FACTORS AFFECTING THE OCCURRENCE OF HOUSEHOLD FALLS AMONG THE ELDERLY (65 AND OLDER) IN OWERRI NORTH LGA, IMO STATE

BY

DIALA CHIZOBA NNEOMA (MBBS ABSU)

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CERTIFICATION

This thesis study on **"Factors affecting the occurrence of household falls among the elderly (65 and older) in Owerri North LGA, Imo State"** written by Diala Chizoba Nneoma (REG.NO 20164997938) in partial fulfillment for the award of Masters degree in Public Health (Environmental Health and Safety Option) in the Department of Public Health, School of Health Technology, Federal University of technology ,Owerri Imo.

.....	01/11/2023
Dr. (Mrs.) U.W. Dozie (Project Supervisor)	Date
.....	01/11/2023
Dr. C.O. Akanazu (Project Supervisor 2)	Date
.....	27/05/24
Dr U.M Chukwuocha (HOD Public Health)	Date
.....	01/11/23
Rev.Sr.(Prof) E.T Oparaocha Dean (SOHT)	Date
.....	.....
Prof. B. O. Esonu Dean (Post Graduate School)	Date
.....	26/03/2024
Prof. D.S Ogaji (External Examiner)	Date

DEDICATION

This work is dedicated to all lovers of education in the field of Public Health Science.

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ABSTRACT

This study assessed the factors affecting the occurrence of household falls among the elderly in Owerri North Local Government Area of Imo state. The study employed a cross-sectional descriptive research design using a structured four sectioned questionnaire to obtain data from three hundred and ninety (390) respondents used for the study. Results showed that most participants agreed that slippery floor 357(92%), inadequate lighting around the house 357(92%), poor arrangements of items around the house (100%), poorly secured rugs/carpets357 (92%) and poor architectural features like sloppy floor 390(100%) were the environmental factors that can contribute to household fall where as old age 390 (100%) and pre-existing medical conditions especially arthritis(75%) were the major biological factors that can lead to the occurrence of fall. Based on the behavioural factors that can cause falls, most of the elderly were found not to be very physically active (47%), majority of them consume alcohol (45%) and smoke tobacco products such as cigarettes, cigars or pipes (45%) at the rate of 1-2 times per month. In addition, few of the participants were shown to always be in a hurry (11%) and stand/lower for a long time (23%). Thus, prevalence of fall was very high 347 (89%) among the participants with rate of fall being once in the past six months 145(43%). The main cause of fall was shown to be sickness 133 (38%) whereas the related injury from most of the fall was bruises (53%). Most of the socio-demographic attributes including age, gender, marital status and occupation had significant influence ($p \leq 0.04$) in the occurrence of household falls among the elderly. Fall was more common among the retiree 176(91%) widowed 159 (98%) males 178 (92%) who were 85 years and above years (94%). Therefore, prevention strategies should be focused on vulnerable groups at higher risk for falls, such as older male people who are widowed.

Keywords: Household fall, Elders Injury risk, Behavioural factors, Environmental risk factors, fall prevention strategies.

CHAPTER ONE

INTRODUCTION

1.1 Background to the study

The increasing occurrence of household falls in developing and developed countries brings up the need to analyze and discuss the main impairing events that may affect different age groups (Iara, Gustavo & Marilisa, 2014). Among these events, the occurrence of falls is relevant, since it has the potential of causing serious risks to health and to the life of the people with consequent loss in productivity, compromise dwell being and comfort (Wannian, Ying & Xueqing, 2014).

Falls are major public health problems among elderly people because they are one of the leading causes of injury and death claiming nearly 6,000 lives and 8 million trips to the Emergency room for non-fatal injuries per year in the United States of America (WHO 2018). In India, fall injury was the cause of 25% of all unintentional injuries with 160,000 deaths in 2018, only marginally less than the road traffic injury deaths185,000 (De Ramirez, Hyder, Herbert & Stevens, 2012; Rubenstein & Josephson, 2006). As a cause of death, injury ranks fifth among older persons, with the majority of these deaths being the result of falls (Rubenstein & Josephson, 2006). Every year, 25% to 30 % of older persons sustain falls in developed countries (Tinetti, Speechley & Ginter, 2008). Fall-related injuries may result in deaths, long-term confinement to bed, disability, and dependence in older persons (De Ramirez *et al*., 2012).

