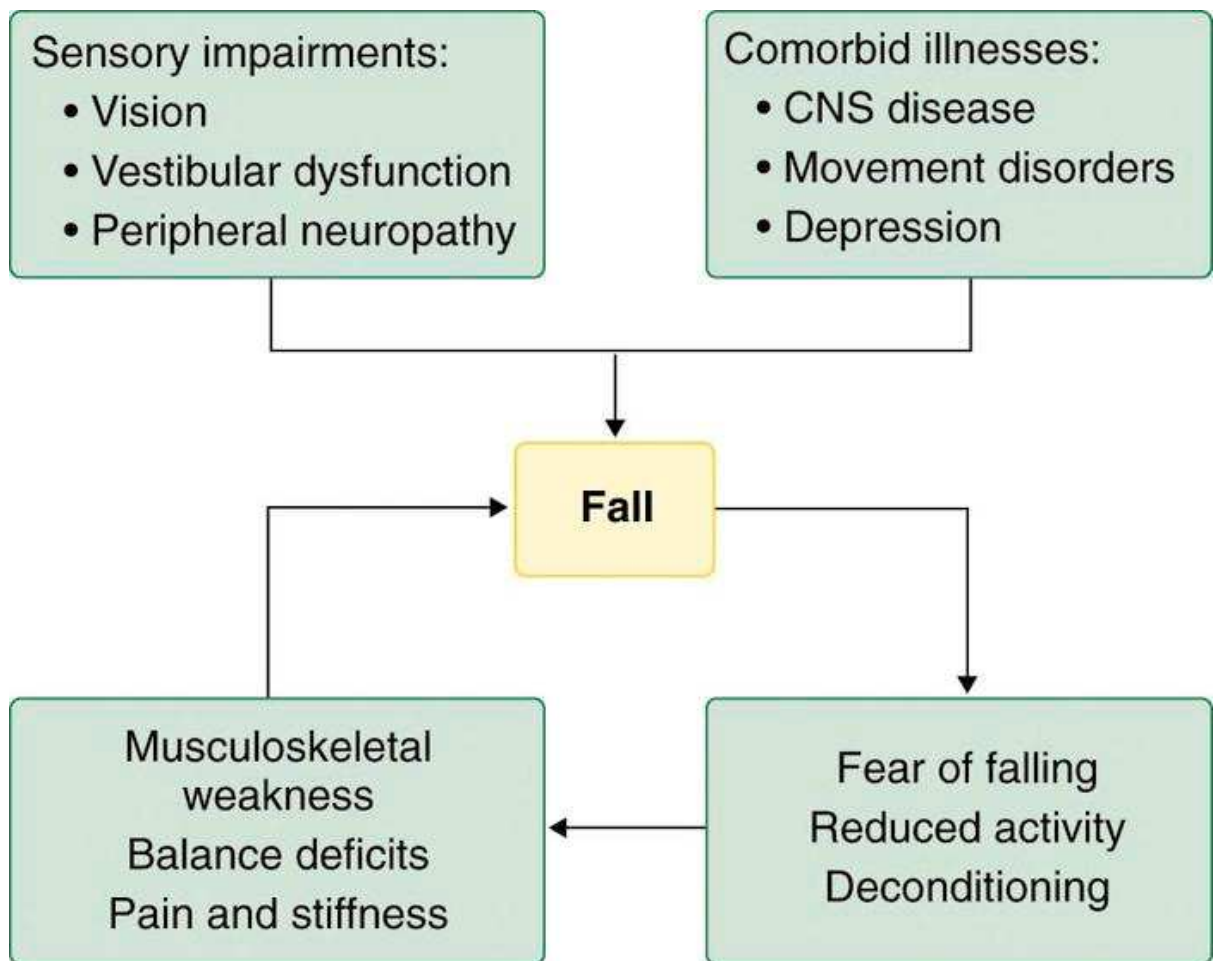
mental and attitudinal characteristics. The risk factors for fall injury includes fall direction , low body weight and osteoporosis.

Balance dysfunction may result from impairment in peripheral sensory receptors for input, central nervous system structures that process input and, plan motor output ; and effector organs to carry out movement. In many elderly , there occurs overlapping of defects across the system thereby resulting in unsteadiness and falls.

The 3 major sensory system for balance includes : visual , somato- sensation, and vestibular function. Position of the body can be determined by visual functions like visual acuity, contrast sensitivity, adaptation in the dark, depth perception , and peripheral vision. Bifocal glasses can decrease visual acuity in significant region in front of the foot during walking. With aging, visual functions are affected by diseases like cataracts, macular degeneration and glaucoma. Dark adaptation can be reduced by medication leading to miosis or constriction of pupil.

The important factor required for balance is the Peripheral sensation. These sensors offer information regarding posture of the body in relation to the supporting surface and gravity, and reveal the association of one body part to the other while rest and mobility.

FIGURE 5: CONSEQUENCES OF FALLS



Peripheral sensation is significant to monitor features of the weight-bearing plane and the sharing of weight to the foot. In older adults, Peripheral sensation loss is frequent due to peripheral vascular disease and diabetes. In such situations, the visual systems help by providing information regarding position of the body. Hence a mixture of peripheral sensory loss in addition to vision loss can generate severe problems with inability to detect the position of body. The vestibular

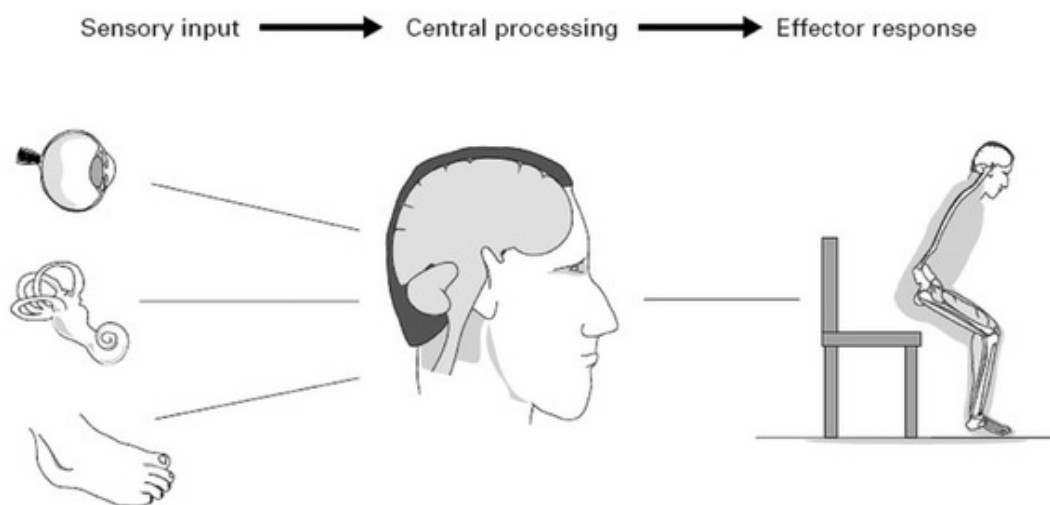
system detect the posture of head in relation to gravity, monitor linear as well as angular acceleration of the head, synchronize head and eye movements to preserve gaze and visual field stability while in motion.. With aging, Vestibular system is impaired can occur and can be affected by head trauma or ischemia. In older adults, vestibular conditions like Meniere disease and benign paroxysmal vertigo are common.

The central nervous system has various components that contributes to balance. There are central pattern generators which includes structures in the spinal cord and brain stem .The brain structures controlling balance includes frontal cortex, cerebellum, motor cortex, basal ganglia,, and other areas. Balance can be affected by deterioration of brain region as in cerebellar degeneration and in the basal ganglia in Parkinson disease . The perfusion of brain determines the process controlled by it and hence inadequate levels of brain perfusion can affect processing of balance and gait. Therefore, syncope or presyncope leads to transitory cerebral hypoperfusion and falls. Example includes postural hypotension, critical aortic stenosis, tachyarrhythmias and bradyarrhythmias.

Recently, there has been better understanding that balance disorders and falls are contributed by diffuse microvascular disease of brain. Accordingly, ischemia occurs in susceptible areas of brain like

frontal lobes and significant white matter tracts that connects frontal lobes and subcortical regions. This ischemia manifests radiologically as leukoaraiosis or white matter disease. This has been related with definite pattern of cognitive decline which involves slowing of psychomotor activities, inattention and decreased functions of execution like sequencing as well as visual spatial organization. These cognitive dysfunction leads to alteration in walking, particularly extremely uneven length and time of step and thereby causing falls. Therefore a promising theory of alteration in balance and gait owing to atypical nonamnesic cognitive function and mobility due to regional microvascular disease of brain has been emerging. This situation might manifest as uneven walking pattern and can amplified by incorporating stress on movement and cognition.

FIGURE 6: PHYSIOLOGY OF GAIT



Tasks that concurrently stress cognition and mobility, constitute part of a promising theoretical approach to balance evaluation and are termed “dual tasking.” Increased fall risk occurs in elderly, whose performing capacity worsens significantly when they were asked concurrently and solve cognitive problems.

There is loss of righting reflex in some central nervous system diseases like extrapyramidal disease and some form of multisystem atrophy. Sedation, reduce attentiveness and attention. Therefore drowsiness and sedative medication increase fall risk in elderly. Psychological factors such as fear of falling and risk preferences are less specific but potentially important.

The factors essential for stability and mobility includes effector organs like joints and muscles. Muscle weakness is prevalent in elderly and may be due to principal loss of muscle mass, diseases of peripheral nerves or junctions of neuromuscular system, or immobility. Certain muscle disorders like inflammatory myositis or steroid induced myopathy produces proximal muscle and trunk weakness. Lower motor neuron diseases, radicular nerve defects owing to spinal stenosis, or peripheral nerve injury results in localizing strength deficit so as to have an effect on definite muscle group and discrete efficient activities. For instance, a foot drop owing to injury to peroneal nerve prevent forefoot

from lifting to clear obstacle with tripping and stumbling. Recently , there is an evidence that decrease vitamin D level can cause weakness of muscles and thereby falls . Reduced testosterone level can cause falls in elderly males less than 80 years. The range of movement is reduced in arthritis and also produces pain thereby leading to alteration in step and weight bearing . Fatigue, which may be widespread or restricted to muscle, contributes to instability. Malformations deform weight bearing surface of the foot and produces pain. Therefore acute condition like overworked muscles or chronic diseases related to exhaustion like anemia or congestive cardiac failure may enhance fall risk.

Any diseases affecting central nervous system leads to instability and thereby causing unexpected falls. Any disease which causes reduction in cerebral perfusion such as decrease in oxygen carrying ability, hypoxia or hypotension can cause light-headedness, instability, giddiness and falls .Toxic or metabolic abnormalities owing to infection, medication, or dyselectrolytes can present as instability and falls due to inattention. Instability can also be due to recent onset neurological defects like stroke. Older adults with predisposing subclinical stability disorder may have increased susceptibility to precipitating factors.

According to biomechanical system, the risk for falls is dependent on concepts of force, mass, momentum, and acceleration of

part of the body and as a whole. While standing, individual appears as a long tall column which rest on a small base of support. The most important task of mobility is to dislocate and restore the column when there is change in base of support. Therefore evaluation of balance include 2 major condition,

(1) static balance- the stability of fixed column above a steady base of support

(2) dynamic balance - the control of column and supporting structure while in motion .

The most important and characteristic dynamic balance task is walking. During walking, one leg supports the body, which is alternated by other leg that swing from back to in front of the body. Walking can be categorized by the pattern of steps which uses spatial factors like step length, step width and stride length .

Walking is also categorized by temporal factors like double support time and tone. It can also be described as “controlled falling” for the reason that the body column move forward precedent the base of support and the foot have to be timed to make contact with the support surface at exact position and time in expectation of the moving position of the trunk. Alteration of timing by any disease causes irregular

movement of trunk and gait. Walking is also influenced by any modification in body segment and joints.

During regular walking, the foot begins a step by means of a thrust off from toe, which is followed by lifting the foot to swing through and end by a heel strike and forward rolling foot get in touch so as to begin subsequently. The knee is in complete extension during toe thrust off, swing forward by insignificant flexion to assist clearance of foot and after that returns to complete extension at the tip of heel contact. The hip is in extension at the back of trunk at thrust off and swing into flexion at heel contact. The arm swings alternately and in a series contradictory to the step series of legs. Biomechanical factors which are atypical in individuals who fall include both static and dynamic balance. Irregular static balance related with falls can manifest as augmented sway while quiet standing. It has been suggested recently that greater sway to the side, medial-lateral plane, have been related to falls. Alteration in dynamic balance amongst the individuals who fall vary depending on the basic cause. Recurrently observed abnormality consists of increased double support time while walking, augmented step width, greater trunk sway while in motion, greater or reduced toe clearance, decreased hip extension, irregular lateral stepping, and late correcting activities at the hip or ankle while the trunk is misplaced.

Stability is dependent on the complex execution of central integration, sensory, and musculoskeletal effector component. Predisposition to falls occur when the physiological changes which occur with aging are coupled with impairments and disease processes that affects these components. [29]. Auditory , visual, vestibular, and proprioceptive systems are most important sensory modality accountable for identifying hazards and orient the elderly in space.

With aging, visual changes occur such as decrease in contrast sensitivity, dark adaptation, accommodation and visual acuity. Postural stability and falling are related to Visual acuity, contrast sensitivity, and depth perception. .[30-32]. Increased postural sway, dizziness and falling in elderly are due to decrease in the vestibular function that occurs with normal aging[33]. Spatial orientation during rest and during motion is contributed by vestibular system. It is also dependable for visual fixation during the motion of head and body. Changes in the otoconia can be ascribed to age-related decline in vestibular function. Usage of diuretics, quinine, quinidine, tobacco, aspirin, alcohol along with aminoglycoside are the predisposing factors. Other predisposing factors include mastoid surgery, middle ear infection and head trauma. Impaired stability in the dark occurs in elderly persons with vestibular problems due to better dependence on the visual input. Stability is contributed by hearing , by

detecting and interpreting auditory stimulus. It also helps in localizing and orienting the elderly in space, while there is impairment of other sensory modalities. Hearing loss is present in more than 50% of elderly persons [34]. Spatial orientation during position changes is provided by proprioceptive system.

The proprioceptive system include apophyseal joint mechanoreceptor, posterior column, various central nervous system associations and peripheral nerves. Peripheral neuropathy due to various causes is common among older adults. Cervical degenerative disease includes rheumatoid arthritis or spondylotic changes, whiplash injuries are the predisposing factors for cervical disorders in elderly. The central nervous system channel input from a variety of sensory modalities to the efferent component of musculoskeletal system. Several central nervous system disease contributes to unsteadiness and falls due to their multiple connections and complexity. The central nervous system diseases related to greater fall risk includes normal pressure hydrocephalus, stroke and Parkinson's disease.

Central nervous system disorders which affects cognition also impedes the steadiness. There is an greater occurrence of falls, even with normal gait pattern in individuals with impaired mental status or dementia. Many study have established the association between diseases

of white matter and gait disorders, even in the lack of impairment in cognition.[35] .Fall risk in an individual is also increased in some impairment inside the musculoskeletal system which includes muscles, joints as well as bones. Diseases associated with falling includes hemiparesis, myopathies and arthritis. The risk of falling in arthritis occurs due to several mechanisms such as periarticular muscle weakness of muscles, compromise in proprioception owing to worsening of joint mechanoreceptors as well as pain. The risk of falling is significantly increased in ankle, hip and knee weakness[36].

The postural stability is maintained by alternating flexion and extension of lower limb muscles. Elderly individuals with weakness of ankle dorsiflexion, tends to fall backwards with minimum dislocation.

Smaller posterior base of support also predisposes elderly persons to fall backward. Foot abnormality provides inaccurate proprioceptive information and adversely affects gait pattern . Many systemic illness gives rise to instability by

- impairment of neurologic, sensory , musculoskeletal functions
- decrease in cerebral oxygen carrying capacity or perfusion
- Confusion.

Example includes dyselectrolytes, acid–base disorder, hypothyroidism, hypoglycemia or hyperglycemia and anemia.

Compromise in cerebral blood flow occurs in Postural hypotension resulting in instability [37]. In community living elderly above age of 65 years, prevalence of orthostatic hypotension ranges from 10% to 30%. Orthostatic hypotension has multiple factors. The causative factor for Postural hypotension include changes in autonomic function with ageing, reduced renin-angiotensin reaction to erect position, reduced baroreceptor sensitivity, salt along with water depletion as well as decreased venous and lymphatic return. Other contributing factors include effects of disease like Parkinson's disease or diabetes, and use of medication like neuroleptics, antidepressants, antihypertensive, diuretics as well as nitrates. Orthostatic hypotension is considered when an individual falls during movement from lying or sitting to standing position.

Postprandial hypotension is an additional defect occurring in changes in blood pressure. The probable aetiology can be due to lack of ability to compensate for splanchnic blood pooling following food.

Drugs can also give rise to gait unsteadiness by a various mechanisms such as postural hypotension, dehydration, impaired balance, impairment of cognitive functioning, electrolyte disturbance or fatigue. The fall risk and injury are greatly associated with Centrally acting drugs which includes antidepressants, neuroleptics, sedative-hypnotics

and tranquilizer.[38,39]. Both tricyclic antidepressants and selective serotonin reuptake inhibitors (SSRIs) are concerned in falls and hip fracture.[40]. Furosemide, type 1A antiarrhythmics, in addition to digoxin are some of the drugs related to falls in elderly[41]. Any changes in the dosage and quantity of drugs can also contribute to falls in elderly. [42]. Alternatively, data suggest that postural unsteadiness, is mainly widespread presentation of adverse drug reaction in elderly.[43,44].

SITUATIONAL FACTORS

In the older adults, fall is considered as a nonspecific presentation of acute disease. Falls can be precipitated in acute febrile illnesses and chronic disease exacerbation by temporarily impairing stability. Reduction in cerebral blood flow and unconsciousness occur in some cardiac dysrhythmias, thereby resulting in fall in the elderly. Syncopal and nonsyncopal falls are contributed by Carotid baroreceptor hypersensitivity. Drop attack is one type of fall. Drop attack refer to abrupt loss of postural tone with no loss of consciousness.

Some elderly persons note that their knees “just gave out” or buckled and this may be due to impairment of mechanoreceptors resulting from changes in joints due to arthritis. The frequency and etiology of drop attacks are not known. In community-living older adults, majority of

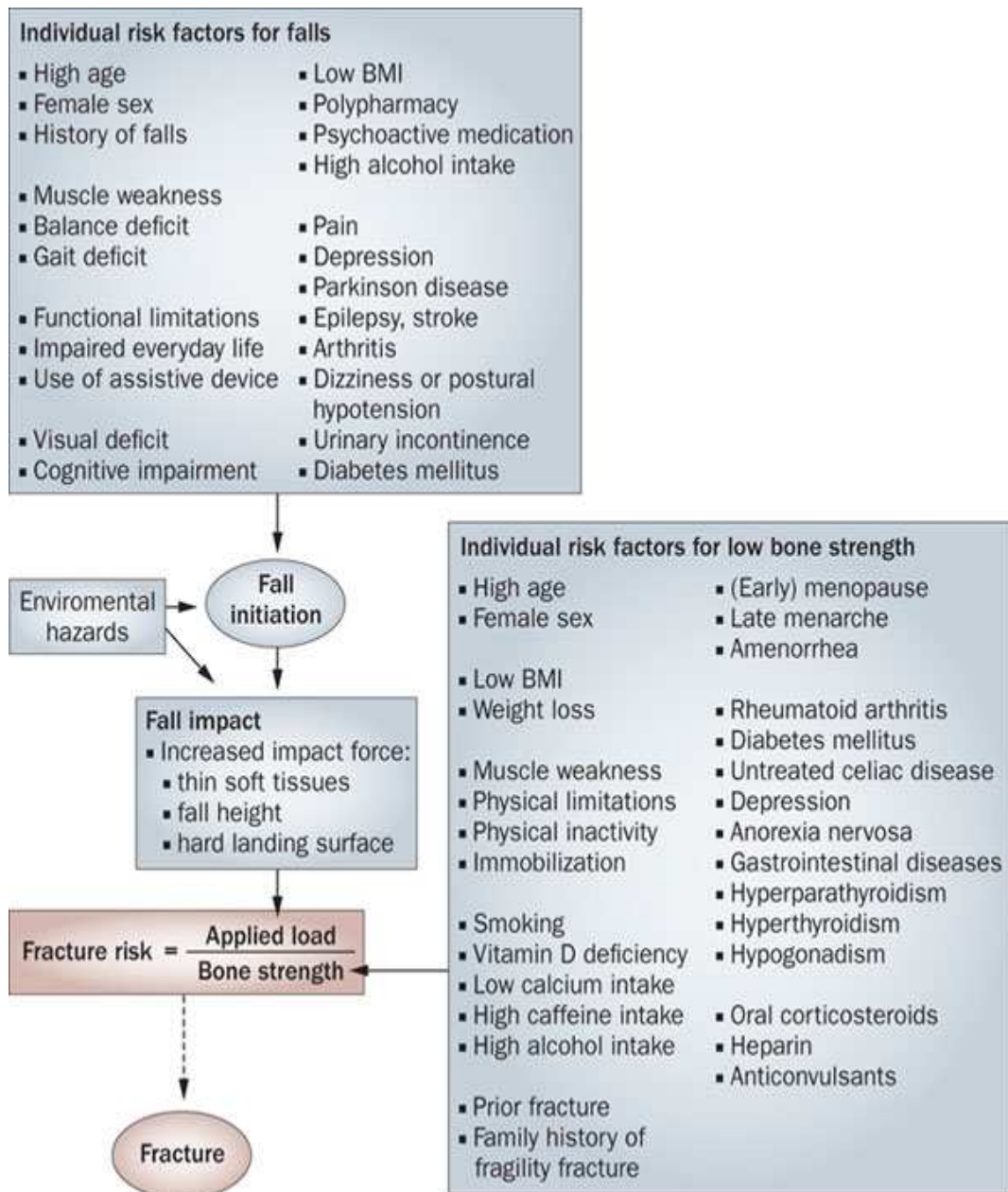
falls occur during usual, nonhazardous activities like walking, varying position, or during performance of fundamental actions of daily living. Some of the falls in elderly take place during dangerous actions such as climbing on ladders or participation in sports.

Among community-dwelling older adults, ecological factors rise give to most of the falls. It is difficult to ascertain the role of environmental factors. More than seventy percentage of falls by elderly living in community take place at their residence. 10% falls take place on staircase, with descending more hazardous than ascending.[45]. Environmental risks consist of lifting heavy items and negotiate obstacle, poor lighting and smooth floor, [46]. Other potential hazards include Slippery or improperly fitting shoes. Patterns on the walls or floor, can either disfigure or lead to improvement in visual acuity.[47]

There are many risk factors for falls. Some of the individual risk factors for falls are as follows;

FIGURE 7: INDIVIDUAL RISK FACTORS FOR FALLS

Falls are multifactorial in origin. Some of the risk factors are :



NURSING HOMES

IMMEDIATE CAUSES

In nursing home residents, occurrence of impairment is high in elderly living in community and this explains higher frequency of falls. Increased risk of fall occurs in nursing home residents due to greater quantity of impairments and disease acquired by them.[48].

SITUATIONAL FACTORS

In the elderly, host factors like postural hypotension, use of multiple medications, dizziness and acute illness contributes to falls. In institutionalized elderly, ecological factors are considered less significant. Falls in elderly living in institutions are contributed by frailty and increase in number of impairments. In institutions, potential hazards have been removed and hence considered safer than community. Also, elderly persons living in institutions have less opportunity to perform activities like climbing on ladders or stairs. But environmental factors may also contribute to falls among institutionalized older adults. For example, untied shoe laces, ill-fitting shoes, slippery floors and long pants contribute to falls in institutionalized elderly[49].

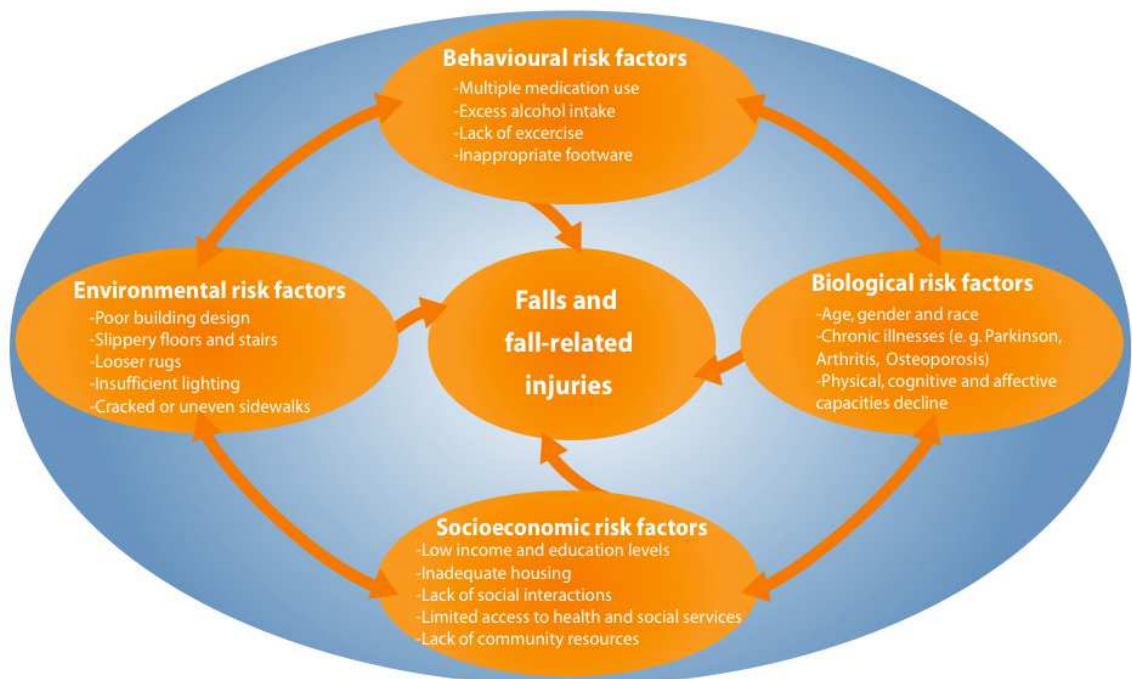
Bed rail which can be climbed above, chairs that are either low or spongy and beds that are either too low or high can be dangerous. Furniture may also be hazardous contributing to falls. Many studies have shown that falls are likely, but are not unavoidable in nursing home surroundings. The impact of falls can be minimized by implementing structured and standardized security program[50].

RISK FACTORS FOR FALL INJURY

Factors increases the risk of hazardous effects , such as fracture as a result of fall have been recently the focus of interest. Factors such as the energy-absorbing capability of surface, velocity of fall , the direction and location of impact , protecting response of the elderly who fall and injury threshold of the tissue determines the likelihood of an individual suffering serious injury during a fall[51,52]. Characteristics of fallers related to severe injury includes female, white race, older age, decrease in body mass index, reduced bone mineral density, , the use of certain drugs, cognitive impairment, abnormal neuromuscular finding like reduced reaction time and instability, previous history of falls and fall related injuries, presence of chronic disease, like stroke and diabetes, and poor visual acuity.[53–64]. Greater risk of suffering a hazardous fall related injuries has been associated with increased physical activity. Conditions

of the fall that increases probability of fractures include height of the fall, rigidity of the landing surface, decreased body mass index (BMI) and height of the fall[63–65].

FIGURE 8 : FALL AND FALL RELATED INJURIES



(WHO, 2007)

EVALUATION AND MANAGEMENT

Minimizing the fall risk with no compromise in mobility or functional independence constitute the aim of fall assessment and preventive scheme in elderly. But the aim might be not easy to attain in some elderly individuals. Hence a enhanced objective would be to avoid

appropriate fall-related morbidity like fear, inability to get up and serious injury. The Quality

Indicators for Assessing Care of the Elderly (ACOVE) project is an evidence-based approach in managing and preventing falls.[65-67].

Eventhough aetiology and risk factor for falls are same in the community residents and nursing home inhabitants, the incidence and modifiability of causative risk factors might vary among them.

COMMUNITY

Identification of the possible contributing factors forms the initial step in assessing elderly who had a fall or who are at danger for falling

[68,69]. The subsequent components of assessment affords additional information :

- (1) Careful evaluation of predisposing risk factor and disease;
- (2) Balance and gait evaluation; and
- (3) reassess earlier fall situation

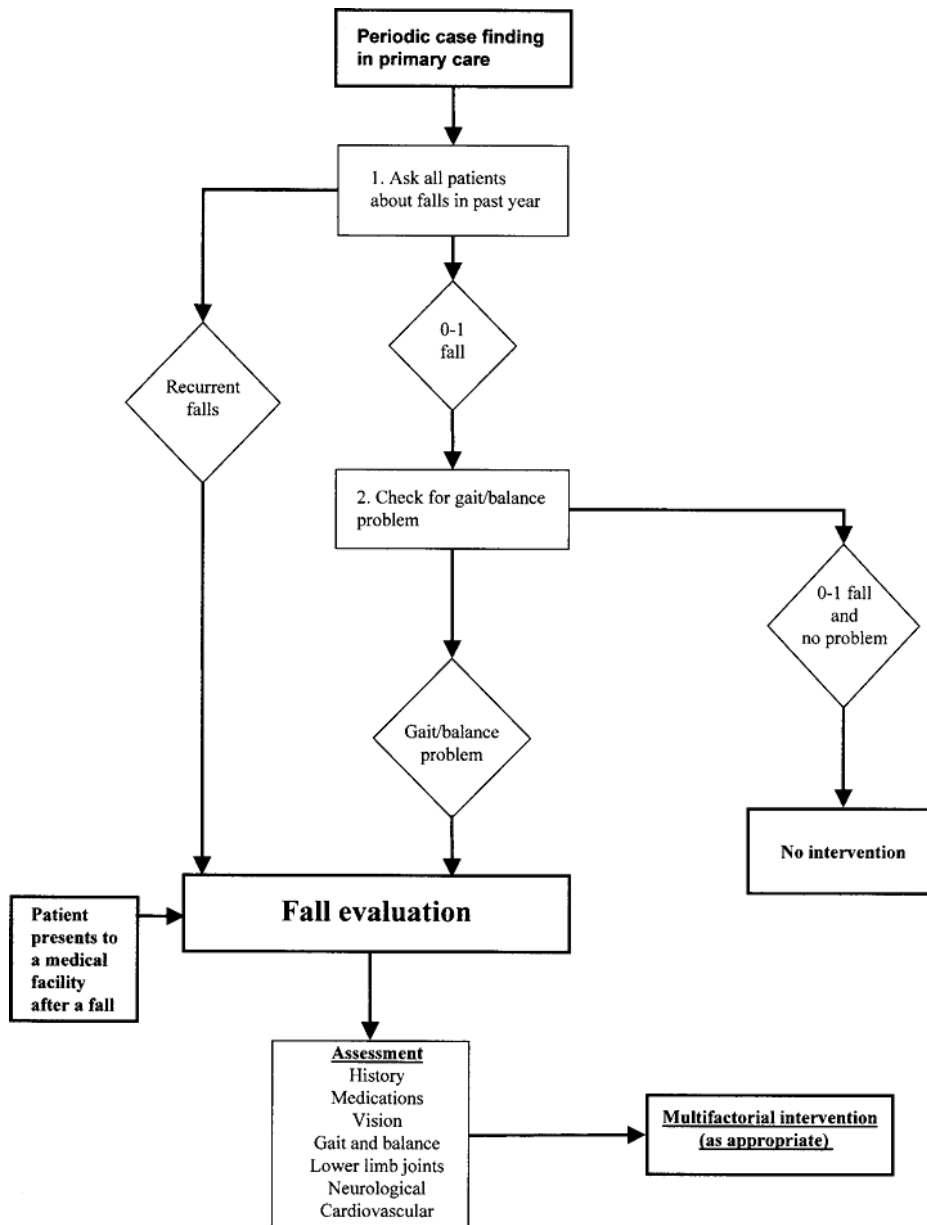
RISK FACTOR ASSESSMENT

Risk factor assessment includes

- History
- Visual screening
- Hearing screening
- Review of medications
- Balance assessment
- Gait assessment
- Cardiovascular examination
- Neurological examination

FALL EVALUATION

FIGURE 9: EVALUATION OF FALLS



HISTORY AND EXAMINATION

The fall risk evaluation begins with history and physical examination intended at identification of risk factors which predisposes to falls. In older adults, the signs and symptoms of specific diseases may be nonspecific or vague. For example, elderly with vestibular

impairment can complain of unsteadiness or giddiness and patients with non vestibular disorders may present with vertigo and hence careful evaluation of all causative factors is important. Fall risk can be decreased by ameliorating many causative factor as possible.

A thorough history and examination is essential to diagnose neurological disease that influence falls. Even though most neurological disease related to falls result in abnormal gait patterns and postural instability, the findings are inconclusive. The most frequent characteristics of gait seen in elderly with central nervous system disorders includes step-to-step variability, flexed posture, path deviation and decrease in step height that result in shuffling[70]. These findings may also be seen in elderly with abnormality in sensory system and represents compensatory, rather than principal changes. Hence gait findings should be thought along with other components of neurologic test such as cranial nerve findings, sensation, tone, muscle strength, and coordination. The central nervous system examination is helpful not only to diagnose particular disease but also to identify other causative factor that increases fall risk like reduced sensation or muscle weakness. Snellen chart can be used to determine distant and near visual acuity. In case of visual impairment, older adults have to be referred to optometrist or ophthalmologist for full examination. Whisper Test[71] or Portable audiometry can be used for screening hearing problems.

Impairment in Vestibular function is often not easy to diagnose from simple medical test. If an elderly complain of vertigo, instability with specific head positions or in the dark, then vestibular contribution to loss of stability must be thought. Dix–Hillpike maneuver can be done to provoke vertigo if vestibular problems are suspected. Selected patients should be referred to otolaryngology for full vestibular testing or to audiology for whole hearing assessment.

Elderly with proprioceptive impairments often complain of instability in the dark or on irregular surface. On examination, decrease in position and vibration sense are noted. Older adults with reduced proprioception might improve their gait pattern by using a straight cane or by holding on to examiner's finger. If cervical disease is the reason of proprioceptive problem, the individual also complains of vertigo or deterioration of symptom with turning the head. The patient might show signs of radiculopathy or myelopathy; there might be mild spastic quadriparesis or clumsiness with fine motor tasks. Many older adults show reduced range of motion of neck and may have complaint range from vague giddiness to obvious loss of stability. It might be often not easy to decide whether the elderly person suffers from a mechanoreceptor-related cervical disease or reduced range of neck movements is due to impairment in vestibular function. The musculoskeletal system examination can further show diverse patterns

of muscle weakness. Any arthritis or musculoskeletal system disorder can cause risk of falls in elderly. Elderly patients with arthritis of knee joint might complain of falls for the reason that their “knee gave out.”

Older adults with distal weakness will complain of frequent tripping and with proximal muscle weakness will complain of complexity reaching in and out of the chairs, as well as while climbing stairs. Foot problems affecting gait pattern and reduction in proprioception have to be recognized. Among community dwelling older persons, orthostatic hypotension have not been recognized as a recurrent factor increasing risk for falls. So any change in blood pressure with posture change have to be a part of fall risk factor evaluation. Older adults might complain of vague sensations or light headedness on posture change, prolonged standing, or walking, even though several persons with considerable postural hypotension might not be symptomatic and are not aware of drop in blood pressure. Some of these persons can have associated disease like diabetes or Parkinson’s disease .[PD]

Some of the drugs can give rise fall risk by causing postural hypotension. Most significant drugs include antidepressants , antihypertensives and nitrates. Elderly individuals can be screened for depressive symptoms . On screening, patients may have vegetative

complaints, reduced concentration, or lack of interest. The most important part of fall risk evaluation includes careful medication review. The assessment includes direct recording of all prescribed medications, and verification of dosage and time of each drug. In addition, Over-the-counter drugs like nonsteroidal anti-inflammatory agents, sedative-hypnotics and cold preparations must be ascertained. Medication side effects including fatigue, weakness, confusion, postural hypotension or light headedness should also be elicited from the patient.

If an elderly give a history of “just going down” or falls with head turn or look up, then Carotid hypersensitivity have to be suspected. Carotid sinus massage should be performed , if there is no indication of cerebrovascular disease or cardiac conduction defect, if carotid sinus syndrome is suspected, and if the process is judged secure in older adults. Carotid sinus syndrome may be defined as more than a 3-s sinus pause or when there is more than 5 mmHg decrease in systolic blood pressure.

INVESTIGATIONS

All older adults who had falls have to undergo lab screening which includes thyroid function tests, serum glucose, complete blood count, electrolytes, including blood urea nitrogen (BUN) and creatinine, and vitamin B12 levels. In individuals taking antiarrhythmics, high-dose aspirin, anticonvulsants and tricyclic antidepressants, the drug levels

should be measured. Lab investigation have to be supported by history and physical examination. Falls among community living elderly are a nonspecific manifestation of an acute disease in approximately 10% of cases. Potentially useful tests like chest x-ray, urine analysis and blood cultures, electrocardiogram, cardiac enzymes should also be done.

When focal abnormality are prominent on neurologic examination, brain imaging with computed tomography or magnetic resonance imaging is necessary. Cervical spine films might be supportive in elderly with lower extremity spasticity, impairment in gait, and hyperreflexia indicative of cervical spondylosis. Lateral measurement of spinal canal of less than 12mm is indicative of major encroachment on the cervical cord . Holter monitoring is not necessary for regular assessment of nonsyncopal falls.

BALANCE AND GAIT EVALUATION

Gait and balance signify end products of accumulate effect of the disease, lifestyle and aging changes, and impairments in neurologic, sensory and musculoskeletal functioning . Hence fall evaluation requires a cautious evaluation of balance and gait. Tests of gait and balance typically reproduce postural responses, gait maneuvers and position changes used during daily activities.

Examples of medical observation test of gait and balance used extensively in clinical practice includes “Get Up and Go” test and Performance-oriented Mobility Assessment [POMA] [72]. These evaluation involves observe the individual performing combination of exercises such as getting up from a chair, reaching up, bending over, assuming a variety of narrowed stance, turning, walking at common and in quick pace, and sitting in a chair. Impaired stability or complexity performance of each exercise is observed by the examiner. The assessment helps to identify elderly who are at increased risk for falls and the situation in which fall occurs. Combining rehabilitative, medical, and ecological intervention can be suggested based on simple observations of gait and balance. Posturography might be useful in deciding relative contribution of visual, proprioceptive and vestibular, abnormality to postural instability and also reveals the mode by which elderly respond to postural perturbations. The part of computerized posturography in clinical assessment and treatment of falls and balance diseases need to be determined.

REVIEW OF FALL SITUATION

Another part of fall assessment is cautious re-evaluation of fall situation. Intrinsic factors for fall includes vertigo, or unsteadiness, feelings of light headedness, recent drug, principally focusing on latest changes, postural hypotension, previous alcohol use , symptom of acute disease or dysrhythmias. Accurate explanation of movement during fall is important .[73]. Detailed history regarding circumstances of fall should be elicited. The goal of intervention for falls occurring during usual and comparatively safe activities requires improvement in safety and efficiency of the manoeuvre at the time of falls. Falls occurring while performing more hazardous activities can be prevented by substitution of safer activities or avoidance .

Environmental facts that have to be ascertained include

- Obstacles in immediate vicinity of the fall
- floor or ground surface;
- the volume and intensity of lighting;
- Footwear, includes fit ,heel height, type of sole;
- objects being carried;
- walking aid use at the time of the fall.

Home safety assessment and cautious re-evaluation of particular fall circumstances can disclose corrective environmental hazard.

INTERVENTIONAL STUDIES

Assessment of Risk factor without intervention does not appear to be effective. Attention to the subsequent factor are mostly helpful:

- Balance, transfer, strength, and gait training;
- environmental adaptation;
- Reduction in drugs , principally psychoactive medication;
- postural hypotension, and other cardiovascular and medical problems;
- management of visual deficits

MINIMIZATION OF MEDICATIONS

Multiple drugs have been associated with increased fall risk in the elderly. Strongest relations happen by means of polypharmacy and psychotropic drugs. The strongest evidence supports withdrawal of psychotropic medication, as a distinct intervention and as a part of multifactorial and multicomponent intervention. Dose reduction should be considered if discontinuation of high-risk drug is impossible due to medical circumstances. Even though most of the clinicians consider that selective serotonin reuptake inhibitors (SSRIs) are safe to use in elderly

than tricyclic antidepressants, it has been said that SSRIs enhance risk of falls similar to tricyclic antidepressants. Decrease use of psychotropic drugs as a distinct intervention, and evaluation, modification, and discontinuation of drug as part of a multiple factor intervention has been found to be efficient in reducing falls.

EXERCISE PROGRAM

A variety of exercise type have been investigated, both group and individual exercises, which can be used alone or in combination are strength training, balance training, flexibility, tai chi, and cardiovascular, survival, and fitness instruction. Many studies have said that exercise, in the type of resistance guidance and balance, gait, and coordination training, is useful in decreasing fall events. Exercise should also be incorporated as part of a multicomponent or multifactorial intervention for preventing falls in elderly and can be considered as a distinct intervention. Exercise may be further useful when used with other intervention. Many exercise programs were related to less falls in multicomponent and multifactorial studies. Exercise programs have to be initiated with care since various studies have revealed that exercise might enhance the fall rates in elderly with restricted movements who are not used to physical activity.

TREATING VISUAL IMPAIRMENT

Age related changes includes change in visual acuity, macular degeneration, cataracts, glaucoma, and other situation that may have a consequence on fall risk. When the patient has visual problems , their vision should be evaluated , and treatable visual abnormality have to be corrected. Accordingly a study showed , no evidence that referring community living elderly for visual correction was efficient in decreasing the number of falls..

MANAGING POSTURAL HYPOTENSION

Postural hypotension is related to increased risk for falls in elderly. It mainly occur due to use of concomitant drugs, dehydration, and autonomic neuropathy. Several multifactorial fall prevention programs useful for prevention of falls incorporated drug reduction and simplification to alter postural blood pressure, specific strategy like elastic stockings, hydration, abdominal binders, and drugs(e.g., fludrocortisone and midodrine). Management of orthostatic hypotension have to be integrated as a part of multiple factors intervention among community living elderly.

MANAGING HEART RATE AND RHYTHM ABNORMALITIES

The major cardiovascular diseases related to falls are vasovagal syndrome, carotid sinus hypersensitivity, bradyarrhythmias and tachyarrhythmias. It can be explained by 2 mechanisms. been proposed. The first is temporary unconsciousness with memory loss and the patient has no remembrance of episode of syncope; and this occurs with postural hypotension and carotid sinus hypersensitivity. About 70% of falls in elderly are unnoticed and they might present with a details of a fall and not syncope. The other projected method is , of transitory hypotensive situations, owing to primary hypotension or hypotension due to arrhythmias. Thus an elderly person with impairment of gait and balance , falls without syncope . syncope. Bradycardia can be treated by cardiac pacing. .

VITAMIN D SUPPLEMENTATION

Vitamin D deficiency is widespread in elderly and it causes impairment of muscle power and functions of neuromuscular system . Several meta-analyses and RCTs have revealed use of vitamin D supplementation in prevention of falls is different from its consequence on bone strength. Many studies have revealed its use even in elderly with normal serum vitamin D levels. Since vitamin D is harmless and economical, elderly with supposed vitamin D deficiency have to be regularly offered vitamin D supplementation to decrease risk for falls. In

addition , vitamin D should be supplemented at desired levels in all elderly.

MANAGING FOOT AND FOOTWEAR PROBLEMS

Foot problems are frequent in elderly and are related to impairment in balance and performance. Severe foot problems like moderate or severe bunions, toe deformity, ulcer or distorted nail influence elderly to fall. In addition, foot posture alertness is considerably decreased in elderly. The form and state of footwear might also give rise to the fall risk in elderly. Footwear that is illfitting, has worn soles, has high heels, or is not laced or buckled when worn has been related to increased fall risk. Shoes with low heel height and high surface contact area might decrease fall risk.

MODIFICATION OF HOME ENVIRONMENT

Environmental hazard are any items or situation in the surroundings that increases fall risk in elderly . It can be inside the residence and ground or can be away from residence . Identification and alleviation of ecological hazard has been elective constituent of several fall preventive programs. Screening of residence surroundings with follow-up for alterations by a healthcare expert is an efficient targeted intervention for elderly with prior history of fall . Programs consist of

home risk assessment by skilled persons, elimination or alteration of identified risk, setting up of security devices like handrail on staircase and clutch bar on bathrooms, and increasing lights.

PROVIDING EDUCATION AND INFORMATION

Many fall prevention programs consist of instructive and health promoting mechanisms. Educating the patient and caregiver may be considered as primary and secondary preventive methods and is significant for carrying out and continued utilization of fall preventive strategies. Several useful programs consists of opportunity for elderly to access fall prevention resources and to implement particular activities so as to sustain or improve health or put up fall prevention skill .

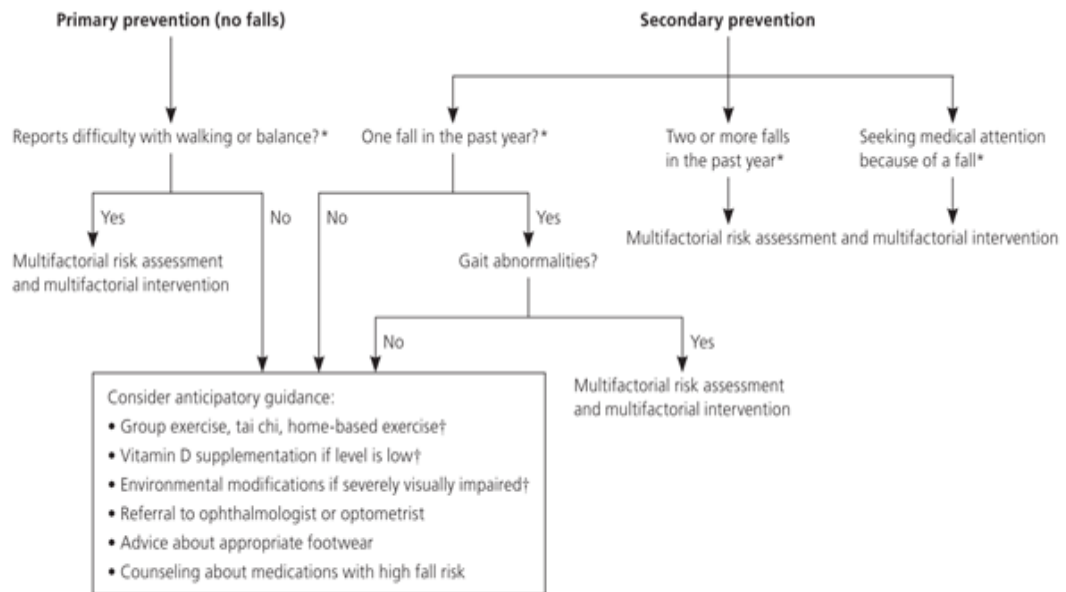
PREVENTION AND THERAPY

Prevention of falls includes

- Primary prevention
- Secondary prevention

Falls can be prevented by assessing the risk factors and appropriate interventions are required – multifactorial risk assessment and multifactorial intervention.