The incidence of household fall mostly among elderly persons is growing globally (Takanishi, Yu & Morita, 2008). Two-thirds of older persons in the world are in developing countries and the government of these countries are not yet ready to recognize fall as a public health problem (United Nations, Department of Economic and Social Affairs, Population Division, 2013). There is paucity

of information regarding the risk factors for falls and related injuries in developing countries like Nigeria and India.

A fall is usually defined as "an event which results in the person coming to rest inadvertently on the ground or other lower level, and other than as a consequence of the following: sustaining a violent blow, loss of consciousness, sudden onset of paralysis, or an epileptic seizure" (Kellogg International Working Group, 2008).

Falls and fall-related injuries among older people are major issues for health and social care providers in Europe and indeed the world, because of the rapid increases in life expectancy observed during the twentieth century (Tinetti, 2008).

Falls are the most serious and frequent home accident among elderly people. They are a major reason for admission to hospital or a residential care setting, even when no serious injury has occurred (Grimley-Evans, Seagroatt & Goldacre, 2007). Fall-induced injuries are increasing rapidly than can be accounted for by the increase in the elderly population.

Epidemiological research into falls and fall-related injuries has been affected by a series of conceptual and methodological problems such as the problem of observability, problem with reporting of incidence of falls. Although the majority of hip fractures, head trauma resulting from falls come to the attention of health professionals, whereas people do not seek professional help for injuries perceived to be less severe such as abrasion, bruises (Ejupi, *et.al*.2016).

Given that majority of falls do not come to the attention of any medical service due to the perception of severity, cost implications, health belief model, incidence figures for falls in the community setting are largely dependent on self-reported recall of events, leading to under

reporting of incidence in developing countries. In developed countries, there tends to be over reporting of incidence due to availability of functional health insurance which in turn leads to increased cost of treatment (Graham *et al.,* 2010).

1.2 Statement of the problem

Due to increase in the occurrence of household falls among the elderly and the health implications, and environmental factors being a greater contributor to causes of falls, due to poor infrastructure in numerous geographic areas. In particular, no good movement within the household premises; poor or non-existent household light; overcrowding and hazards in dwellings places; poor architectural features like the floors can be major contributors of falls in household.

Estimates from the national health interview survey in rural and urban Southwestern Nigeria indicate that, among persons aged 65 and older in 2011, there were 5.8 million acute injuries of all types associated with 58.9 million days of restricted activity and 18.8 million bed days due to fall injuries (National Center for Health Statistics, 2008). Falls probably account for a large part of total injury burden in most of developing countries (Idowu 2015).

However, knowledge regarding the etiologic mechanisms of these risk factors and how they combine to produce falls remains limited. Perhaps even more limited is an understanding of environmental factors that precipitate a fall in persons with predisposing characteristics. Situational and environmental factors such as poor lighting; architectural features; tiles; carpets may be among the most important determinants of risk in healthy persons. Finally, a better understanding is needed of factors that affect the risk of injury and other adverse outcomes of a fall.

The incidence of household fall in older persons is growing globally (WHO, 2018). Two-thirds of persons in the world are in developing countries have not adequately recognised falls as a public health problem (Leipzig, Cummins, and Tinetti, 2016). There is a lack of information regarding the risk factors for falls and related injuries in Nigeria. There are limited studies on falls among persons in the country (Joshi, Kumar & Avasthi, 2003). Therefore, this study aimed to determine the factors associated with occurrence of household falls in elderly in Owerri North LGA in Imo State.

1.3 Aim and objectives of the study

1.3.1 Aim of the study

The aim of this study was to determine the factors affecting occurrence of household falls among the elderly in Owerri North LGA of Imo State.