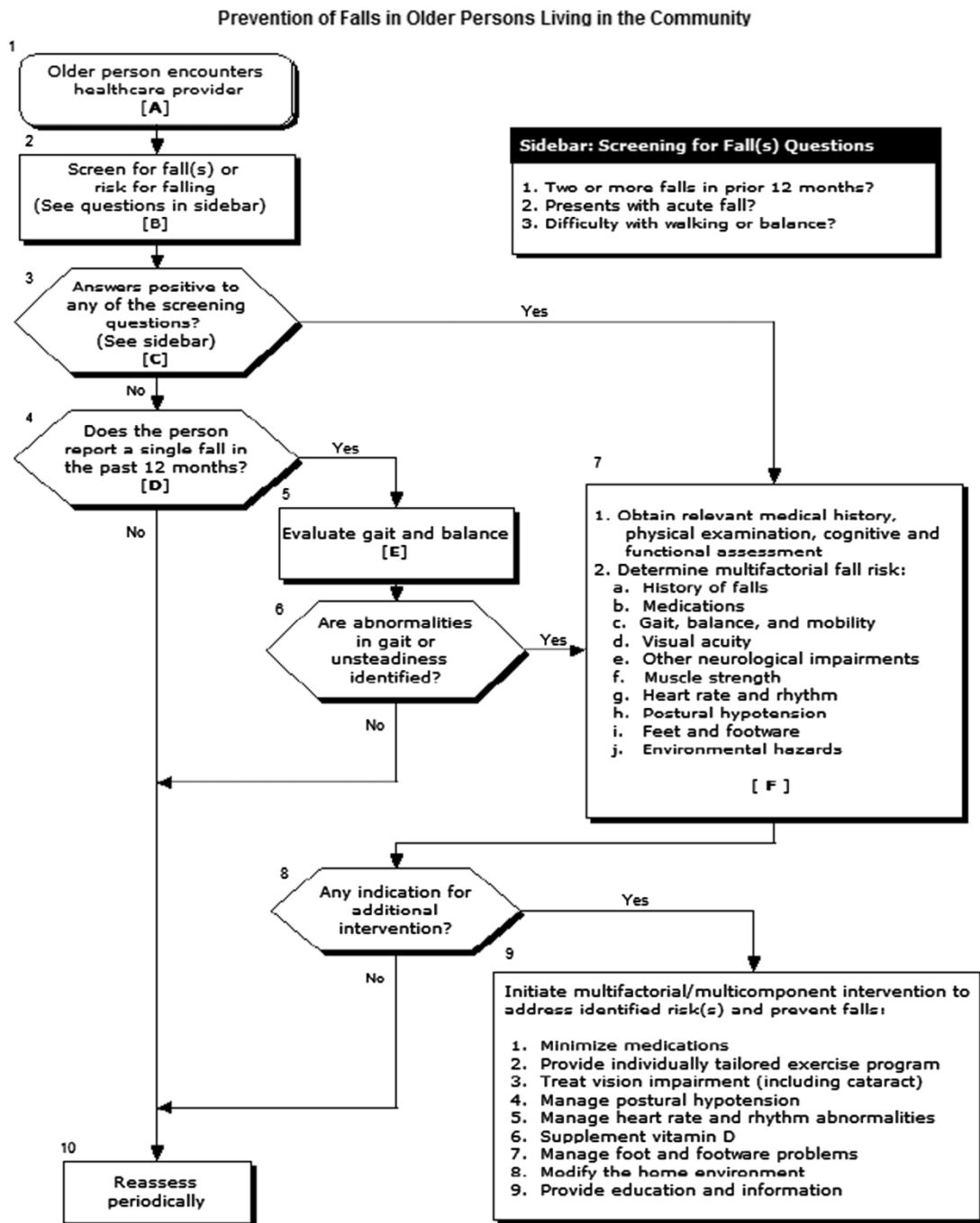
FIGURE 10 : FALL PREVENTION



*—Recommended screening questions from the American Geriatrics Society/British Geriatrics Society 2010 clinical practice guidelines.¹⁸

†—Interventions that have been found to decrease the number of persons who fall, thereby offering the potential for primary prevention.²⁰

FIGURE 11 : PREVENTION OF FALLS IN COMMUNITY



The suitable intervention scheme is dependent on fall history and physical condition of individual. The treatment goal for fit elderly who have not sustained falls includes maintenance or improvement in gait, flexibility, balance and endurance to reduce fall risk and maintenance of functional independence and mobility. Strength and balance training are efficient in rising power of lower limbs in fit, older adults.[74]. The plan of action in elderly who had sustained falls or who suffer from chronic illness and impairments is reduction in the rate of succeeding falls and to reduce frequency of fall-related morbidity like , fear, injury, inability to get up, functional decline, and immobility. It is not impossible to decrease fall risks and its sequelae by modification or elimination of various causative factors as possible. Since most of the factors leading to fall risk are chronic illness or impairments that might be adjustable, the treatment scheme have to merge suitable combination of surgical, medical , rehabilitative, and environmental interventions. The balance and gait evaluation is helpful for identification of elderly who are at increased fall risk; circumstances under which falls take place ; determination of rehabilitative and environmental interventions which decreases the risk. An individualized, interdisciplinary and multifactorial approach to modify the risk factors has been most useful in decreasing falls in elderly.

For instance , fall prevention interventions carried out by qualified physiotherapist consists of , recommendation and teaching the suitable use of Assistive devices, training in muscle-strengthening and balance training , transfer and gait training, and a home safety assessment with recommendation for adjustment and alteration.[75]. Treatment of osteoporosis is important for the preventing fall-related fractures. Fall assessment is suggested for the elderly who had hip fracture.[76]. One of the severe effects of falls among older adults are hip fractures. Hip fractures can be prevented by additional padding through the utilization of hip protectors[77]. These devices were recently shown to decrease the hazard of hip fracture in frail mobile elderly and develop self-efficacy in high risk community living elderly .[78]

NURSING HOME

Establishment of appropriate goals is the initial measure in development and implementation of fall assessment and fall preventive program for elderly living in institutions . Elderly living in institutions are frail in comparing with elders living in the community . Therefore it essential to carefully evaluate the safety measures in elderly living in institutions since increase in physical activity may contribute to increased risk for falls and hence injury among them.

RISK FACTOR ASSESSMENT

Among nursing home residents, medical assessment intended at identification all the risk factors contributing to fall , forms the cornerstone of evaluation[79]. The fall risk is increased with increased amount of impairments and hence eliminating or ameliorating risk factors may decrease risk of falls.[80]. Among elderly living in nursing homes, , careful examination of risk factors is essential since the nature of disease and amount is more severe in elderly living in nursing homes than those living in the community. Among nursing home residents with impaired cognition, presentations are vague and therefore their history is often not reliable. [81]

INVESTIGATIONS

Routine lab testing should be targeted toward conditions that are most common and treatable. Based on history and physical examination, additional testing should be considered. Among elderly living in nursing homes and who had sustained non syncopal falls, ambulatory monitoring of cardiovascular system does not have any role.

BALANCE AND GAIT EVALUATION

Evaluation of balance and gait among elderly living in nursing homes has same part as those living in community. Several validated and reliable assessment tools have been developed for use among frail elderly in hospitals and in nursing homes. [82]

REVIEW OF FALL SITUATIONS

In elderly living in nursing homes, many falls are not witnessed but there is better chance for identification of acute inherent and environmental factors leading to falls. Symptoms such as dizziness, medication side effect, hypoglycaemia or dysrhythmia can be experienced near the time of fall. Angina or myocardial infarction presents as chest pain. The immediate post fall physical examination includes estimation of postural blood pressure and pulse rate changes at one minute and three minutes, signs of acute infection, and focal neurologic signs that may present as falls. Environmental factors includes improper use of walking aid like walker or wheelchairs, use of side rails, use of belt, or other restraints. Falls leading to serious injuries are more common among non ambulatory nursing home residents , while sitting or while transferring from chair or be level and poor maintenance of equipments like wheelchair, or commodes.[83]

PREVENTION AND THERAPY

The strong association between falling and medications needs repeated review of prescriptions and alteration. The main aim is to decrease the dosage and Quantity of drugs taken by elderly living in nursing homes.. Decreasing the use of psychotropic drugs and educating the workers to carry out safe transfer can prevent falls in nursing homes residents.

ENVIRONMENTAL ASSESSMENT

In nursing homes, evaluation of surroundings intended at eliminating possible risk factors and environmental modification to improve mobility and safety have to be considered. The use of sufficient illumination with no glare; high, firm chairs with arms; dry, non oily floor that are devoid of hindrance; beds at suitable height for elderly individual; raised toilet seats with arms and beds without upper side rails are the useful for preventing falls and need to be implemented in elderly living in nursing homes. Mobile bed trays, have to be considered a severe fall risk among nursing home residents. Footwear have to be examined; shoes that have worn out soles or heels; that are ill fitting or left untied are not safe for elderly living in nursing homes.. .

FALL CLINICS

Falls constitute one of the components of geriatric syndrome and therefore , fall clinics have been created. In-depth examination and assessment of fallers are done so that significant physiological and pathological problems may be addressed and appropriate intervention planned. In fall clinics , the diagnostic precision and outcome of interventions is significantly greater than in non-specialized clinics.

EXERCISE

There are identified optimistic effect of exercise which includes decline in cognitive impairment, , reduce dysphoria and behavioural disorder, improve function, decrease falls, fall related injuries and fear of falling, reverses sarcopenia, slow loss of bones, decrease frailty, decrease pain, enhance sleep, reduce constipation and incontinence, , get better glycaemic control and quality of life. Therefore exercise is often prescribed by primary care physician. The norm for a minimal effective exercise dose would associate to a twice-weekly programme for twenty five weeks .

Intensity and incidence of exercise is dependent on fitness of the patient. A fit elderly can execute 30–60 minutes of moderate activity 5–7 days per week. Ill fit elderly have to do moderate activity which will enhance heart rate 55–69%. Activity less than 10 minutes might be allowed with steady rise. In view of devastating facts on the efficiency of moderate-high intensity balance training, clinicians can advise a simple balance training- For example, join dancing or Tai chi group exercise or have the person stand on one leg holding on to a stable object and then shut their eyes four times on each leg.

SUMMARY

Falls are more frequent event among elderly living in the community and in nursing homes. These falls can result in substantial morbidity, that ranges from restricted activities of living, to severe injury and even death. Some falls result from single, overwhelming inherent event such as stroke, from the effect of single disease like Parkinson's disease, or from risk factors in the surroundings. Falls have multiple risk factors and, results from a variety of combination of inherent, activity-related, and ecological factors. Careful evaluation and intervention focuses on the at identified risk factors for falls and exercise programs might reduce fall risk. The main aim of fall prevention

programs is to reduce the risk factors for falls and injuries with no compromise in mobility or function.

MATERIALS AND METHODS

MATERIALS AND METHODS

STUDY CENTRE:

Madras Medical College and Rajiv Gandhi Government General Hospital, Chennai

ETHICAL COMMITTEE APPROVAL:

Ethical committee clearance obtained from Institutional Ethical Committee of MADRAS MEDICAL COLLEGE held on 3.06.2014

STUDY DESIGN:

Hospital based Cross sectional study

PERIOD OF STUDY:

3 months

STUDY POPULATION:

200patients

INCLUSION CRITERIA:

Age \geq 65 years of age

EXCLUSION CRITERIA:

1. Patients with acute illness
2. Patients with acute painful lower limb conditions

3. Patients with severe dementia
4. Patients with severe depression
5. Patients with previous history of stroke and lower limb muscle weakness

DETAILS OF THE STUDY:

This study includes 200 elderly patients attending geriatric outpatient department in RGGGH, Chennai. Patients were selected according to inclusion and exclusion criteria. Relevant history like h/o falls, polypharmacy, associated comorbid conditions were obtained. Cardiovascular, Neurological and Musculoskeletal examinations, vision and hearing screening was done. To assess balance and to test lower limb muscle strength, Fall risk assessment tools like TUG, 4 Stage Balance Test, 30 Second Chair Stand Test were done.

OBSERVATIONS AND RESULTS

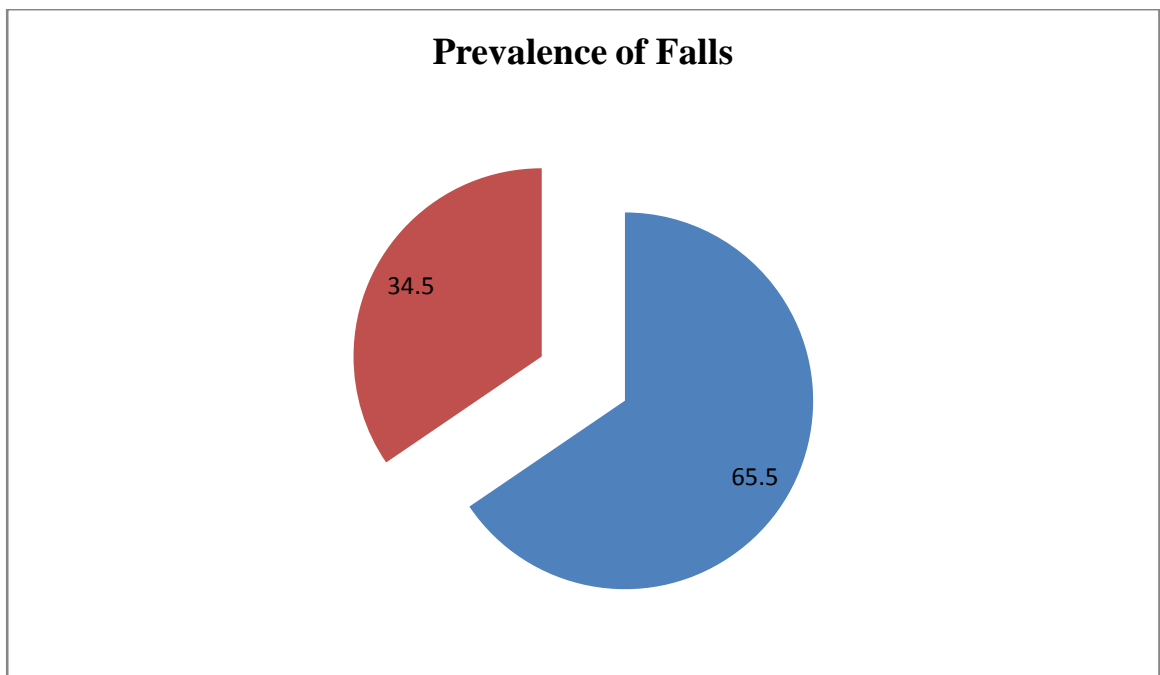
RESULTS

PREVALENCE OF FALLS- TOTAL[out of 200 patients 69 (34.5%) had falls.]

TABLE 1 : PREVALENCE OF FALLS

	FREQUENCY	PERCENTAGE
NIL	131	65.5
YES	69	34.5

FIGURE 12 : PREVALENCE OF FALLS



Among 200 elderly patients aged ≥ 65 years, 69 patients had falls. In our study, the Prevalence of falls among elderly attending geriatric out patient department was 34.5%.

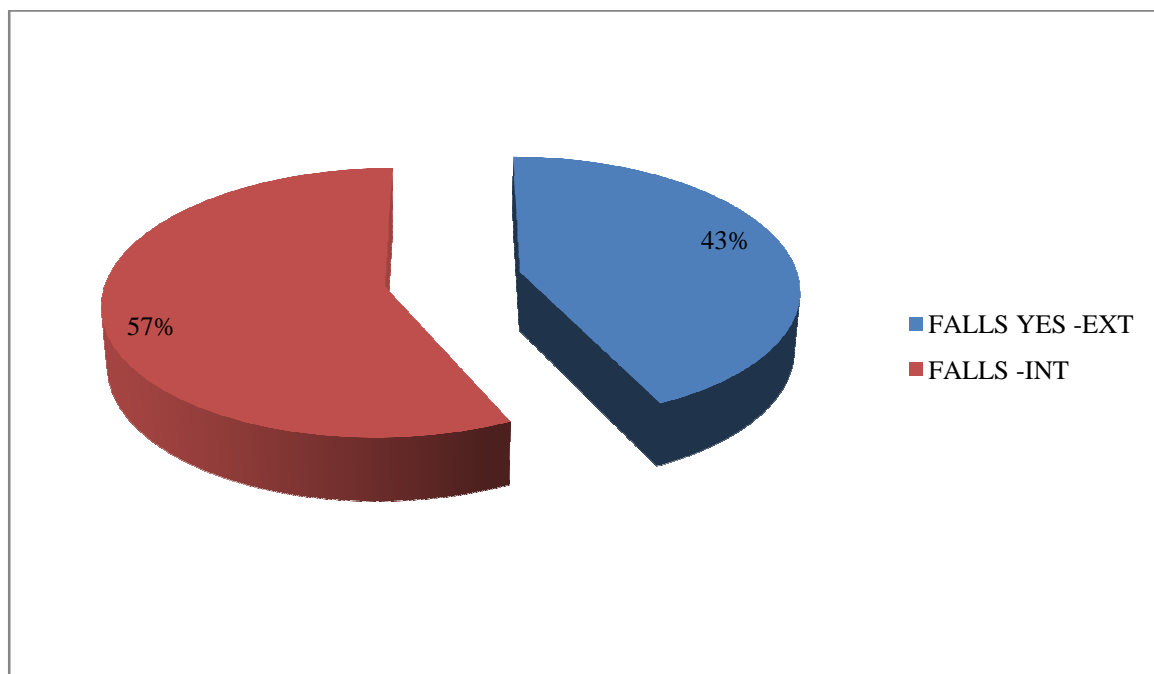
PREVALENCE OF FALLS -- EXTRINSIC AND INTRINSIC

Falls may be due to extrinsic or intrinsic causes. In our study, 30 patients had fall due to extrinsic cause and 39 patients had fall due to intrinsic cause.

TABLE 2 : EXTRINSIC AND INTRINSIC RISK FACTORS

FALLS	FREQUENCY	PERCENT
NIL	131	65.5
YES-E	30	15.0
YES-I	39	19.5
TOTAL	200	100.0

FIGURE 13 : EXTRINSIC AND INTRINSIC RISK FACTORS



Our study included 200 elderly patients ≥ 65 years. 57% of patients had intrinsic causes and 43% of patients had extrinsic causes for

falls. Falls due to extrinsic causes contributed to 15% and falls due to intrinsic causes of contributed to 19.5%.

AGE WISE DISTRIBUTION OF FALLS

In our study population, 163 patients were aged between 65-75 years ; 36 patients were aged between 75-85 years ; 1 patient above 85 years of age

TABLE 3 : AGE WISE DISTRIBUTION OF FALLS

			AGE_GROUP			Total	chi square	p value
			65-75 Yrs	75-85 Yrs	>85 Yrs			
FALLS TOTAL	NO	Count	115	15	1	131	11.417*	0.003
		%	87.79%	11.45%	0.76%	65.50%		
	YES	Count	48	21	0	69		
		%	69.57%	30.43%	0.00%	34.50%		
Total		Count	163	36	1	200		
		%	81.50%	18.00%	0.50%	100.00%		

*Significant at $p < 0.01$

Falls had occurred in 48 patients between 65-75 years of age [69.57%] and in 21 patients between 75-85 years[30.43%].

PERCENTAGE DISTRIBUTION OF AGE GROUPS

In our study group, 82% of patients were aged between 65-75 years; 18% were aged between 75-85 years and 1% above 85 years of age.