1.3.2 Specific Objectives

1. To determine the environmental risk factors for the occurrence of falls among the elderly.
2. To determine the biological risk factors for the occurrence of fall among the elderly.
3. To determine the behavioural factors for the occurrence of fall among elderly persons in Owerri North Imo State.
4. To determine the influence of sociodemographic factors on the occurrence of household falls among the elderly.

1.4 RESEARCH QUESTIONS

1. What are the environmental factors of occurrence of fall in elderly people?
2. What are the behavioural factors of occurrence of fall amongst the elderly?

3. What are the biological factors that contribute to fall occurrence among the elderly people?
4. What are the sociodemographic factors that influence the occurrence of household falls?

1.5 Hypothesis

Ho: there is no significant difference on the influence of socioeconomic factors on the occurrence of household falls among the elderly in Owerri North LGA of Imo State.

1.6 Significance of the study

This study focused on the factors affecting the occurrence of household falls among elderly in Owerri North LGA of Imo State. It is very important that factors associated with falls in the family household in Owerri North, Imo State may be due to poor setting which should be determined mostly in the context of the study area of the state.

The study will assist the head of every household to learn of a better way of preventing and improved ways of dealing with factors associated with household falls in the study area. Also, the outcome of the research project will aid the understanding of health workers on how fall-related to household occurrence.

Most importantly, it will assist in proffering appropriate recommendations or suggestions to the Ministry of Health and occupational/environmental health practitioners on the prevention and improved ways of dealing with risk factors associated with household falls.

1.7 Scope of the study

The study is limited to elderly people within the family household of the study communities in Owerri North LGA, Imo State and also the factors associated with the occurrence of falls in the household such as architectural features, behavioural factors like alcoholism, pre-existing medical conditions.

1.8 Definition of variables

Occurrence of fall: Architectural features such as stairs, slippery floor, furniture can favour the occurrence of fall.

Independent variables

Household fall: an event of inadvertently coming to the ground or a lower level by a person within the house.

Place of fall: fall can occur along the stairway, in the bedroom, bathroom, etc

Condition of Fall-related injuries: Injuries that are associated with significant disability, reduced mobility and independence, and increased risk of death.

Type of fall related injuries: This can result in hip fractures, dislocations, head trauma, bruises, lacerations, etc.

Nature of fall: this can either be from a height or sliding.

Type of fall: Intrinsic and extrinsic risk factors of falls.

Bed day: A bed-day is a day during which a person is confined to abed and in which the patient stays overnight in a hospital due to occurrence of fall

Restricted activity days: The number of restricted activity days experienced by an individual in the course of a year is an important measure of functional well-being, particularly for older adults. Of an annual average of 31 restricted activity days, 6 days were associated with falls

CHAPTER TWO

LITERATURE REVIEEW

2.1 CONCEPTUAL FRAMEWORK

Falls are sudden occurrence among elderly people, which is one of the leading causes of injury and death (Kannus *et al*., 2011; Rubenstein & Josephson, 2012). They are major public health problems among old and young people. Physical and mental change associated with advancing age and frailty increases the risk of fall-related injury, resulting in substantial health and economic costs to individuals and society (Kannus *et al*., 2011; WHO, 2018). In 2010 falls accounted for over 77% and 85% of years lived with disability (YLDs) resulting from unintentional injuries other than traffic accidents in adults aged 50-69, and 70 and over (Institute for Health Metrics and Evaluation, 2013). With the rapid ageing of the world's populations, falls in older adults are a significant public health issue. Many low cost interventions have been identified for falls prevention, yet health system development and implementation is occurring mostly in high-income countries.