FIGURE 14 : PERCENTAGE DISTRIBUTION OF AGE GROUPS

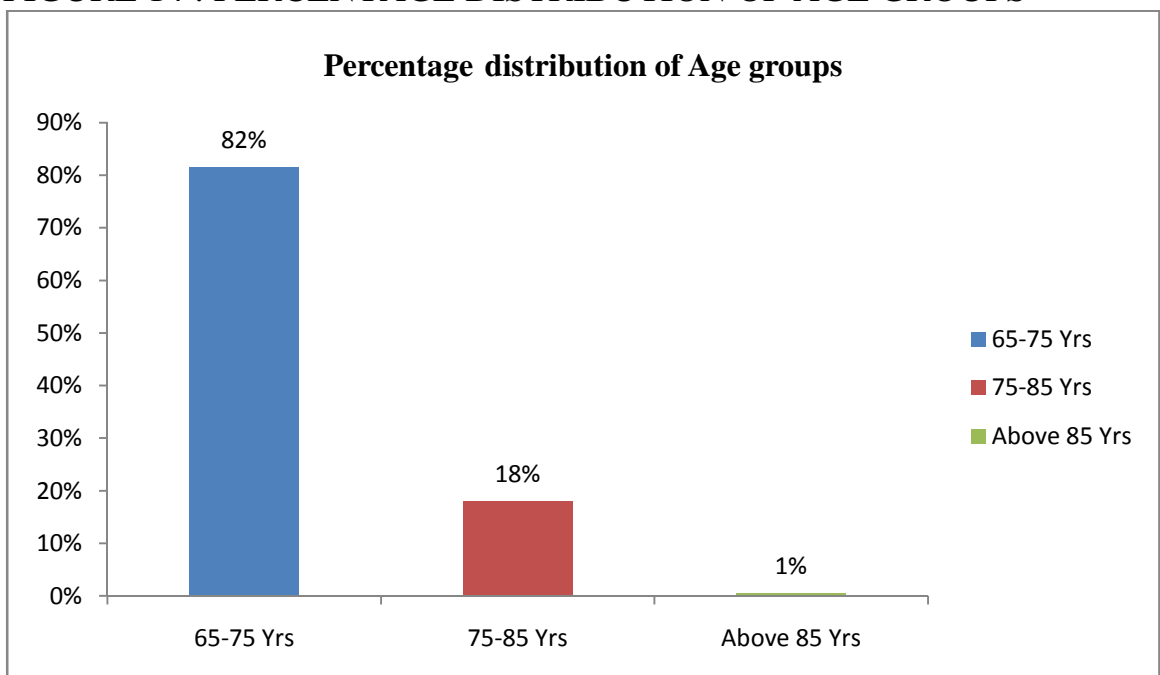
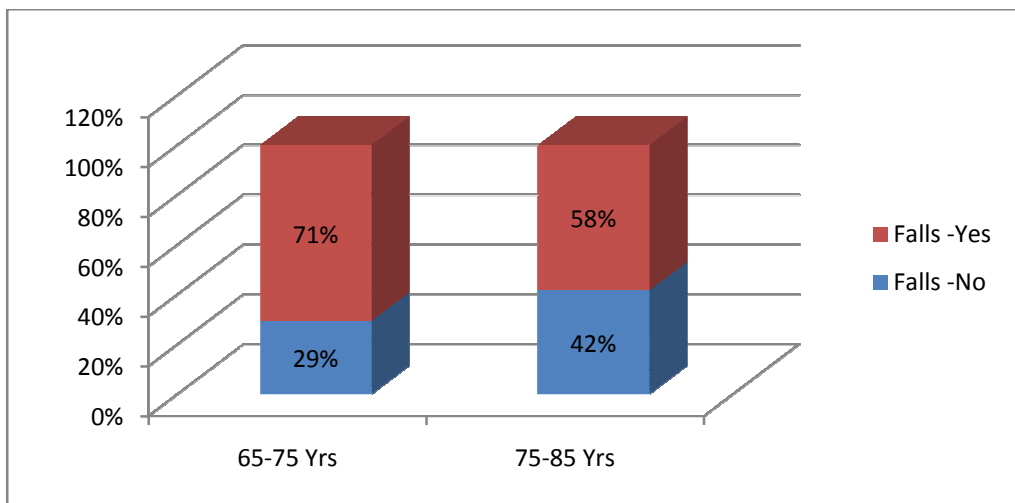


FIGURE 15 : AGEWISE DISTRIBUTION OF FALLS



SEX WISE DISTRIBUTION OF FALLS

Our study population included 100 male patients and 100 female patients

FIGURE 16 : GENDER DISTRIBUTION

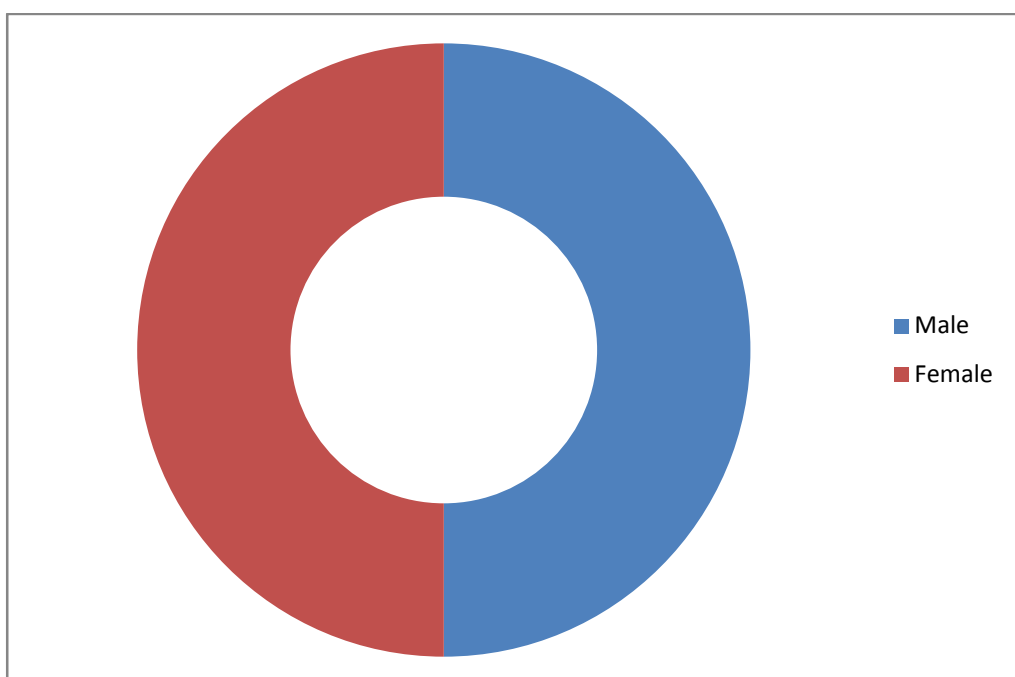


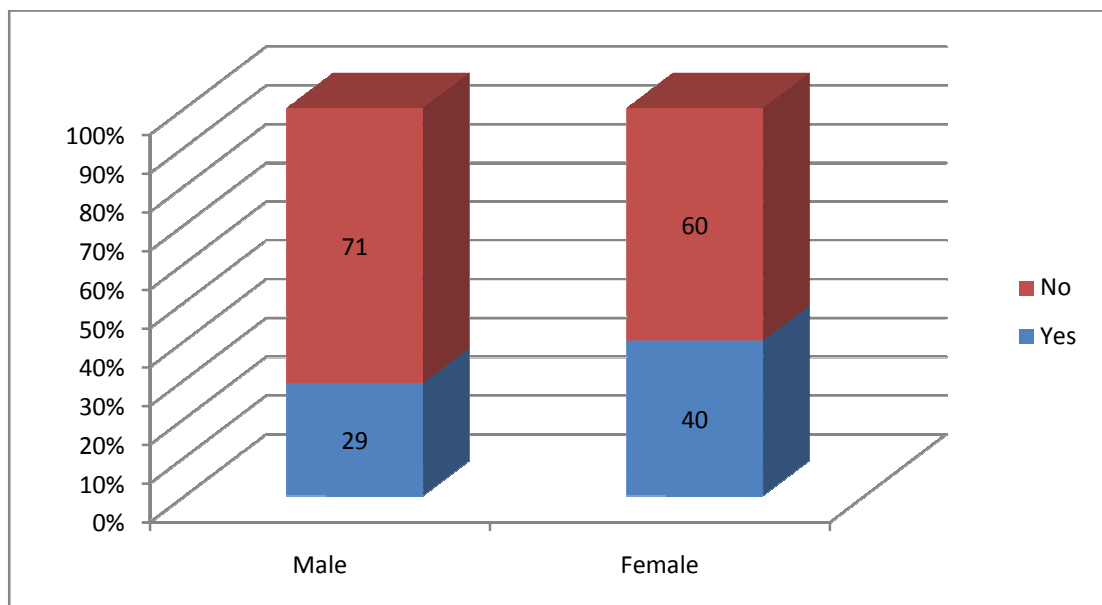
TABLE 4 : SEX WISE DISTRIBUTION OF FALLS

			SEX		Total
			Male	Female	
FALLS TOTAL	NO	Count	71	60	131
		%	54.20%	45.80%	65.5%
	YES	Count	29	40	69
		%	42.03%	57.97%	34.5%
Total		Count	100	100	200
		%	50.00%	50.00%	100.0%

Falls had occurred in 29 males [42.03%] and in 40 females[57.97%].

The prevalence of falls was more in females compared with males.

FIGURE 17 : SEX WISE PREVALENCE OF FALLS



VISUAL IMPAIRMENT AND FALLS

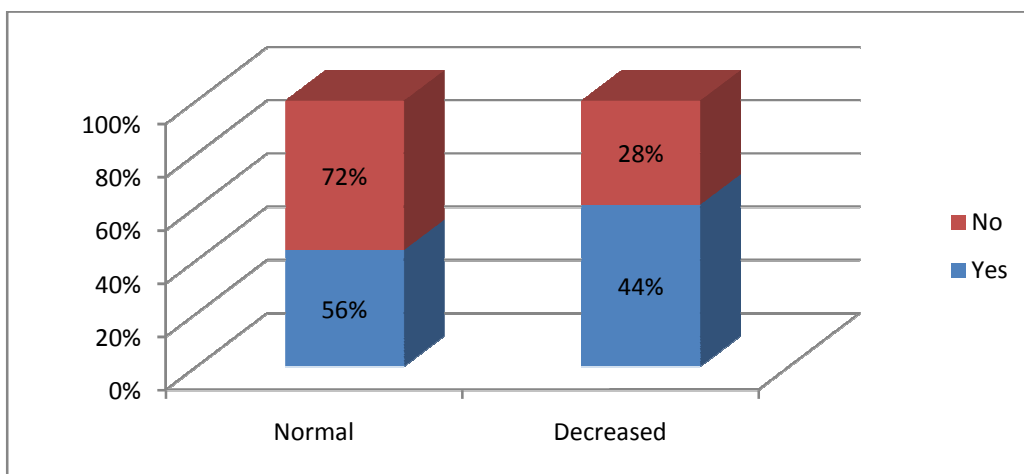
In our study population, 133 patients had normal vision [66.5%] and 67 patients had visual impairment [32.5%]

TABLE 5 : VISUAL IMPAIRMENT AND FALLS

	NORMAL	DECREASED	TOTAL	CHI SQUARE VALUE	P VALUE
NO	94 (71.8%)	37 (28.2%)	131(65.5%)	4.708*	0.003
YES	39 (56.5%)	30(43.5%)	69 (34.5%)		
TOTAL	133(66.5%)	67(32.5%)	200 (100%)		

Falls had occurred in 39 patients with normal vision [56.5%] and 30 patients with visual impairment [43.5%]. The association between visual impairment and falls was statistically significant as evidenced by p value 0.003

FIGURE 18 : VISUAL IMPAIRMENT AND FALLS



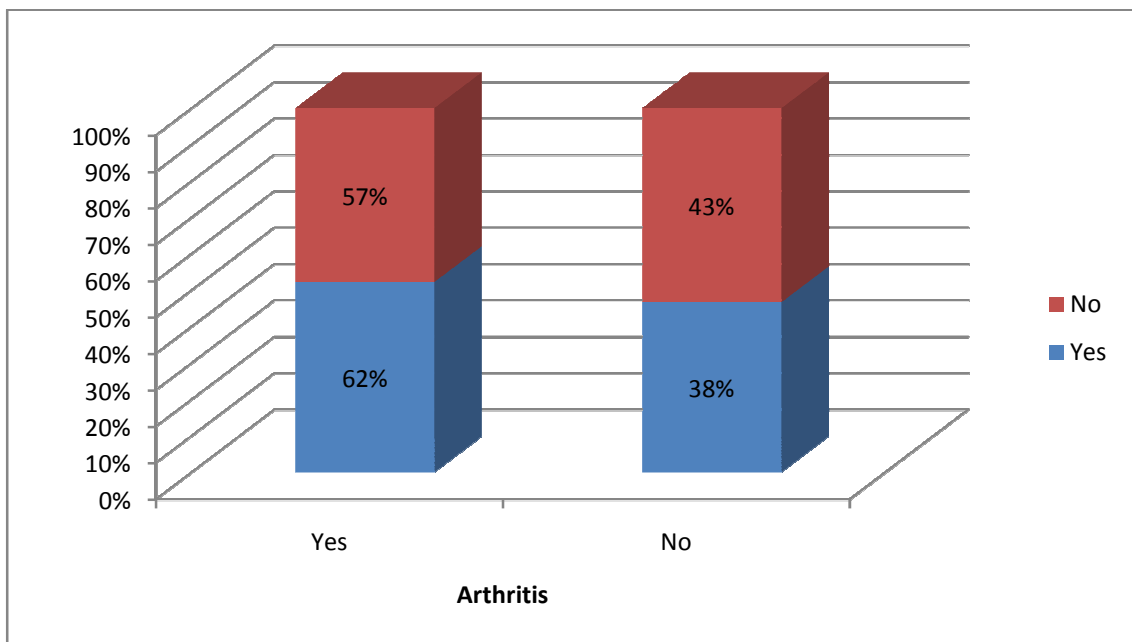
ARTHRITIS AND FALLS

TABLE 6 : ARTHRITIS AND FALLS

			ARTHRITIS		Total	chisquare	p value
			NO	YES			
FALLS TOTAL	NO	Count	74	57	131	6.395*	0.011
		%	56.5%	43.5%	65.5%		
	YES	Count	26	43	69		
		%	37.7%	62.3%	34.5%		
Total		Count	100	100	200		
		%	50.0%	50.0%	100.0%		

In our study population, 50% of patients had arthritis and falls had occurred in 62.3% of patients with arthritis. The association between arthritis and falls was statistically significant [p value 0.01]

FIGURE 19 : ARTHRITIS AND FALLS



DEPRESSION AND FALLS

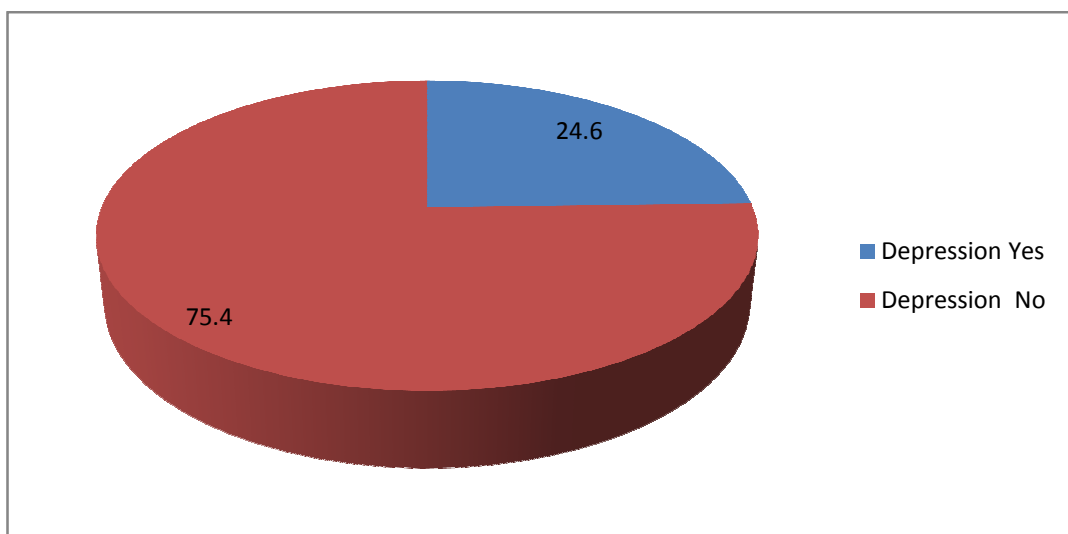
In our study population, 173 patients had no depression [86.5%] and 27 patients had depression [13.5%]

TABLE 7: DEPRESSION AND FALLS

			DEPRESSION		Total	chisquare	p value
			NO	YES			
FALLS TOTAL	NO	Count	121	10	131	11.190*	0.001
		%	92.4%	7.6%	65.5%		
	YES	Count	52	17	69		
		%	75.4%	24.6%	34.5%		
Total		Count	173	27	200		
		%	86.5%	13.5%	100.0%		

Falls had occurred in 52 patients without depression [75.4%] and in 17 patients with depression [24.6%]. The association between depression and falls was statistically significant [p value 0.001]

FIGURE 20 : DEPRESSION AND FALLS



INCONTINENCE AND FALLS

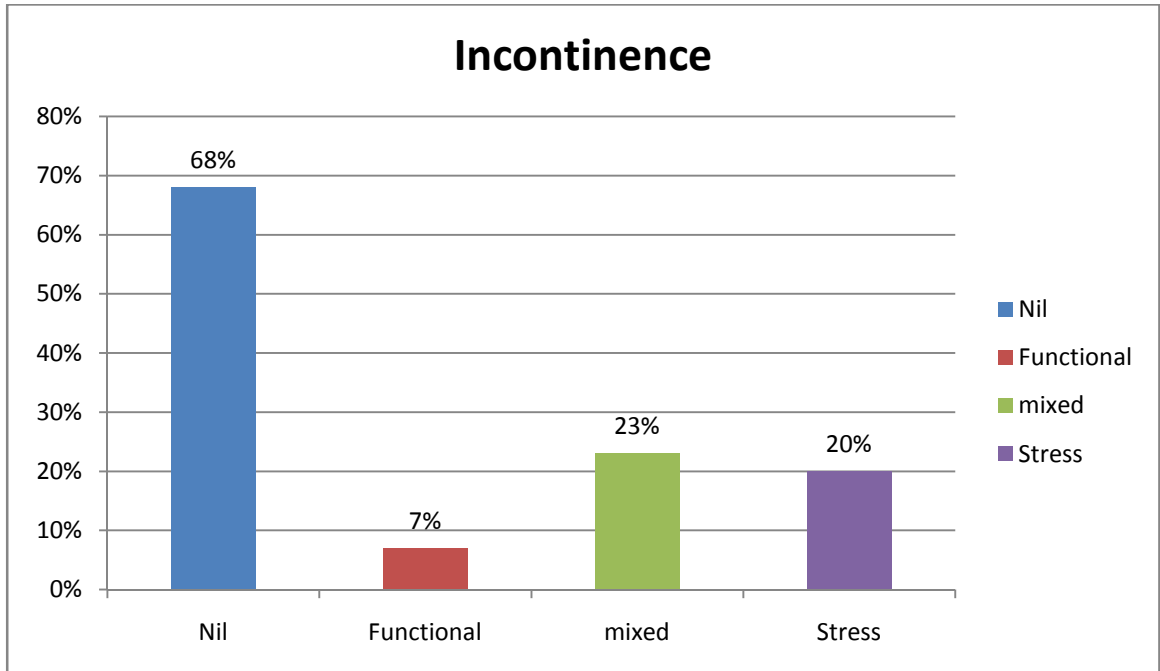
In our study population, 12 patients had functional incontinence [6%], 20 patients had mixed incontinence [10%] and 3 patients had stress incontinence [1.5%].

TABLE 8 : INCONTINENCE AND FALLS

		INCONTINENCE				Total	chi square	p value
		NIL	FUNCTIONAL	MIXED	STRESS			
FALLS TOTAL	NO	Count %	118 90.08%	7 5.34%	4 3.05%	2 1.53%	21.239*	p<0.0001
	YES	Count %	47 68.12%	5 7.25%	16 23.19%	1 1.45%		
Total	Count %	165 82.50%	12 6.00%	20 10.00%	3 1.50%	200 100.0%		

Falls had occurred in 5 patients with functional incontinence [7.25%], 16 patients with mixed incontinence [23.19%] and 1 patient with stress incontinence [1.45%]. There was statistically significant association between incontinence falls [p value < and 0.0001 falls [p value < and 0.0001].

FIGURE 21: INCONTINENCE AND FALLS



Falls had occurred in 5 patients with functional incontinence [7.25%], 16 patients with mixed incontinence [23.19%] and 1 patient with stress incontinence [1.45%].

AGE > 80 AND FALLS

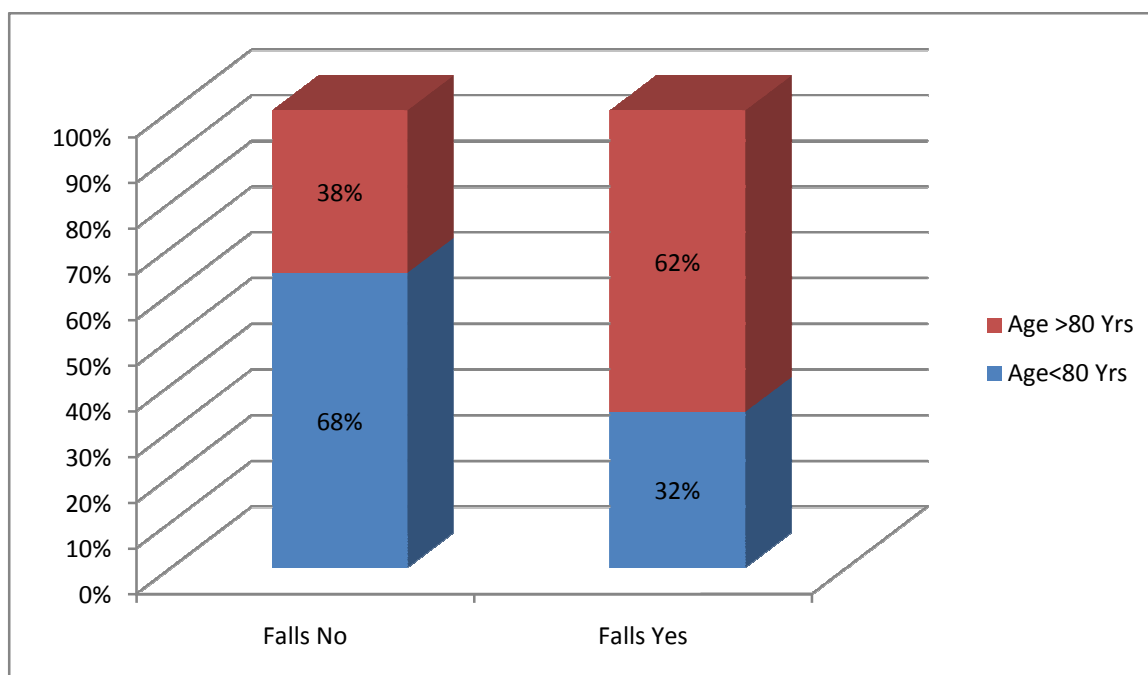
In our study, 16 patients were aged above 80 years [8%]

TABLE 9 : AGE > 80 AND FALLS

			AGE80		Total	chi square	p value
			NO	YES			
FALLS TOTAL	NO	Count	125	6	131	6.034*	0.014
		%	95.4%	4.6%	65.5%		
	YES	Count	59	10	69		
		%	85.5%	14.5%	34.5%		
Total			Count	184	16	200	
			%	92.0%	8.0%	100.0%	

Falls occurred in 10 patients of those aged 80 years [14.5%]. There was statistically significant association between age >80 years and falls [p value 0.01].

FIGURE 22 : AGE > 80 AND FALLS



POLYPHARMACY AND FALLS

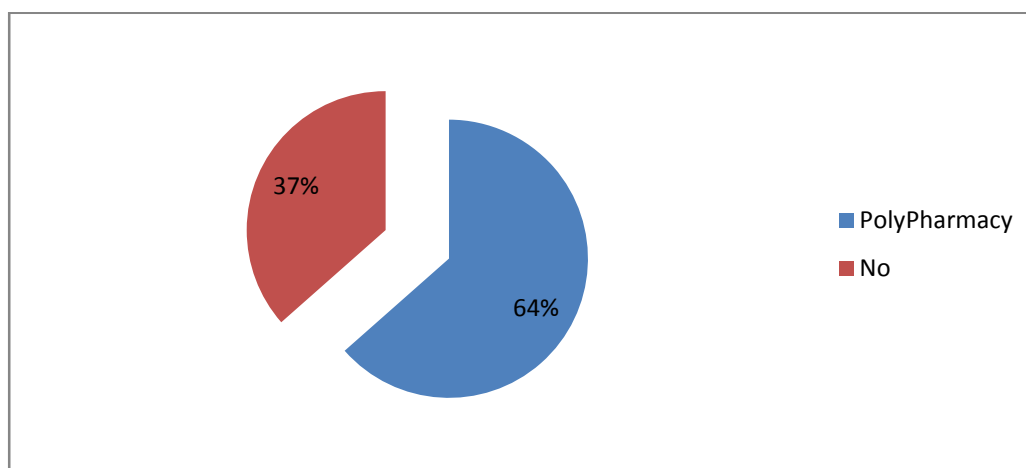
In our study, 73 patients had been taking multiple medications [36.5%]

TABLE 10 : POLYPHARMACY AND FALLS

			POLYPHARMACY		Total	chi square	p value
			NO	YES			
FALLS TOTAL	NO	Count	90	41	131	4.434*	0.035
		% within POLYPHARMACY	70.9%	56.2%	65.5%		
	YES	Count	37	32	69		
		% within POLYPHARMACY	29.1%	43.8%	34.5%		
Total		Count	127	73	200		
		% within POLYPHARMACY	100.0%	100.0%	100.0%		

Falls occurred in 32 patients who had been taking multiple medications. [46.3%]. The association between polypharmacy and falls was statistically significant as evidenced by p value 0.03.

FIGURE 23 : POLYPHARMACY AND FALLS



PSYCHOTROPIC DRUGS AND FALLS

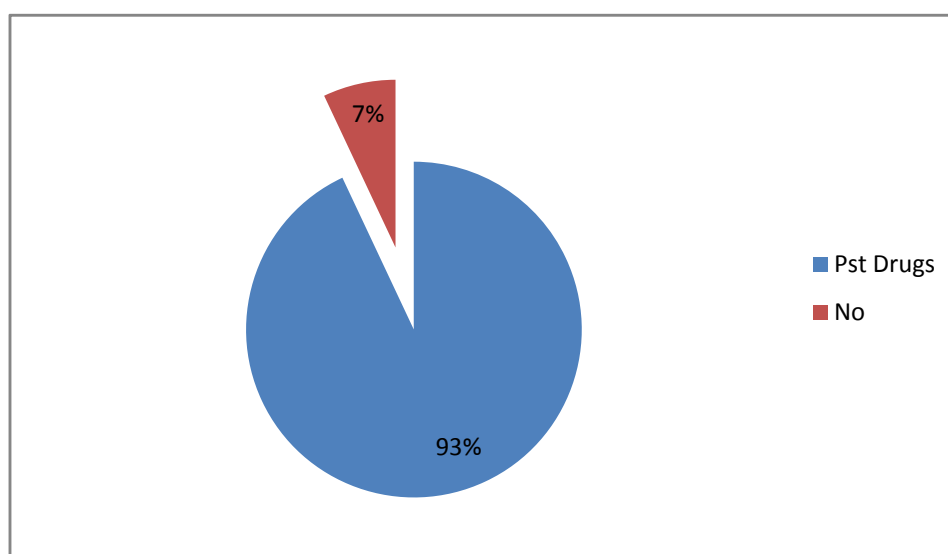
In our study population, 14 patients had been taking psychotropic medications [7%].

TABLE 11 : PSYCHOTROPIC DRUGS AND FALLS

			Psy drugs		Total	chi square	p value
			No	Yes			
FALLS TOTAL	NO	Count	126	5	131	5.91*	0.015
		% within pstdrugs	67.7%	35.7%	65.5%		
	YES	Count	60	9	69		
		% within pstdrugs	32.3%	64.3%	34.5%		
Total		Count	186	14	200		
		% within pstdrugs	93.0%	7.0%	100.0%		

Falls occurred in 9 patients who were on psychotropic medications [64.3%] which was higher when compared with falls among patients not on psychotropic medications [32.3%]. There was statistically significant association between falls and psychotropic medications [p value 0.01].

FIGURE 24 : PSYCHOTROPIC DRUGS AND FALLS



ANTIHYPERTENSIVES AND FALLS

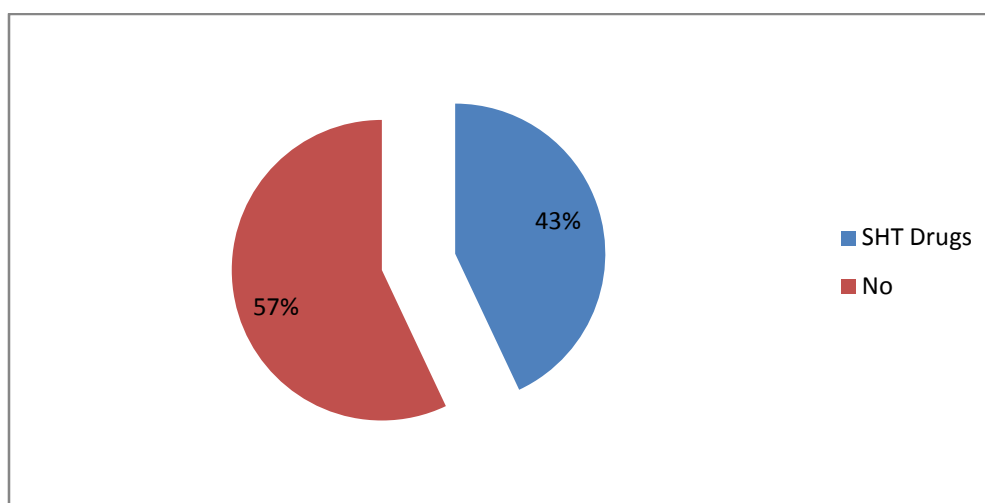
In our study population, 114 patients were on antihypertensives [57%].

TABLE 12 : ANTIHYPERTENSIVES AND FALLS

			drugst		Total	chi square	p value
			no	yes			
FALLS TOTAL		Count	63	68	131	4.016*	0.045
		% within drugst	73.3%	59.6%	65.5%		
	YES	Count	23	46			
		% within drugst	26.7%	40.4%			
Total		Count	86	114	200		
		% within drugst	43.0%	57.0%	100.0%		

Falls occurred in 46 patients on antihypertensives [40.4%] and in 23 patients not on antihypertensives [26.7%]. There was statistically significant association between patients on antihypertensives and falls [p value 0.04].

FIGURE 25 : ANTIHYPERTENSIVES AND FALLS



CAD DRUGS AND FALLS

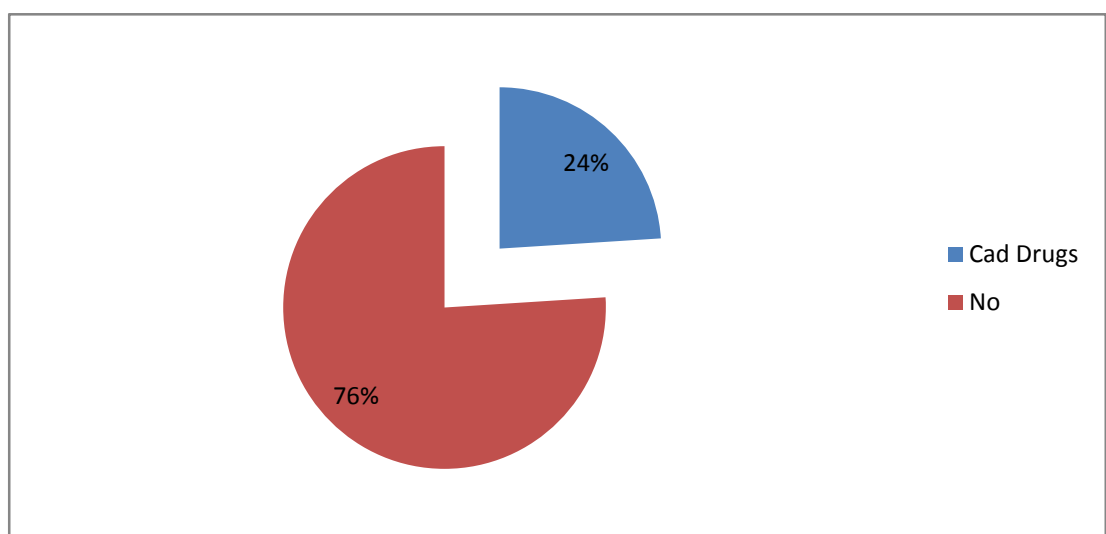
In our study, 48 patients were coronary artery disease medications [24%].

TABLE 13 : CAD DRUGS AND FALLS

			drugcad		Total	chi square	p value
			No	Yes			
FALLS TOTAL	NO	Count	103	28	131	1.435	0.231
		% within drugcad	67.8%	58.3%	65.5%		
	YES	Count	49	20	69		
		% within drugcad	32.2%	41.7%	34.5%		
Total		Count	152	48	200		
		% within drugcad	76.0%	24.0%	100.0%		

Falls occurred in 20 patients on CAD drugs [41.7%] and in 49 patients not on CAD drugs [32.2%].

FIGURE 26 : CAD DRUGS AND FALLS



In our study, there was statistically insignificant association between falls and patients on CAD drugs. [p value 0.2]

HAND GRIP AND FALLS

In our study, 161 patients had low hand grip [80.5%] and 39 patients had normal hand grip [19.5%].

TABLE 14 : HAND GRIP AND FALLS

			HAND GRIP		Total	CHI SQUARE	P VALUE
			GRIP	LOW			
FALLS TOTAL	NO	Count	25	106	131	3.724*	0.05
		%	19.08%	80.92%	65.5%		
	YES	Count	6	63	69		
		%	8.7%	91.3%	34.5%		
Total		Count	39	161	200		
		%	19.50%	80.50%	100.0%		

Falls occurred in 63 patients with decreased hand grip [91.3%] and in 6 patients with normal hand grip [8.7%]. There was statistically significant association between decreased hand grip and falls [p value 0.05]

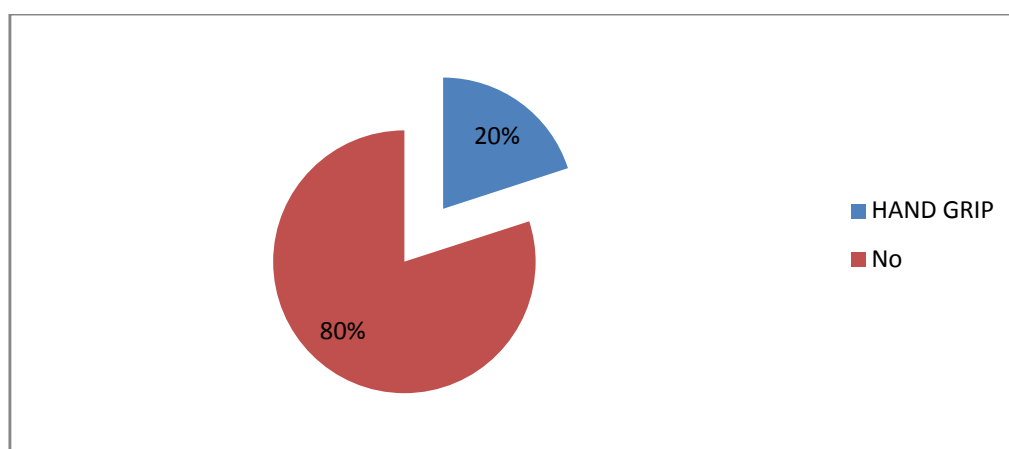


FIGURE 27 : HAND GRIP AND FALLS

BMI AND FALLS

TABLE 15 : BMI AND FALLS

In our study, 22% were obese and 6% had decreased BMI.

			BMI SCORE			Total	chisquare	p value
			low weight	normal	obese			
FALLS TOTAL	NO	Count %	9 6.87%	87 66.41%	35 26.72%	131 65.50%	5.268	0.071
	YES	Count %	4 5.80%	56 81.16%	9 13.04%	69 34.50%		
Total		Count % within bmi score	13 6%	143 72%	44 22%	200 100%		

Falls occurred in 9 patients with increased BMI [13.04%]; 56 patients with normal BMI [81.16%] and in 4 patients with decreased BMI [5.8%]. In our study, there was statistically insignificant association between decreased BMI and falls [p value 0.07]

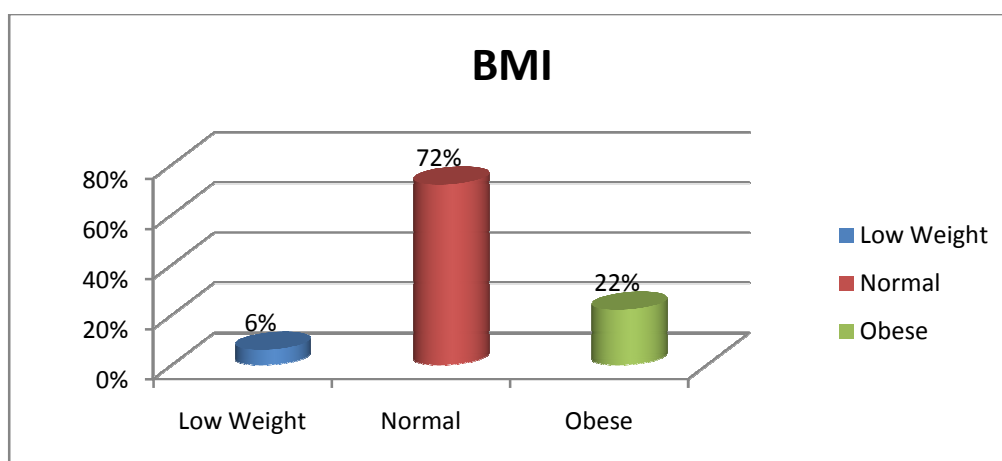


FIGURE 28 : BMI AND FALLS

POSTURAL HYPOTENSION AND FALLS

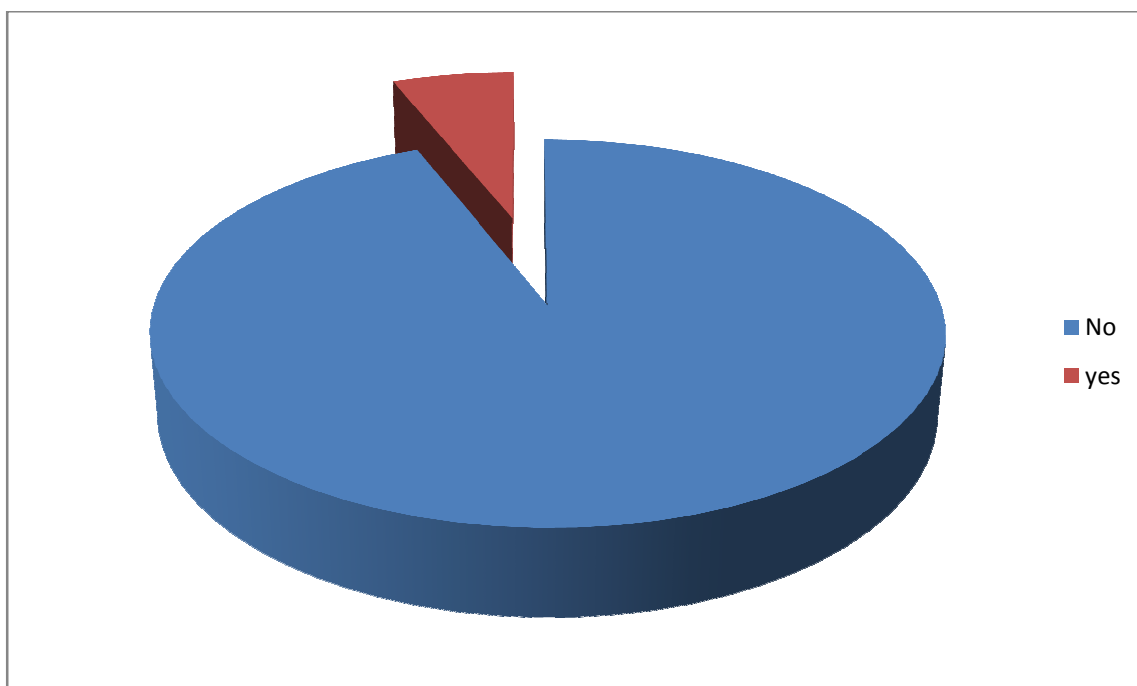
In our study, 13 patients had postural hypotension [7%] ; 187 patients had no postural hypotension [93%].

			PHT		Total	chisquare	p value
			NO	YES			
FALLS TOTAL	NO	Count %	129 68.98%	2 15.38%	131 65.50%	15.453*	p<0.0001
	YES	Count %	58 31.02%	11 84.62%	69 34.50%		
Total		Count % within PHT	187 94%	13 7%	200 100.00%		

TABLE 16 : POSTURAL HYPOTENSION AND FALLS

Falls occurred in 11 patients with postural hypotension [84.62%] and in 58 patients without postural hypotension [31.02%]. There was a significant association between falls and postural hypotension [p value < 0.0001]

FIGURE 29 : POSTURAL HYPOTENSION AND FALLS



HEARING IMPAIRMENT AND FALLS

In our study, 51 patients had hearing impairment [25.5%] and 149 patients had no impairment in hearing [74.5%]

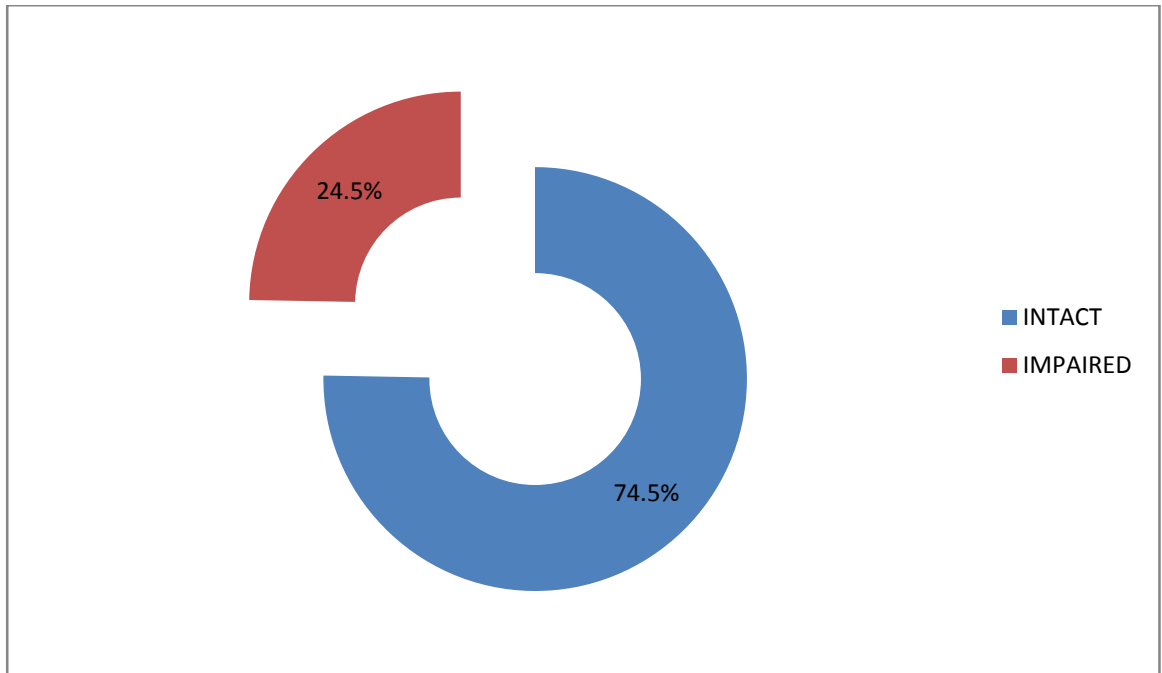
TABLE 17 : HEARING IMPAIRMENT AND FALLS

			HEARING		Total	chisquare	p value
			INTACT	IMPAIRED			
FALLS TOTAL	NO	Count	100	31	131	0.674	0.412
		%	76.3%	23.7%	65.5%		
	YES	Count	49	20	69		
		%	71.0%	29.0%	34.5%		
Total		Count	149	51	200		
		%	74.5%	25.5%	100.0%		

Falls occurred in 20 patients with impaired hearing [29%], and in 49 patients without hearing impairment [71%]. In our study, there was

statistically insignificant association between hearing impairment and falls [p value 0.4]

FIGURE 30 : HEARING IMPAIRMENT AND FALLS



GAIT SPEED AND FALLS

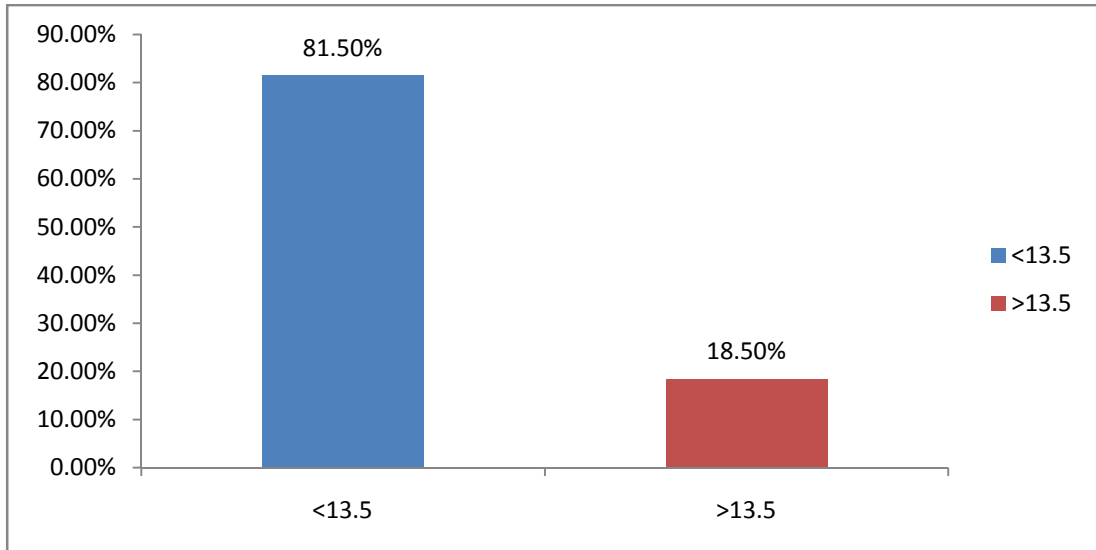
In our study, gait speed was decreased in 37 patients [18.5%] – done by timed up and go test . Gait speed was normal in 163 patients [81.5%]

TABLE 18 : GAIT SPEED AND FALLS

				TUG		Total	Chi square	P value
				<13.5	>13.5			
FALLS TOTAL	NO	Count	FALLS	122	9	131	34.062*	P<0.0001
		% within TOTAL		93.1%	6.9%	65.5%		
	YES	Count	FALLS	41	28	69		
		% within TOTAL		59.4%	40.6%	34.5%		
Total		Count	FALLS	163	37	200		
		% within TOTAL		81.5%	18.5%	100.0%		

Falls occurred in 28 patients with decreased gait speed [40.6%] and in 41 patients with normal gait speed [59.4%]. There was statistically significant association between slow gait speed and falls [p value < 0.0001].

FIGURE 31 : GAIT SPEED AND FALLS



DECREASED MUSCLE STRENGTH AND FALLS

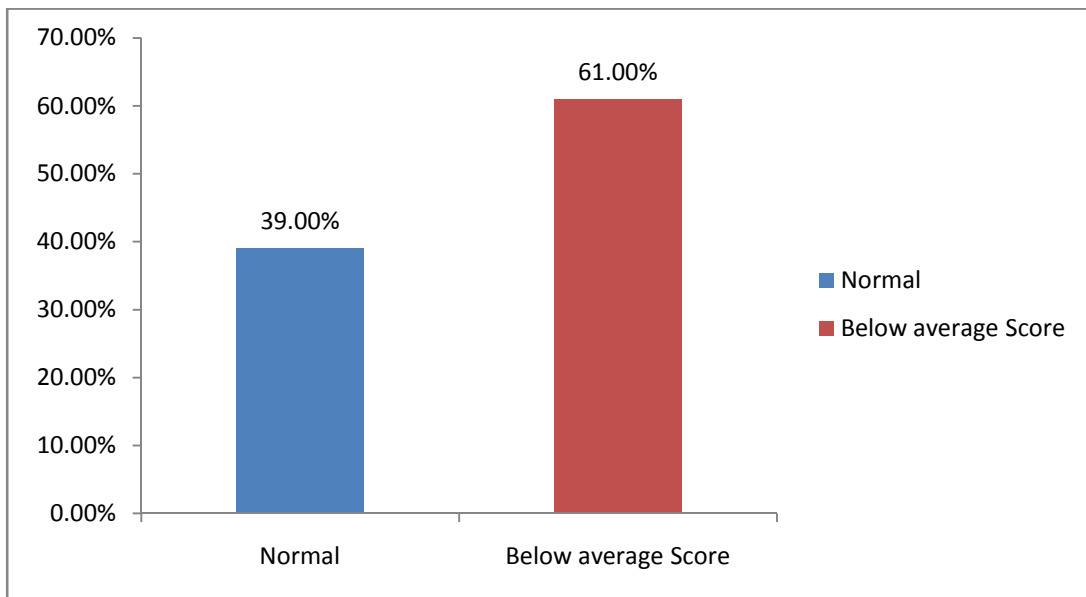
In our study, lower limb muscle strength was decreased in 122 patients [61%] and normal in 78 patients [39%].

TABLE 19 : DECREASED MUSCLE STRENGTH AND FALLS

		CST		Total	chisquare	p value
		NORMAL	BELOW AVERAGE SCORE			
FALLS TOTAL	NO	Count 65	66	131	17.996*	p<0.0001
		% 49.62%	50.38%	65.50%		
	YES	Count 13	56	69		
		% 18.84%	81.16%	34.50%		
Total		Count 78	122	200		
		% 39.00%	61.00%	100.00%		

Falls occurred in 56 patients with decreased lower limb muscle strength [81.16%] and in 13 patients with normal strength [18.84%]. The association between falls and decreased lower limb muscle strength was statistically significant. [p value < 0.0001]

FIGURE 32 :DECREASED MUSCLE STRENGTH AND FALLS



IMPAIRED BALANCE AND FALLS

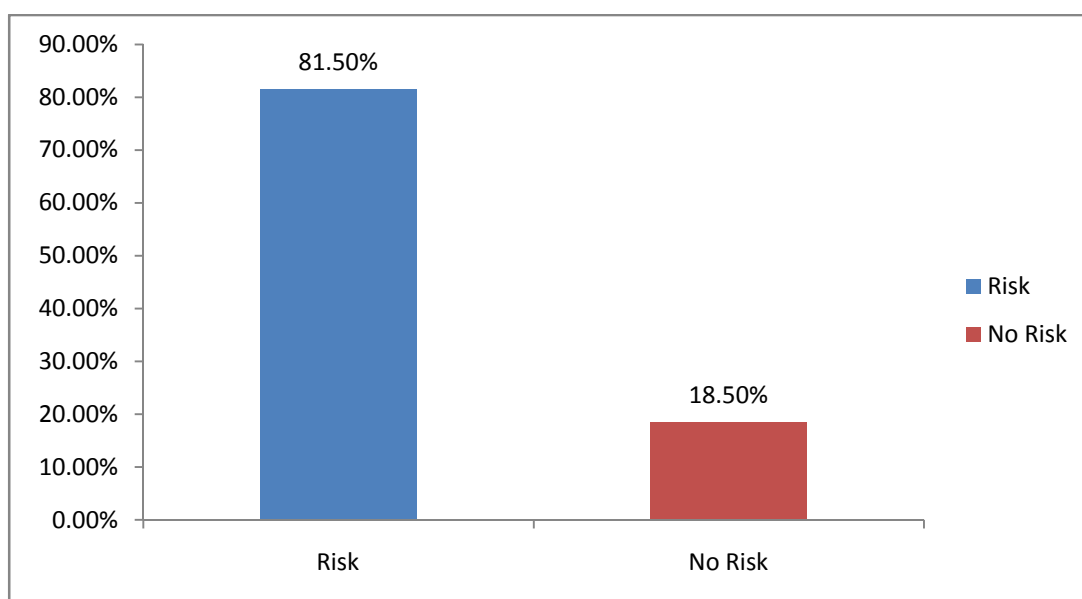
Balance was assessed by 4 stage balance test. In our study, all patients were able to perform side to side balance test and none of the patients were able to perform single leg stance. Semitandem stance and tandem stance were analysed here. In our study, 163 patients were able to perform semi tandem test [81.5%] and 37 patients were not able to perform this test [18.5%].

TABLE 20 : SEMITANDEM STANCE AND FALLS

			ST SCORE		Total	Chi square	p value
			NO RISK 10 secs	RISK <10 Secs			
FALLS TOTAL	NO	Count %	122 93.13%	9 6.87%	131 65.50%	34.062*	p<0.0001
	YES	Count %	41 59.42%	28 40.58%	69 34.50%		
Total		Count %	163 81.50%	37 18.50%	200 100.00%		

Falls occurred in 28 patients who were not able to perform ST test [40.5%] and in 41 patients who were able to perform this test [59.42%] . There was statistically significant association between falls and impaired balance [p value < 0.0001]

FIGURE 33 : SEMITANDEM STANCE AND FALLS



TANDEM STANCE

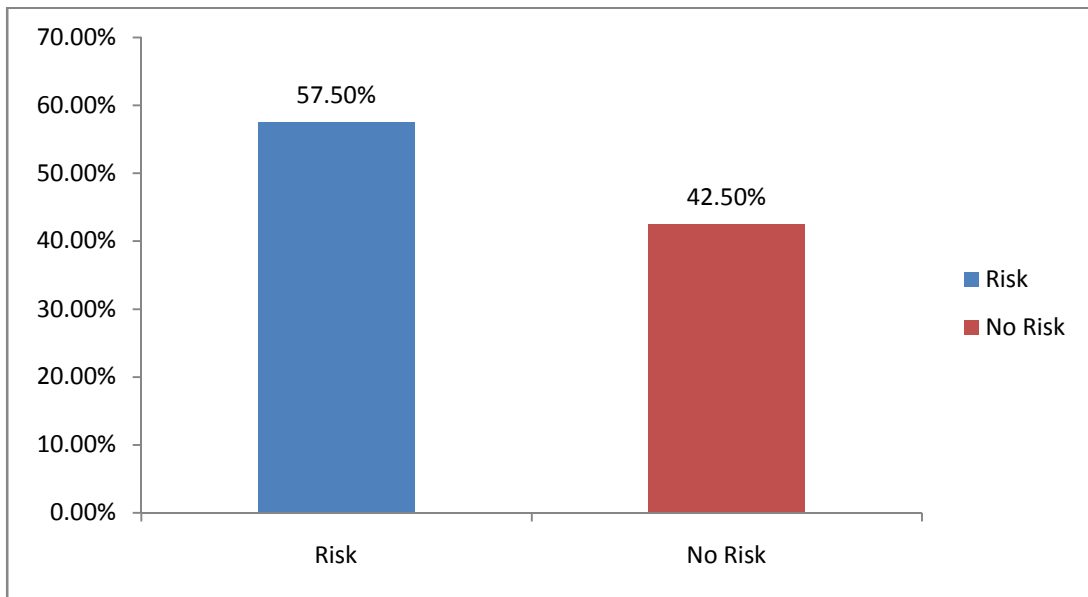
In our study, 115 patients were not able to perform tandem stance [57.5%] and 85 patients were able to perform [42.50%]

TABLE 21 : TANDEM STANCE AND FALLS

		T SCORE		Total	Chi square	p value
		NO RISK 10 secs	RISK <10 Secs			
FALLS TOTAL	NO	Count	69	62	131	16.06*
		%	52.67%	47.33%	65.50%	
	YES	Count	16	53	69	
		%	23.19%	76.81%	34.50%	
Total		Count	85	115	200	
		%	42.50%	57.50%	100.00%	

Falls occurred in 53 patients who were not able to perform tandem test [76.81%]. There was statistically significant association between falls and impaired balance [p value < 0.0001]

FIGURE 34 :TANDEM STANCE AND FALLS



MULTIPLE RISK FACTORS AND FALLS

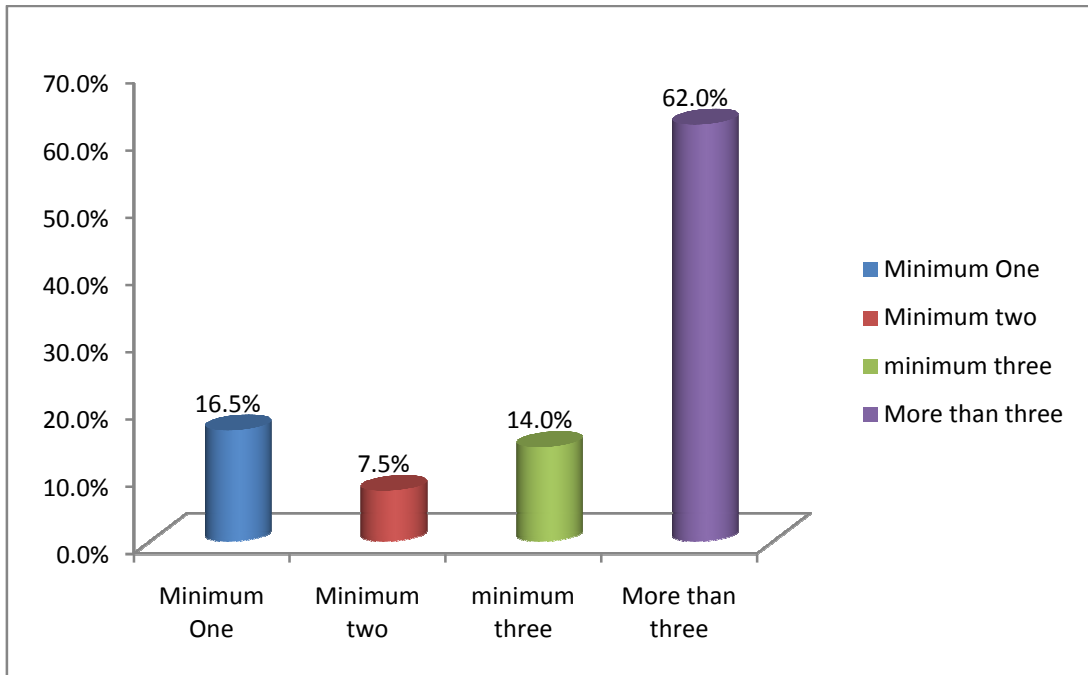
In our study, 33 patients had single risk factor , 15 patients had 2 risk factors , 28 patients had 3 risk factors and 124 patients had more than 3 risk factors.

TABLE 22 : MULTIPLE RISK FACTORS AND FALLS

			Number of risk factor				Total	chi square	p value
			one	two	three	More than three			
FALLS TOTAL	NO	Count	28	11	23	69	131	14.636*	0.002
		% within number of risk factor	84.8 %	73.3 %	82.1 %	55.6%	65.5%		
	YES	Count	5	4	5	55	69		
		% within number of risk factor	15.2 %	26.7 %	17.9 %	44.4%	34.5%		
Total		Count	33	15	28	124	200		
		% within number of risk factor	100.0%	100.0%	100.0 %	100.0%	100.0%		

Falls occurred in 5 patients with single risk factor [15.2%]; 4 patients with 2 risk factors[26.7%]; 5 patients with 3 risk factors [17.9%] and 55 patients with more than 3 risk factors [44.4%]. There was statistically significant association between falls and multiple risk factors [p value 0.002]

FIGURE 35 : MULTIPLE RISK FACTORS AND FALLS



DISCUSSION

Falls are a common phenomenon in the elderly and are associated with considerable morbidity and mortality. They often lead to reduced functioning and to nursing home admissions. The risk of falling increases dramatically with the number of risk factors, such as musculoskeletal problems, neurological diseases, psychosocial characteristics, functional dependency and drug use. These findings have been well established in various studies. The prevalence of falls had a large variation among the countries studied.

In our study, 200 patients aged ≥ 65 years attending geriatric outpatient department were selected and examined. The results were analysed and tabulated. The results were compared with other related studies. Our study showed that the prevalence of falls was 34.5% , as supported by studies conducted by Blake et al, in which the prevalence of falls was 35% and study conducted by W.C.Graafmans et al, M.E.Ooms et al , in which the prevalence of falls was 36%.

In our study, percentage of falls among 65-75 years was 69.57% and the percentage of falls among 75-85 years was 30.43%. This may be due to the fact that the proportion of elderly population among 65-75 years in our study was 82% which is higher when compared with other age groups[75-85years was 18% ; >85 years 1%]

In a study conducted by J H Downton et al, K Andrews et al , women were more likely to have falls when compared with males. In our study , 57.97% women had falls when compared with men in which 42.03% had falls. This shows that in our study, prevalence of falls in women is higher than in males.

A study conducted by Jack C.I.A et al, Neoh C Lyc M et al showed a significant correlation between visual impairment and falls. In our study 32.5% had visual impairment and falls occurred in 43.5% of visually impaired elderly. The association between visual impairment and falls was statistically significant which was supported by a p value 0.003.

According to a study done by Daina L Sturneits et al, Anne Tiedemann et al older adults with lower limb arthritis were at increased risk for fall. In our study, 50% of elderly patients suffered from lower limb arthritis and falls had occurred in 62.3% of patients with arthritis. Our study showed a statistically significant association between lower limb arthritis and falls as evidenced by p value of 0.01.

A study by Joy S.H Teo et al, N Kathryn et al concluded that urge incontinence as an independent risk factor for falls. In our study 6% had functional incontinence, 10% had mixed incontinence and 1.5% had

stress incontinence. Our study had a statistically significant association between urinary incontinence and falls as evidenced by p value < 0.0001 .

A study by Reyes-Ortiz et al; Soham Al Snih et al ; Kyriakos S. Markides et al concluded that female gender, increased age [age >80], high depressive symptoms were independent risk factors for falls.

In our study, 13.5% had mild depression ,out of which 24.6% had sustained falls. There was significant association between depression and falls [p value 0.001].

In our study, 8% of the population were aged above 80 years . Falls occurred in 14.5% among population aged above 80 years. There was statistically significant association between increasing age and falls as evidenced by p value 0.01 .

As per Rotterdam Study, and many other studies, there was a significant association between polypharmacy and falls. In our study, 43.8% of patients with polypharmacy had sustained a fall. There was statistically significant association between polypharmacy and falls as evidenced by p value 0.03 .

In our study, the association between psychotropic drug use and falls was statistically significant as evidenced by p value 0.01

A study conducted by Francesco Landi et al, Rosa Liperoti et al [ILSIRENTE STUDY], showed that sarcopenic elderly were more likely to have falls compared with healthy elderly. In our study , there was statistically significant association between decreased muscle strength and falls .In our study ,there was significant association between decreased hand grip and falls as evidenced by p value 0.05. Also there was association between falls and decreased lower limb muscle strength[30 second chair stand test] with p value <0.0001.

According to a study conducted by C Fjeldsted et al, LS Aerce et al, obese elderly had a prevalence of falls of about 27%. In our study, 13.04% of obese elderly had falls.

According to a study by Woe L Ooi et al, Monis Hossain et al , orthostatic hypotension was an independent risk factor for falls. In our study, there was statistically significant association between orthostatic hypotension and falls as evidenced by p value <0.0001.

In a study conducted by C.-K Liang et al, M.-Y. Chou et al, there was association between slow gait speed and falls. In our study, 18.5% had slower gait speed ,out of which 40.6% had sustained falls. There was

significant association between slow gait speed and falls in our study as evidenced by p value <0.0001.

A study conducted by UNC Division of Physical Therapy, showed that balance and strength impairments were independent risk factors for falls. In our study, impaired balance [4 stage balance test] had a significant association with falls –p value < 0.0001.

A study conducted by Mary E. Tinetti, M.D et al., Mark Speechley, Ph.D et al showed that risk of falling increased linearly with the number of risk factors. In our study, 44.4% patients with more than three risk factors sustained fall. There was statistically significant association between falls and multiple risk factors as evidenced by p value 0.002.

LIMITATIONS

- Study period was 3 months
- Study population included only 200 patients
- Since this study was conducted in outpatient department in a tertiary care hospital, only active elderly participated in the study
- Large scale home based longitudinal study should be done.

CONCLUSIONS

CONCLUSION

- Prevalence of falls in elderly ≥ 65 years attending outpatient department in tertiary care hospital is 34.5%
- Prevalence of falls in females are high in comparing with males
- Visual impairment, lower limb arthritis, incontinence, depression, age >80 , polypharmacy are important risk factors for fall.
- Impaired balance, decreased gait speed , decreased lower limb muscle strength are important predictors of falls in elderly.
- Increase in number of risk factors increases fall risk in elderly.



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ANNEXURES

ABBREVIATIONS

ADL	Activities of daily living
IADL	Instrumental activities of daily living
ACE	Angiotensin converting enzyme
SSRI	Selective serotonin reuptake inhibitor
SMA	Supplementary motor area
PMA	Premotor area
PPN	Pedunculopontine nucleus
NPH	Normal pressure hydrocephalus
BMI	Body mass index
PD	Parkinson's disease
BUN	Blood urea nitrogen
POMA	Performance-oriented Mobility Assessment
RCT	Randomised control trial
TUG	Timed up and go test
SHT	Systemic hypertension
CAD	Coronary artery disease

ST Semitandem

CST Chair stand test

DM Diabetes mellitus

PROFORMA

PREVALENCE OF FALLS AND ASSOCIATED FACTORS IN ELDERLY
POPULATION

NAME:

AGE:

SEX:

ADDRESS:

OP NO:

EDUCATION:

SOCIOECONOMIC STATUS:

COMORBIDITIES:

FACTORS:

H/O FALLS

H/O FRACTURES

VISION

ARTHRITIS

DEPRESSION

COGNITION

INCONTINENCE

AGE>80

POLYPHARMACY

BMI

HAND GRIP

POSTURAL HYPOTENSION

HEARING

ADL

TESTS

TIMED UP AND GO TEST : sec

4 STAGE BALANCE TEST :

FEET TOGETHER STAND: sec

SEMI TANDEM STAND: sec

TANDEM STAND : sec

ONE LEG STAND : sec

30 SECOND CHAIR STAND TEST:

NUMBER:

SCORE:

PROCEDURE:

- **TIMED UP AND GO TEST**: Time in seconds to rise from a chair, walk 3 m, turn, walk back and sit down. <10 sec is normal. Fall risk increases with time >13.5 sec
- **4 STAGE BALANCE TEST**:
 1. Stand with feet side by side. Time: _____ seconds
 2. Place the instep of one foot so it is touching the big toe of the other foot.
Time: _____ seconds
 3. Place one foot in front of the other, heel touching toe. Time: _____ seconds
 4. Stand on one foot. Time: _____ seconds
- An older adult who cannot hold the tandem stance for at least 10 seconds is at increased risk for falling
- **30 SECOND CHAIR STAND TEST**: Scores less than 8 (unassisted) stands were associated with lower levels of functional ability

BARTHEL INDEX OF ACTIVITIES OF DAILY LIVING

The Barthel Index

Bowels

0 = incontinent (or needs to be given enemata)

1 = occasional accident (once/week)

2 = continent

Patient's Score:

Bladder

0 = incontinent, or catheterized and unable to manage

1 = occasional accident (max. once per 24 hours)

2 = continent (for over 7 days)

Patient's Score:

Grooming

0 = needs help with personal care

1 = independent face/hair/teeth/shaving (implements

provided)

Transfer

0 = unable – no sitting balance

1 = major help (one or two people, physical), can sit

2 = minor help (verbal or physical)

3 = independent

Patient's Score:

Mobility

0 = immobile

1 = wheelchair independent, including corners, etc.

2 = walks with help of one person (verbal or physical)

3 = independent (but may use any aid, e.g., stick)

Patient's Score:

Dressing

0 = dependent

1 = needs help, but can do about half unaided

2 = independent (including buttons, zips,

Patient's Score:

Toilet use

0 = dependent

1 = needs some help, but can do something alone

2 = independent (on and off, dressing, wiping)

Patient's Score:

Feeding

0 = unable

1 = needs help cutting, spreading butter, etc.

2 = independent (food provided within reach)

Patient's Score:

laces, etc.)

Patient's Score:

Stairs

0 = unable

1 = needs help (verbal, physical, carrying aid)

2 = independent up and down

Patient's Score:

Bathing

0 = dependent

1 = independent (or in shower)

Patient's Score:

Scoring:

Sum the patient's scores for each item. Total possible scores range from 0 – 20, with lower scores indicating increased disability.

INSTITUTIONAL ETHICS COMMITTEE
MADRAS MEDICAL COLLEGE, CHENNAI-3

EC Reg No.ECR/270/Inst./TN/2013
Telephone No : 044 25305301
Fax : 044 25363970

CERTIFICATE OF APPROVAL

To
Dr. Geetha .J,
Post Graduate,
Department of Geriatric Medicine,
Madras Medical College, Chennai – 600003.

Dear Dr. Geetha .J,

The Institutional Ethics Committee of Madras Medical College, reviewed and discussed your application for approval of the proposal entitled **“PREVALENCE OF FALLS AND ASSOCIATED FACTORS IN ELDERLY POPULATION”** No.40062014

The following members of Ethics Committee were present in the meeting held on 03.06.2014 conducted at Madras Medical College, Chennai-3.

- | | |
|---|------------------------|
| 1. Dr. C. Rajendran, M.D. | -- Chairperson |
| 2. Dr. R. Vimala, M.D., Dean, MMC, Ch-3. | -- Deputy Chair Person |
| 3. Prof. Kalaiselvi, MD., Vice-Principal, MMC, Ch-3 | -- Member |
| 4. Prof. Nandhini, M.D. Inst. of Pharmacology, MMC, Ch-3. | -- Member |
| 5. Dr. G. Muralidharan, Director Incharge , Inst. of Surgery | -- Member |
| 6. Prof. Md Ali, MD., DM., Prof & HOD of MGE, MMC, Ch-3. | -- Member |
| 7. Prof. Ramadevi, Director i/c, Biochemistry, MMC,Ch-3. | -- Member |
| 8. Prof. Saraswathy, MD., Director, Pathology, MMC, Ch-3. | -- Member |
| 9. Prof. Tito, Director, i/c. Inst. of Internal Medicine, MMC | -- Member |
| 10. Thiru. Rameshkumar, Administrative Officer | -- Lay Person |
| 11. Thiru. S. Govindasamy, BABL, High Court, Chennai-1. | -- Lawyer |
| 12. Tmt. Arnold Saulina, MA MSW | -- Social Scientist |

We approve the proposal to be conducted in its presented form.

Sd/Chairman & Other Members

The Institutional Ethics Committee expects to be informed about the progress of the study, and SAE occurring in the course of the study, any changes in the protocol and patients information / informed consent and asks to be provided a copy of the final report.


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INSTITUTIONAL ETHICS COMMITTEE
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Originality GradeMark PeerMark

PREVALENCE OF FALLS AND
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INTRODUCTION

In elderly, falls and impaired balance constitute major clinical problems. Falls and its consequences are a cause of considerable rates of morbidity and mortality in elderly. In older adults, unintentional injuries constitute fifth leading cause of death. Falls constitute about 67% of these deaths in elderly.

Falls are more common in elderly. They have compound interacting causes leading to serious effects and require multiple disciplines for efficient management. Hence falls are considered as major focus in elderly. Unstable gait and falls are important concerns in older adults because they lead to injury, restricted activities of daily living, increase in health care utilisation and death due to its consequences.

Fall is considered as an important indicator of frailty as supported by its

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3	Studenski, Stephanie A... Publication	2%
4	"Summary of the Updat... Publication	2%
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14. DECLARATION OF ORIGINALITY
15. DECLARATION OF ORIGINALITY

ஆராய்ச்சி தகவல் தாள்

ஆராய்ச்சி தலைப்பு

முதியோர்களில் விழுதலுக்கான நோய்த்தாக்கம் மற்றும் அதன் காரணிகளும் பற்றிய ஆராய்ச்சி

ஆராய்ச்சியாளர் பெயர் : மரு.கீதா.ஜெ
ஆராய்ச்சி செய்யுமிடம் : முதியோர் பிரிவு, ராஜீவ் காந்தி அரசு பொது மருத்துவமனை, சென்னை
பங்கேற்பாளர் பெயர் : வயது : பாலினம்: ஆண் / பெண்

ஆராய்ச்சியின் நோக்கம்

முதியோர்களில் விழுதலுக்கான நோய்த்தாக்கம் மற்றும் அதன் காரணிகளும் பற்றி ஆராய்வதே இந்த ஆராய்ச்சியின் நோக்கமாகும்.

ஆராய்ச்சி முறை

முதியோர்களின் கண்பார்வை, கேட்கும் திறன், உட்கொள்ளும் மருந்துகளின் எண்ணிக்கை, இரத்த அழுத்தம் பற்றிய தகவல்கள் கண்டறியப்படும். மேலும் அவர்களின் சமநிலை மற்றும் தசை வலிமை பற்றி அறிந்துகொள்ள அவர்களின் நடைவேகம், நாற்காலியிலிருந்து எழுவது போன்ற பரிசோதனைகள் செய்யப்படும்.

ஆராய்ச்சியின் பலன் மற்றும் தீங்கு

இந்த ஆராய்ச்சியின் மூலம் பங்கேற்பவருக்கு தீங்கு ஏதும் கிடையாது. நீங்களும் இந்த ஆராய்ச்சியில் பங்கேற்க நாங்கள் விரும்புகிறோம்.

முடிவுகளை அல்லது கருத்துகளை வெளியிடும்போதோ அல்லது ஆராய்ச்சியின் போதோ தங்களது பெயரையோ அல்லது அடையாளங்களையோ வெளியிட மாட்டோம் என்பதையும் தெரிவித்துக் கொள்கிறோம்.

இந்த சிறப்பு சிகிச்சையின் முடிவுகளை ஆராய்ச்சியின்போது அல்லது ஆராய்ச்சியின் முடிவின் போது தங்களுக்கு அறிவிக்கப்படும் என்பதையும் தெரிவித்துக் கொள்கிறோம்.

இதனால் தங்களது ஆய்வறிக்கையோ, அன்றாட செயல்பாடுகளோ பாதிக்கப்படாது என்று தெரிவித்துக்கொள்கிறோம்.

இந்த ஆராய்ச்சியில் பங்கேற்பது தங்களுடைய விருப்பத்தின் பேரில் தான் இருக்கிறது. மேலும் நீங்கள் எந்நேரமும் இந்த ஆராய்ச்சியிலிருந்து பின்வாங்கலாம் என்பதையும் தெரிவித்துக் கொள்கிறோம்.

ஆராய்ச்சியாளர் கையொப்பம்

பங்கேற்பாளர் கையொப்பம்

நாள் :

இடம் :

ஆராய்ச்சி ஒப்புதல் கடிதம்

ஆராய்ச்சி தலைப்பு
முதியோர்களில் விழுதலுக்கான நோய்த்தாக்கம் மற்றும் அதன்
காரணிகளும் பற்றிய ஆராய்ச்சி

ஆராய்ச்சியாளர் பெயர் : மரு.கீதா.ஜெ
ஆராய்ச்சி செய்யுமிடம் : முதியோர் பிரிவு, ராஜீவ் காந்தி அரசு பொது
மருத்துவமனை, சென்னை
பங்கேற்பாளர் பெயர் :
வயது :
பாலினம் : ஆண் / பெண்
அடையாள எண் :

இந்த ஆராய்ச்சியின் விவரங்களும் அதன் நோக்கங்களும் முழுமையாக
எனக்கு தெளிவாக விளக்கப்பட்டது.

எனக்கு விளக்கப்பட்ட விஷயங்களை நான் புரிந்துகொண்டு எனது
சம்மதத்தை தெரிவிக்கிறேன்.

எனக்கு முதியோர்களில் விழுதலுக்கான நோய்த்தாக்கம் மற்றும் அதன்
காரணிகளும் பற்றிய ஆராய்ச்சி செய்ய முழு சம்மதம்.

இந்த ஆராய்ச்சியில் பிறரின் நிர்பந்தமின்றி என் சொந்த விருப்பத்தின்பேரில்
பங்கு பெறுகின்றேன். இந்த ஆராய்ச்சியில் இருந்து நான் எந்நேரமும்
பின்வாங்கலாம் என்பதையும் அதனால் எந்த பாதிப்பும் ஏற்படாது என்பதையும்
நான் புரிந்துகொண்டேன்.

நான் இந்த ஆராய்ச்சியின் விவரங்களைக் கொண்ட ஆராய்ச்சித் தகவல் தாளைப்
பெற்றுக் கொண்டேன்.

முதியோர்களின் கண்பார்வை, கேட்கும் திறன், உட்கொள்ளும் மருந்துகளின்
எண்ணிக்கை, இரத்த அழுத்தம் பற்றிய தகவல்கள் கண்டறியப்படும். மேலும்
அவர்களின் சமநிலை மற்றும் தசை வலிமை பற்றி அறிந்துகொள்ள அவர்களின்
நடைவேகம், நாற்காலியிலிருந்து எழுவது போன்ற பரிசோதனைகள்
செய்யப்படுவதே இந்த ஆராய்ச்சியின் நோக்கமாகும்.

இதன் மூலம் எந்த பின்விளைவும் ஏற்படாது என்று மருத்துவர் மூலம் தெரிந்து
கொண்டு, நான் என்னுடைய சுய நினைவுடனும் மற்றும் முழு சுதந்திரத்துடனும் இந்த
மருத்துவ ஆராய்ச்சியில் என்னை சேர்த்துக்கொள்ள சம்மதம் தெரிவிக்கிறேன்.

ஆராய்ச்சியாளர் கையொப்பம்
நாள் :
இடம் :

பங்கேற்பாளர் கையொப்பம்

PATIENT CONSENT FORM

Study Detail : **“Prevalence of Falls and associated factors in elderly population”**
Study Centre : Rajiv Gandhi Government General Hospital, Chennai.
Patient's Name :
Patient's Age :
Identification Number :

Patient may check (√) these boxes

- a) I confirm that I have understood the purpose of procedure for the above study. I have the opportunity to ask question and all my questions and doubts have been answered to my complete satisfaction.
- b) I understand that my participation in the study is voluntary and that I am free to withdraw at any time without giving reason, without my legal rights being affected.
- c) I understand that sponsor of the clinical study, others working on the sponsor's behalf, the ethical committee and the regulatory authorities will not need my permission to look at my health records, both in respect of current study and any further research that may be conducted in relation to it, even if I withdraw from the study I agree to this access. However, I understand that my identity will not be revealed in any information released to third parties or published, unless as required under the law. I agree not to restrict the use of any data or results that arise from this study.
- d) I agree to take part in the above study and to comply with the instructions given during the study and faithfully cooperate with the study team and to immediately inform the study staff if I suffer from any deterioration in my health or well being or any unexpected or unusual symptoms.
- e) I hereby consent to participate in this study.
- f) I hereby give permission to undergo complete clinical examination and hematological tests.

Signature/thumb impression

Signature of Investigator

Patient's Name and Address:

Study Investigator's Name:
Dr. GEETHA J

S.NO	OP NO	AGE	SEX	FALLS	FRACTURES	VISION	ARTHRITIS	DEPRESSION	COGNITION	INCONTINENCE	AGE>80	POLYPHARMACY	BMI	PHT	HEARING	ADL	GRIP	TUG	CST	2	ST	T	O	EDUCATION	SES	COMORBIDITIES	
1	235/11	72	M	NIL	NIL	NORMAL	YES	NIL	INTACT	NIL	NO	NO	25	NO	INTACT	I		15	10	12	10	10	10	2	5	LOW	SHT
2	592/10	72	M	NIL	NIL	DECREASED	YES	NIL	INTACT	NIL	NO	YES	23	NO	INTACT	I		17	10	14	10	10	8	2	3	LOW	SHT
3	395/12	68	M	NIL	NIL	DECREASED	YES	NIL	INTACT	NIL	NO	NO	21	NO	INTACT	I		20	13	10	10	10	2	2	8	LOW	SHT/COPD
4	4845/12	75	M	NIL	NIL	DECREASED	YES	YES	INTACT	NIL	NO	YES	26	NO	INTACT	I		16	8	10	10	10	0	0	5	LOW	SHT/COPD
5	305/13	65	M	NIL	NIL	DECREASED	YES	NIL	INTACT	NIL	NO	NO	24	YES	INTACT	I		20	12	8	10	10	2	0	NIL	LOW	SHT/DM
6	2023/11	74	M	NIL	NIL	NORMAL	NO	NIL	INTACT	NIL	NO	YES	21	NO	INTACT	I		18	12	10	10	10	7	0	3	LOW	SHT/DM
7	1282/11	70	F	YES-E	YES-LL	DECREASED	YES	YES	INTACT	MIXED	NO	NO	20	NO	INTACT	I		10	23	3	10	10	2	0	7	LOW	APD
8	284/14	70	M	YES-E	YES-LL	NORMAL	YES	NIL	INTACT	NIL	NO	NO	22	NO	INTACT	I		12	10	14	10	10	8	2	3	LOW	COPD/SHT
9	2486/13	78	M	YES-E	YES-LL	DECREASED	NO	NIL	INTACT	NIL	NO	YES-PSY	21	NO	INTACT	I		16	14	8	10	10	7	2	NIL	LOW	SHT/BA
10	1295/13	78	M	YES-E	NIL	NORMAL	NO	NIL	INTACT	NIL	NO	YES-PSY	20	NO	INTACT	I		15	11	8	10	10	10	0	NIL	LOW	DM
11	195/12	70	F	NIL	NIL	DECREASED	YES	NIL	INTACT	NIL	NO	YES	19	NO	INTACT	I		12	10	10	10	10	10	1	NIL	LOW	DM
12	395/14	65	F	NIL	NIL	NORMAL	NO	YES	INTACT	NIL	NO	NO	22	NO	INTACT	I		13	12	12	10	10	8	2	NIL	LOW	DM/SHT
13	984/11	75	F	NIL	NIL	DECREASED	YES	NIL	INTACT	NIL	NO	NO	21	NO	INTACT	I		11	15	10	10	10	5	0	NIL	LOW	DM
14	841/12	65	F	YES-E	NIL	DECREASED	YES	YES	INTACT	NIL	NO	NO	24	NO	INTACT	I		10	12	7	10	10	8	2	NIL	LOW	DM/SHT
15	745/11	70	F	YES-E	NIL	DECREASED	NO	YES	INTACT	NIL	NO	NO	20	NO	INTACT	I		15	15	8	10	10	5	0	NIL	LOW	DM
16	898/11	72	F	NIL	NIL	NORMAL	NO	YES	INTACT	NIL	NO	NO	21	NO	INTACT	I		13	10	11	10	10	10	2	NIL	LOW	SHT/DM
17	535/12	70	F	NIL	NIL	DECREASED	YES	YES	INTACT	NIL	NO	NO	21	NO	INTACT	I		15	15	8	10	10	7	0	NIL	LOW	CAD
18	900/12	72	F	NIL	NIL	NORMAL	NO	NIL	INTACT	NIL	NO	NO	22	NO	INTACT	I		14	8	12	10	10	10	2	NIL	LOW	SHT
19	695/11	70	F	NIL	NIL	DECREASED	YES	NIL	INTACT	NIL	NO	NO	21	NO	INTACT	I		14	11	10	10	10	8	2	NIL	LOW	SHT
20	500/12	70	F	YES-E	YES-LL	DECREASED	YES	YES	INTACT	NIL	NO	YES	19	YES	INTACT	I		16	20	5	10	8	5	0	NIL	LOW	DM/SHT/CAD
21	512/12	81	F	YES-E	YES-LL	DECREASED	YES	NIL	INTACT	MIXED	YES	YES	22	NO	IMPAIRED	I		8	20	5	10	7	5	0	NIL	LOW	CAD
22	1583/12	70	F	NIL	NIL	NORMAL	YES	NIL	INTACT	NIL	NO	YES	21	NO	IMPAIRED	I		10	22	4	10	8	5	0	NIL	LOW	CAD/SHT/DM
23	2152/11	71	F	YES-E	NIL	NORMAL	YES	YES	INTACT	NIL	NO	YES-PSY	20	NO	INTACT	I		12	14	6	10	7	4	0	NIL	LOW	SHT
24	291/12	74	F	NIL	NIL	NORMAL	NO	YES	INTACT	NIL	NO	YES	19	NO	INTACT	I		11	9	9	10	10	8	2	NIL	LOW	CAD/SHT/DM
25	515/11	70	F	NIL	NIL	NORMAL	NO	NIL	INTACT	NIL	NO	YES-PSY	20	NO	INTACT	I		13	8	10	10	10	10	2	NIL	LOW	SHT
26	2742/13	72	M	NIL	NIL	NORMAL	YES	NIL	INTACT	NIL	NO	NO	24	NO	INTACT	I		15	9	10	10	10	10	2	6	LOW	APD
27	3406/14	72	M	NIL	NIL	NORMAL	NO	NIL	INTACT	NIL	NO	NO	23	NO	INTACT	I		16	9	12	10	10	10	3	5	LOW	COPD
28	3527/14	65	M	NIL	NIL	DECREASED	NO	NIL	INTACT	NIL	NO	NO	22	NO	INTACT	I		18	8	13	10	10	10	2	7	LOW	DM
29	768/08	74	M	NIL	NIL	NORMAL	YES	NIL	INTACT	NIL	NO	YES	21	NO	INTACT	I		20	10	11	10	10	10	2	9	LOW	SHT
30	2558/08	65	M	NIL	NIL	NORMAL	YES	NIL	INTACT	NIL	NO	NO	20	NO	INTACT	I		23	9	12	10	10	10	0	8	LOW	DM
31	3415/14	65	M	NIL	NIL	NORMAL	NO	NIL	INTACT	NIL	NO	NO	21	NO	INTACT	I		20	8	10	10	10	10	2	8	LOW	SHT
32	35/09	65	M	YES-E	YES-UL	DECREASED	YES	NIL	INTACT	NIL	NO	YES	22	NO	INTACT	I		22	23	1	10	10	7	0	5	LOW	COPD/SHT/CKD
33	903/14	67	F	NIL	NIL	NORMAL	YES	NIL	INTACT	NIL	NO	NO	18	NO	IMPAIRED	I		20	20	8	10	10	8	0	3	LOW	SHT
34	3095/14	65	F	NIL	NIL	DECREASED	YES	NIL	INTACT	NIL	NO	NO	19	NO	IMPAIRED	I		15	11	9	10	10	7	0	2	LOW	SHT
35	3234/13	91	M	NIL	NIL	DECREASED	YES	NIL	INTACT	FUNCTIONAL	YES	NO	17	NO	IMPAIRED	I		16	24	1	10	7	0	0	5	LOW	CAD/SHT/DM
36	4830/12	70	M	YES-E	NIL	DECREASED	NO	NIL	INTACT	NIL	NO	NO	22	NO	INTACT	I		19	10	8	10	10	10	2	9	LOW	SHT/DM
37	1595/09	70	M	NIL	NIL	NORMAL	YES	NIL	INTACT	NIL	NO	NO	20	NO	IMPAIRED	I		21	18	6	10	10	10	2	4	LOW	SHT
38	1195/12	71	M	YES-I	NIL	NORMAL	NO	NIL	INTACT	NIL	NO	YES	25	YES	INTACT	I		20	12	11	10	10	5	0	2	LOW	SHT/DM
39	2914/14	78	M	YES-E	YES-LL	DECREASED	YES	NIL	INTACT	NIL	NO	YES	24	NO	IMPAIRED	I		18	12	2	10	8	0	0	7	LOW	SHT/DM/CAD
40	3391/12	78	F	NIL	NIL	NORMAL	YES	NIL	INTACT	NIL	NO	YES	22	NO	INTACT	I		15	14	9	10	10	3	0	3	LOW	CAD/SHT
41	785/13	75	M	NIL	NIL	DECREASED	YES	NIL	INTACT	NIL	NO	YES	25	NO	INTACT	I		18	9	10	10	10	10	2	5	LOW	CAD
42	3406/11	70	M	NIL	NIL	NORMAL	NO	NIL	INTACT	NIL	NO	YES	26	NO	INTACT	I		20	10	10	10	10	10	3	9	LOW	CAD
43	9217/13	66	M	NIL	NIL	DECREASED	NO	NIL	INTACT	NIL	NO	YES	26	NO	IMPAIRED	I		19	10	9	10	10	8	0	4	LOW	CAD
44	481/13	81	F	YES-E	NIL	DECREASED	YES	YES	INTACT	MIXED	YES	NO	21	NO	INTACT	I		18	17	5	10	7	0	0	7	LOW	APD/SHT
45	3408/14	65	F	YES-I	YES-LL	DECREASED	YES	YES	INTACT	MIXED	NO	YES-PSY	22	YES	INTACT	I		15	20	3	10	6	0	0	4	LOW	CAD/SHT/DM
46	539/07	72	F	YES-E	NIL	DECREASED	YES	NIL	INTACT	NIL	NO	YES-PSY	20	NO	INTACT	I		20	12	8	10	10	8	0	5	LOW	CAD/SHT/DM
47	7395/06	67	F	YES-E	NIL	DECREASED	YES	YES	INTACT	NIL	NO	YES	21	YES	INTACT	I		19	14	8	10	8	0	0	6	LOW	SHT/DM
48	3627/14	75	M	YES-I	YES-LL	DECREASED	YES	YES	INTACT	MIXED	NO	YES	18	YES	INTACT	I		18	15	6	10	7	0	0	9	LOW	CAD/SHT
49	3566/14	65	M	NIL	NIL	NORMAL	YES	NIL	INTACT	NIL	NO	NO	26	NO	INTACT	I		20	9	11	10	10	10	2	4	LOW	DM
50	3554/14	65	M	NIL	NIL	NORMAL	NO	NIL	INTACT	NIL	NO	YES	25	NO	INTACT	I		16	8	12	10	10	8	2	NIL	LOW	DM
51	3595/14	72	M	NIL	NIL	DECREASED	YES	NIL	INTACT	NIL	NO	NO	25	NO	INTACT	I		21	9	12	10	10	10	2	6	LOW	SHT
52	5255/13	65	M	YES-E	NIL	DECREASED	NO	NIL	INTACT	NIL	NO	NO	24	NO	INTACT	I		20	9	14	10	10	10	2	9	LOW	DM
53	1234/14	65	M	YES-E	NIL	NORMAL	NO	NIL	INTACT	NIL	NO	YES-PSY	26	NO	INTACT	I		19	12	8	10	8	5	0	4	LOW	SHT/CAD
54	985/11	65	M	YES-I	NIL	DECREASED	YES	NIL	INTACT	NIL	NO	YES-PSY	22	YES	INTACT	I		25	15	9	10	10	8	0	3	LOW	CAD/DM/SHT
55	542/12	77	M	NIL	NIL	NORMAL	YES	NIL	INTACT	NIL	NO	YES	24	NO	INTACT	I		25	10	10	10	10	10	0	5	LOW	DM/COPD
56	3341/13	82	M	NIL	NIL	DECREASED	YES	YES	INTACT	FUNCTIONAL	YES	YES	25	NO	IMPAIRED	I		23	12	6	10	10	10	2	6	LOW	APD/SHT
57	289/12	81	F	YES-E	YES-LL	DECREASED	YES	YES	INTACT	MIXED	YES	YES	24	NO	IMPAIRED	I		23	20	5	10	10	5	0	5	LOW	CAD/SHT
58	911/14	70	M	YES-I	NIL	NORMAL	YES	YES	INTACT	NIL	NO	YES	23	YES	INTACT	I		19	12	8	10	10	6	0	NIL	LOW	DM/SHT
59	259/05	65	M	YES-E	NIL	NORMAL	NO	NIL	INTACT	NIL	NO	NO	25	NO	INTACT	I		26	12	10	10	10	10	0	NIL	LOW	SHT/COPD
60	9658/06	70	F	YES-E	YES-LL	NORMAL	NO	YES	INTACT	NIL	NO	NO	21	NO	INTACT	I		20	17	7	10	10	10	0	5	LOW	CAD/DM/SHT
61	2914/14	78	M	NIL	NIL	DECREASED	NO	NIL	INTACT	NIL	NO	YES	24	NO	INTACT	I		24	12	9	10	10	8	0	6	LOW	DM/SHT
62	7953/06	72	M	NIL	NIL	NORMAL	YES	NIL	INTACT	NIL	NO	YES	23	NO	INTACT	I		24	10	9	10	10	10	0	8	LOW	DM/SHT
63	178/03	76	M	YES-E	YES-LL	NORMAL	YES	NIL	INTACT	NIL	NO	NO	24	NO	IMPAIRED	I		22	15	6	10	5	0	0	10	LOW	CAD/DM/SHT
64	933/14	65	F	YES	YES-LL	DECREASED	NO	YES	INTACT	NIL	NO	NO	22	YES	INTACT	I		26	18	5	10	7	0	0	5	LOW	SHT/DCM
65	617/14	65	F	NIL	NIL	DECREASED	NO	NIL	INTACT	NIL																	

72	3987/12	81	M	YES-E	YES-LL	NORMAL	NO	NIL	INTACT	NIL	YES	YES		23	NO	INTACT	I		18	17	6	10	8	0	0	5	LOW	DM/SHT	
73	3563/14	70	F	YES-E	YES-LL	NORMAL	YES	NIL	INTACT	NIL	NO	YES		22	NO	INTACT	I		15	16	6	10	8	5	0	6	LOW	COPD	
74	3586/12	70	F	NIL	NIL	NORMAL	NO	NIL	INTACT	MIXED	NO	NO		21	NO	IMPAIRED	I		16	9	10	10	10	2		3	LOW	APD	
75	303/06	74	M	YES	NIL	DECREASED	YES	NIL	INTACT	NIL	NO	YES		23	NO	INTACT	I		19	12	8	10	10	10	2	5	LOW	BA/SHT	
76	1254/02	66	M	YES-E	NIL	DECREASED	YES	NIL	INTACT	NIL	NO	YES		25	NO	IMPAIRED	I		20	12	10	10	10	10	2	5	LOW	SHT/CAD	
77	98/06	84	M	NIL	NIL	NORMAL	YES	NIL	INTACT	FUNCTIONAL	YES	YES		18	NO	IMPAIRED	I		15	10	6	10	8	0	0	3	LOW	DM/APD	
78	389/06	65	M	NIL	NIL	NORMAL	NO	NIL	INTACT	NIL	NO	YES		25	NO	INTACT	I		25	9	14	10	10	10	2	6	LOW	SHT/CAD/CKD	
79	3454/10	70	M	NIL	NIL	NORMAL	YES	NIL	INTACT	NIL	NO	YES		24	NO	INTACT	I		22	9	11	10	10	10	2	9	LOW	DM/CAD/BA	
80	989/06	72	M	NIL	NIL	DECREASED	NO	NIL	INTACT	NIL	NO	YES		23	NO	INTACT	I		21	8	12	10	10	8	2	5	LOW	SHT/DM	
81	3489/14	68	M	NIL	NIL	NORMAL	NO	NIL	INTACT	NIL	NO	NO		23	NO	INTACT	I		25	8	9	10	10	10	2	9	LOW	SHT/CAD	
82	3810/12	78	M	NIL	NIL	DECREASED	YES	NIL	INTACT	FUNCTIONAL	NO	YES		22	NO	IMPAIRED	I		14	12	7	10	8	5	0	10	LOW	BA/SHT	
83	3988/12	66	M	NIL	NIL	NORMAL	NO	NIL	INTACT	NIL	NO	YES		22	NO	INTACT	I		20	9	14	10	10	10	2	5	LOW	PT/DM	
84	432/08	75	F	NIL	NIL	NORMAL	NO	NIL	INTACT	NIL	NO	NO		18	NO	INTACT	I		16	9	9	10	10	8	0	5	LOW	COPD/SHT	
85	312/07	76	F	NIL	NIL	NORMAL	NO	NIL	INTACT	STRESS	NO	NO		16	NO	INTACT	I		18	9	10	10	10	8	0	2	LOW	APD	
86	354/08	75	F	NIL	NIL	NORMAL	YES	NIL	INTACT	NIL	NO	NO		17	NO	INTACT	I		13	8	14	10	10	10	2	6	LOW	APD	
87	4318/05	70	F	NIL	NIL	NORMAL	YES	NIL	INTACT	NIL	NO	NO		23	NO	INTACT	I		19	8	12	10	10	10	2	5	LOW	SHT	
88	4652/09	78	F	YES	NIL	DECREASED	YES	NIL	INTACT	MIXED	NO	NO		23	NO	IMPAIRED	I		18	12	12	10	10	8	0	5	LOW	SHT	
89	411/02	75	F	NIL	NIL	NORMAL	YES	NIL	INTACT	NIL	NO	NO		28	NO	IMPAIRED	I		18	10	10	10	10	10	0	2	LOW	DM	
90	583/09	68	F	NIL	NIL	NORMAL	NO	NIL	INTACT	NIL	NO	NO		22	NO	INTACT	I		20	8	14	10	10	10	2	9	LOW	APD	
91	342/09	65	F	NIL	NIL	NORMAL	YES	NIL	INTACT	NIL	NO	NO		23	NO	INTACT	I		18	9	10	10	10	10	2	5	LOW	BA	
92	321/06	76	F	YES	NIL	NORMAL	YES	NIL	INTACT	NIL	NO	NO		22	NO	INTACT	I		20	15	8	10	10	8	0	4	LOW	DM	
93	423/08	82	M	YES-E	NIL	NORMAL	YES	NIL	INTACT	NIL	YES	NO		25	NO	IMPAIRED	I		16	14	6	10	8	0	0	9	LOW	SHT	
94	534/09	71	M	NIL	NIL	NORMAL	NO	NIL	INTACT	NIL	NO	NO		26	NO	INTACT	I		19	9	9	10	10	10	2	5	LOW	CAD	
95	760/08	82	M	YES	NIL	DECREASED	YES	NIL	INTACT	NIL	YES	YES		19	YES	IMPAIRED	I		15	14	5	10	7	0	0	4	LOW	DM/SHT/CAD	
96	536/08	78	M	YES	NIL	NORMAL	YES	NIL	INTACT	FUNCTIONAL	NO	NO		18	NO	IMPAIRED	I		15	15	6	10	8	2	0	4	LOW	APD	
97	698/09	69	F	NIL	NIL	DECREASED	YES	NIL	INTACT	MIXED	NO	NO		20	NO	INTACT	I		19	9	10	10	10	8	2	NIL	LOW	SHT	
98	645/08	65	M	NIL	NIL	NORMAL	NO	NIL	INTACT	NIL	NO	NO		26	NO	INTACT	I		24	8	14	10	10	10	2	5	LOW	COPD	
99	534/05	75	M	NIL	NIL	NORMAL	NO	NIL	INTACT	NIL	NO	NO		24	NO	INTACT	I		14	10	12	10	10	10	2	4	LOW	COPD	
100	548/09	75	M	NIL	NIL	NORMAL	YES	NIL	INTACT	NIL	NO	NO		25	NO	IMPAIRED	I		18	9	11	10	10	8	2	6	LOW	DM	
101	1028/09	75	F	NIL	NIL	NORMAL	NO	NIL	INTACT	NIL	NO	NO		20	NO	INTACT	I		18	9	9	10	10	8	0	NIL	LOW	DM	
102	45/02	81	F	YES-E	NIL	NORMAL	YES	NIL	INTACT	MIXED	YES	YES-PSY		24	NO	IMPAIRED	I		8	10	8	10	7	0	0	NIL	LOW	DM/CAD	
103	6298/05	75	F	YES	NIL	NORMAL	YES	NIL	INTACT	MIXED	NO	NO		23	NO	INTACT	I		7	11	6	10	7	2	0	NIL	LOW	SHT	
104	1961/08	68	F	NIL	NIL	NORMAL	NO	NIL	INTACT	NIL	NO	NO		24	NO	INTACT	I		20	10	10	10	10	9	3	NIL	LOW	SHT	
105	4689/08	78	F	NIL	NIL	NORMAL	NO	NIL	INTACT	NIL	NO	NO		24	NO	IMPAIRED	I		13	8	8	10	10	7	0	NIL	LOW	BA	
106	1378/09	69	F	NIL	NIL	NORMAL	NO	NIL	INTACT	NIL	NO	NO		25	NO	INTACT	I		15	10	7	10	10	10	2	5	LOW	DM/SHT	
107	342/09	78	F	NIL	NIL	NORMAL	YES	NIL	INTACT	NIL	NO	YES		19	NO	INTACT	I		16	10	8	10	6	0	0	4	LOW	SHT	
108	2951/08	82	F	NIL	NIL	DECREASED	YES	NIL	INTACT	MIXED	YES	YES		15	YES	IMPAIRED	I		10	15	5	10	7	0	0	NIL	LOW	APD	
109	1684/08	79	F	YES-E	NIL	NORMAL	YES	NIL	INTACT	MIXED	NO	NO		17	NO	IMPAIRED	I		12	14	7	10	7	2	0	NIL	LOW	DM/CAD	
110	998/04	78	F	YES	YES-LL	DECREASED	YES	NIL	INTACT	MIXED	NO	YES		25	NO	INTACT	I		7	15	6	10	10	5	0	NIL	LOW	DM/CKD	
111	2988/04	68	M	NIL	NIL	NORMAL	NO	NIL	INTACT	NIL	NO	NO		25	NO	INTACT	I		15	8	10	10	10	10	2	5	LOW	COPD/APD	
112	3154/08	82	M	NIL	NIL	DECREASED	YES	NIL	INTACT	FUNCTIONAL	YES	YES		18	NO	IMPAIRED	I		16	10	7	10	6	0	0	9	LOW	CAD/DM/SHT	
113	583/09	85	M	YES	NIL	NORMAL	YES	NIL	INTACT	FUNCTIONAL	YES	NO		22	NO	INTACT	I		15	10	6	10	7	0	0	10	LOW	DM/CAD	
114	593/09	65	M	NIL	NIL	NORMAL	YES	NIL	INTACT	NIL	NO	NO		25	NO	IMPAIRED	I		25	8	14	10	10	10	2	6	LOW	SHT/CAD	
115	321/08	68	M	NIL	NIL	NORMAL	NO	NIL	INTACT	NIL	NO	NO		26	NO	INTACT	I		19	9	14	10	10	10	2	7	LOW	DM	
116	5289/09	78	M	NIL	NIL	DECREASED	YES	NIL	INTACT	NIL	NO	YES		25	NO	IMPAIRED	I		22	10	9	10	10	8	0	5	LOW	CAD/DM/SHT	
117	5417/08	77	M	NIL	NIL	DECREASED	YES	NIL	INTACT	NIL	NO	YES		26	NO	INTACT	I		21	9	8	10	10	10	2	NIL	LOW	COPD/PT	
118	1983/09	75	F	NIL	NIL	NORMAL	NO	YES	INTACT	NIL	NO	NO		22	NO	INTACT	I		20	9	8	10	10	1	0	2	NIL	LOW	SHT
119	753/08	65	F	NIL	NIL	DECREASED	YES	NIL	INTACT	NIL	NO	NO		20	NO	INTACT	I		19	8	14	10	10	8	2	NIL	LOW	DM	
120	191/08	68	F	NIL	NIL	NORMAL	NO	NIL	INTACT	NIL	NO	NO		25	NO	INTACT	I		18	9	12	10	10	10	2	NIL	LOW	SHT	
121	165/12	65	M	YES-E	NIL	NORMAL	NO	NIL	INTACT	NIL	NO	NO		26	NO	INTACT	I		22	8	15	10	10	10	2	4	LOW	SHT	
122	169/11	75	M	YES	NIL	DECREASED	YES	NIL	INTACT	FUNCTIONAL	NO	NO		22	NO	IMPAIRED	I		21	10	8	10	10	8	0	8	LOW	DM	
123	3309/09	75	M	YES	YES-UL	DECREASED	YES	NIL	INTACT	NIL	NO	YES-PSY		25	YES	IMPAIRED	I		22	9	9	10	8	0	0	4	LOW	DM/SHT/CAD	
124	531/10	66	F	NIL	NIL	NORMAL	NO	NIL	INTACT	MIXED	NO	YES		26	NO	INTACT	I		19	10	8	10	10	10	2	5	LOW	CAD/SHT	
125	3961/08	75	M	NIL	NIL	NORMAL	NO	NIL	INTACT	NIL	NO	NO		21	NO	INTACT	I		20	10	10	10	10	7	1	NIL	LOW	CAD	
126	170/11	75	M	NIL	NIL	NORMAL	YES	NIL	INTACT	NIL	NO	NO		22	NO	INTACT	I		19	8	14	10	10	7	0	NIL	LOW	COPD	
127	2008/07	70	F	YES	NIL	NORMAL	YES	NIL	INTACT	MIXED	NO	NO		20	NO	INTACT	I		20	14	8	10	10	10	2	NIL	LOW	SHT	
128	1122/12	67	M	NIL	NIL	NORMAL	NO	NIL	INTACT	NIL	NO	NO		26	NO	INTACT	I		25	11	12	10	10	10	3	NIL	LOW	COPD	
129	159/12	81	M	YES	YES-LL	NORMAL	YES	NIL	INTACT	NIL	YES	YES		20	NO	IMPAIRED	I		16	30	5	10	6	0	0	NIL	LOW	SHT/CAD	
130	267/12	65	F	NIL	NIL	NORMAL	NO	NIL	INTACT	NIL	NO	NO		22	NO	INTACT	I		15	9	14	10	10	10	2	NIL	LOW	APD	
131	187/12	84	M	NIL	NIL	DECREASED	YES	NIL	INTACT	FUNCTIONAL	YES	YES		20	NO	IMPAIRED	I		16	17	5	10	7	0	0	5	LOW	CAD/SHT	
132	3723/11	67	M	NIL	NIL	NORMAL	NO	NIL	INTACT	NIL	NO	NO		26	NO	IMPAIRED	I		22	9	14	10	10	10	2	6	LOW	COPD	
133	3162/08	65	M	NIL	NIL	NORMAL	NO	NIL	INTACT	NIL	NO	NO		26	NO	INTACT	I		25	8	12	10	10	10	2	8	LOW	SHT	
134	1551/12	70	M	NIL	NIL	NORMAL	NO	NIL	INTACT	NIL	NO	NO		24	NO	INTACT	I		20	9	14	10	10	8	2	3	LOW	APD	
135	5395/12	66	M	NIL	NIL	NORMAL	NO	NIL	INTACT	NIL	NO	NO		25	NO	INTACT	I		25	8	14	10	10	10	3	4	LOW	SHT	
136	4814/12	66	M	YES	NIL	NORMAL	NO	NIL	INTACT	NIL	NO	NO		25															

144	5445/12	66	M	NIL	NIL	NORMAL	NO	NIL	INTACT	NIL	NO	NO	25	NO	INTACT	I	24	8	12	10	10	10	3		10	LOW	COPD
145	313/02	77	M	YES	NIL	NORMAL	YES	NIL	INTACT	NIL	NO	YES	19	NO	IMPAIRED	I	15	10	8	10	10	7	0	NIL	10	LOW	CAD/SHT/DM
146	4308/12	66	M	NIL	NIL	NORMAL	NO	NIL	INTACT	NIL	NO	NO	22	NO	INTACT	I	20	9	14	10	1	10	2		12	LOW	COPD
147	41/07	66	M	NIL	NIL	NORMAL	NO	NIL	INTACT	NIL	NO	NO	21	NO	INTACT	I	22	11	14	10	10	8	2		10	LOW	SHT
148	102/03	65	M	NIL	NIL	NORMAL	NO	NIL	INTACT	NIL	NO	YES	22	NO	INTACT	I	21	8	12	10	10	10	3		11	LOW	SHT/CAD
149	5736/12	67	M	YES	NIL	NORMAL	NO	NIL	INTACT	NIL	NO	NO	20	NO	INTACT	I	22	8	14	10	10	8	2		6	LOW	SHT
150	4257/11	65	M	NIL	NIL	NORMAL	NO	NIL	INTACT	NIL	NO	NO	25	NO	INTACT	I	19	8	14	10	10	10	2	NIL	10	LOW	DM
151	5680/12	68	M	NIL	NIL	NORMAL	NO	NIL	INTACT	NIL	NO	NO	23	NO	INTACT	I	19	9	14	10	10	10	2		5	LOW	SHT
152	869/09	73	M	NIL	NIL	DECREASED	YES	NIL	INTACT	FUNCTIONAL	NO	NO	22	NO	IMPAIRED	I	18	8	13	10	10	10	2		12	LOW	CPD
153	8336/06	72	M	NIL	NIL	DECREASED	YES	YES	INTACT	NIL	NO	NO	22	NO	INTACT	I	19	9	13	10	10	8	2		10	LOW	DM
154	2572/10	65	M	NIL	NIL	DECREASED	NO	YES	INTACT	NIL	NO	NO	21	NO	IMPAIRED	I	16	9	10	10	10	7	0		6	LOW	SHT
155	2336/10	70	M	NIL	NIL	NORMAL	NO	NIL	INTACT	NIL	NO	NO	20	NO	INTACT	I	20	10	12	10	10	10	2	NIL	10	LOW	SHT
156	2439/12	75	M	NIL	NIL	DECREASED	YES	NIL	INTACT	NIL	NO	NO	21	NO	IMPAIRED	I	16	9	14	10	10	10	2		10	LOW	SHT
157	5516/12	74	M	NIL	NIL	DECREASED	YES	NIL	INTACT	NIL	NO	NO	20	NO	INTACT	I	18	10	12	10	10	8	2		12	LOW	DM
158	5753/07	65	M	NIL	NIL	NORMAL	NO	NIL	INTACT	NIL	NO	NO	25	NO	INTACT	I	17	10	10	10	10	10	2		8	LOW	SHT
159	624/12	70	M	YES-E	YES-LL	NORMAL	NO	NIL	INTACT	NIL	NO	YES	21	NO	INTACT	I	14	15	8	10	8	5	0	NIL	10	LOW	APD
160	4512/12	66	M	NIL	NIL	DECREASED	NO	NIL	INTACT	NIL	NO	NO	22	NO	INTACT	I	20	10	10	10	10	10	2	NIL	10	LOW	CAD
161	2031/11	75	F	NIL	NIL	DECREASED	YES	NIL	INTACT	NIL	NO	YES-PSY	22	NO	IMPAIRED	I	19	9	14	10	10	8	0		5	LOW	COPD
162	6596/12	70	F	YES	NIL	NORMAL	NO	NIL	INTACT	NIL	NO	YES	22	NO	INTACT	I	18	9	10	10	10	7	0		12	LOW	CAD/SHT
163	5236/12	68	F	NIL	NIL	NORMAL	NO	NIL	INTACT	NIL	NO	NO	21	NO	INTACT	I	15	8	12	10	10	8	2		10	LOW	APD
164	577/02	66	F	YES	NIL	NORMAL	NO	NIL	INTACT	NIL	NO	NO	20	NO	INTACT	I	17	10	8	10	10	10	2		4	LOW	DM
165	6250/12	65	F	NIL	NIL	NORMAL	NO	NIL	INTACT	NIL	NO	NO	22	NO	INTACT	I	15	9	8	10	10	8	0		6	LOW	SHT
166	1023/11	66	F	YES	NIL	NORMAL	NO	NIL	INTACT	NIL	NO	YES	20	NO	INTACT	I	18	8	14	10	10	10	5		12	LOW	SHT/CAD
167	781/13	76	F	NIL	NIL	DECREASED	YES	NIL	INTACT	NIL	NO	NO	22	NO	IMPAIRED	I	16	10	9	10	10	8	2		6	LOW	DM
168	5290/12	75	F	NIL	NIL	NORMAL	YES	NIL	INTACT	NIL	NO	NO	20	NO	INTACT	I	15	10	8	10	10	7	0		4	LOW	APD
169	4089/08	76	F	YES	NIL	DECREASED	YES	YES	INTACT	NIL	NO	NO	21	NO	INTACT	I	16	8	8	10	10	8	2		4	LOW	DM
170	6009/12	75	F	YES	NIL	DECREASED	YES	NIL	INTACT	FUNCTIONAL	NO	NO	22	NO	IMPAIRED	I	16	12	8	10	8	2	0	NIL	10	LOW	COPD
171	8525/06	66	F	NIL	NIL	NORMAL	YES	NIL	INTACT	NIL	NO	YES-PSY	24	NO	INTACT	I	19	8	14	10	10	5	0		8	LOW	CAD/DCM
172	2013/12	84	F	YES	NIL	DECREASED	YES	NIL	INTACT	FUNCTIONAL	YES	NO	20	NO	IMPAIRED	I	16	16	3	10	7	0	0		8	LOW	DM
173	2650/11	70	F	NIL	NIL	NORMAL	YES	NIL	INTACT	NIL	NO	NO	21	NO	IMPAIRED	I	19	8	15	10	10	8	2		4	LOW	SHT
174	3423/10	68	F	NIL	NIL	NORMAL	YES	NIL	INTACT	NIL	NO	NO	22	NO	INTACT	I	20	8	14	10	10	10	2		4	LOW	SHT
175	5539/12	65	F	NIL	NIL	NORMAL	NO	NIL	INTACT	NIL	NO	NO	22	NO	INTACT	I	25	9	14	10	10	10	5	NIL	10	LOW	APD
176	1922/09	66	F	YES	NIL	NORMAL	NO	NIL	INTACT	NIL	NO	NO	20	NO	INTACT	I	19	9	12	10	10	10	2		5	LOW	SHT
177	6079/12	65	F	NIL	NIL	NORMAL	NO	NIL	INTACT	NIL	NO	NO	22	NO	INTACT	I	18	9	12	10	10	8	2		5	LOW	SHT
178	3801/07	70	F	NIL	NIL	NORMAL	NO	NIL	INTACT	NIL	NO	NO	21	NO	INTACT	I	20	9	14	10	10	10	5		4	LOW	DM
179	4906/12	68	F	NIL	NIL	NORMAL	NO	NIL	INTACT	NIL	NO	NO	19	NO	INTACT	I	22	8	12	10	10	8	2	NIL	10	LOW	COPD
180	3962/11	75	F	NIL	NIL	DECREASED	NO	NIL	INTACT	NIL	NO	NO	22	NO	IMPAIRED	I	14	10	8	10	8	5	0	NIL	10	LOW	DM
181	5685/07	70	F	YES	YES-UL	NORMAL	YES	NIL	INTACT	MIXED	NO	NO	22	NO	IMPAIRED	I	15	8	10	10	10	8	2	NIL	10	LOW	SHT
182	3453/07	65	F	YES	NIL	NORMAL	NO	NIL	INTACT	NIL	NO	NO	21	NO	INTACT	I	14	8	12	10	10	10	2	NIL	10	LOW	SHT
183	723/09	65	F	YES	YES-UL	NORMAL	NO	NIL	INTACT	NIL	NO	YES	22	NO	INTACT	I	16	9	10	10	10	8	0	NIL	10	LOW	CAD/SHT
184	1137/98	68	F	NIL	NIL	NORMAL	NO	NIL	INTACT	NIL	NO	NO	20	NO	INTACT	I	12	9	8	10	10	7	1	NIL	10	LOW	APD
185	520/10	65	F	YES-I	NIL	NORMAL	NO	NIL	INTACT	MIXED	NO	NO	18	YES	INTACT	I	12	8	8	10	10	10	2	NIL	10	LOW	DM
186	1029/08	65	F	NIL	NIL	NORMAL	YES	NIL	INTACT	NIL	NO	NO	19	NO	INTACT	I	13	8	10	10	10	10	2	NIL	10	LOW	CAD
187	2160/08	67	F	YES	NIL	NORMAL	YES	NIL	INTACT	NIL	NO	NO	19	NO	INTACT	I	13	9	8	10	10	8	0	NIL	10	LOW	SHT
188	2189/06	65	F	NIL	NIL	NORMAL	YES	YES	INTACT	NIL	NO	NO	20	NO	INTACT	I	12	9	8	10	10	7	0		4	LOW	SHT
189	121/09	75	F	YES	NIL	NORMAL	YES	NIL	INTACT	MIXED	NO	NO	22	NO	IMPAIRED	I	11	10	7	10	8	5	0	NIL	10	LOW	DM
190	6006/05	65	F	NIL	NIL	NORMAL	NO	NIL	INTACT	NIL	NO	YES	21	NO	INTACT	I	14	9	9	10	10	10	0	NIL	10	LOW	BA/CAD
191	1015/08	75	F	YES	NIL	NORMAL	YES	YES	INTACT	MIXED	NO	NO	22	NO	IMPAIRED	I	9	10	9	10	8	2	0	NIL	10	LOW	SHT
192	181/07	67	F	NIL	NIL	NORMAL	NO	NIL	INTACT	NIL	NO	NO	21	NO	INTACT	I	9	10	8	10	10	8	2	NIL	10	LOW	CAD/SHT
193	972/12	66	F	NIL	NIL	NORMAL	NO	NIL	INTACT	NIL	NO	NO	21	NO	INTACT	I	10	8	10	10	10	10	2	NIL	10	LOW	DM
194	120/04	66	F	NIL	NIL	NORMAL	NO	NIL	INTACT	NIL	NO	YES	20	NO	INTACT	I	10	9	8	10	10	8	2	NIL	10	LOW	DM
195	373/02	70	F	YES	NIL	DECREASED	YES	NIL	INTACT	NIL	NO	YES	19	NO	INTACT	I	9	8	10	10	10	7	2	NIL	10	LOW	SHT
196	4854/12	65	F	NIL	NIL	NORMAL	NO	NIL	INTACT	NIL	NO	YES	18	NO	INTACT	I	10	9	8	10	10	10	2		2	LOW	CAD/DM/SHT
197	2824/05	70	F	YES	NIL	NORMAL	NO	YES	INTACT	STRESS	NO	NO	20	NO	INTACT	I	12	9	8	10	10	8	0		4	LOW	DM/BA
198	2012/05	65	F	NIL	NIL	NORMAL	NO	NIL	INTACT	STRESS	NO	NO	22	NO	INTACT	I	8	8	9	10	10	7	0	NIL	10	LOW	SHT
199	262/12	65	F	YES	NIL	NORMAL	NO	NIL	INTACT	NIL	NO	NO	21	NO	INTACT	I	8	9	10	10	8	5	0	NIL	10	LOW	SHT
200	1213/03	68	F	YES	NIL	NORMAL	NO	NIL	INTACT	NIL	NO	NO	20	NO	INTACT	I	9	10	9	10	10	8	2	NIL	10	LOW	DM