There is now, more than ever, a need to re-focus public health priorities in low-and middle-income countries (LMIC) (WHO, 2018; De Ramirez *et al*., 2012). In 2010 the global burden of YLDs due to falls in adults aged 50-69 was 66% in developing countries compared with 34% in developed countries (Institute for Health Metrics and Evaluation, 2013). Furthermore, this gap is expected to increase, firstly as a consequence of rapid population ageing in developing countries, where over 70% of the world's older population currently lives (Scheffer *et al*., 2013), and secondly, due to the implementation of effective falls prevention strategies in developed countries. Developing

countries require data and resources to develop and integrate falls prevention into their public health policy frameworks (Dionyssiotis *et al*., 2015; Foley *et al*., 2018).

Epidemiological research is urgently needed in order to identify the complexity of determinants and conditions associated with fall-related injury in LMIC. This study uses consistent comparable national health and ageing survey data, collected at the individual and household level from older adults in LMIC in different regions of the world, to measure prevalence and investigate risk factors associated with fall-related injury.

A fall event is defined by the National Database of Nursing Quality Indicators (NDNQI), the most common benchmark, as "a sudden, unintentional descent, with or without injury to the person, that results in the person coming to rest on the floor or against some other surface, on another person, or on an object" (American Nurses Association [ANA], (NDNQI, 2013).

A fall event includes both assisted and unassisted falls, regardless of injury, but does not include child falls unless the child is injured. Most health care organizations compare their falls and injury rates (per 1000 patient days) with other organizations as a benchmark through the NDNQI from the American Nurses Association's National Center for Nursing Quality (NDNQI, 2013).

Because falls and falls with injuries are considered indicators of the quality of care provided in households (Currie, 2014), fall prevention efforts are a focus for nurses and hospital administrators alike. Several agencies have developed guidelines to help health care organizations with tools and evidence on related topics. According to Morse (2016), falls have different causes and require different strategies for prevention; therefore, they should be classified based on cause. Morse

classified falls into three categories: unanticipated physiological falls, accidental falls, and anticipated physiological falls. Unanticipated physiological falls are falls attributable to physiological causes such as seizures; they account for only about 8% of falls. Accidental falls are typically due to environmental problems such as slipping and account for approximately 14% of falls. Anticipated physiological falls are those identified as risks on a screening tool; they account for approximately 78% of falls (Morse, 2013).

The Morse Fall Scale (MFS) is used by many workplaces like household, hospital etc to predict the likelihood of anticipated physiological falls. There are six items on the MFS that a person scores to determine fall risk; these are:1) having a history of falling, either in the immediate or within the last three months; 2) have a secondary diagnosis; 3) uses automotive aid; 4) person has an IV/Med lock; 5) patient has a problem with gait or transferring from one physical place to another; and 6) person has mental status concerns (Morse, 2013).

To prevent falls it is also important to understand the predictors of unanticipated physiological and accidental falls since there is currently no measure used to predict for these types of research (Gabell, *et al*., 2013). Currently, fall prevention includes assessments for fall risk, post-fall follow-up and quality improvement efforts. Analysis of an individual fall helps to keep the same patient from falling again, while aggregate analysis identifies contributory causes at the unit, service, or organizational levels (Gabell, *et al*., 2013).

Cummings *et al*. (2012) recommended that clinicians focus on identifying causes of falls from post-fall assessments. Clearly, when a person falls, it is important for people within the area to examine the causes of the fall in order to prevent them from falling again (Barlett *et al*., 2015).

Post-fall reviews include an assessment and evaluation of the fall event, and they are done as close to the fall event as possible by the primary nurse and team. Post-fall follow-up provides an immediate review after a patient has fallen (Gang, *et al*., 2016).

Nevitt *et al*. (2014) reported that falls were reduced on units performing 'safety huddles' after a person fell, in which researchers discussed what seemed to contribute and how to modify the person plan. A post fall huddle sheet includes factors that the primary nurse thinks it could be contributed to a patient's fall. In this discussion they select the factors thought to have contributed to this fall and consider fall prevention interventions to prevent a repeat fall. Post-fall huddles can include persons and families, and all people working with the victim at the time of the fall (Gang *et al*., 2016). Post-fall huddles should include what happened during or related to the fall, any falls interventions in place at the time of the fall, persons' injury and risk factors that are identified, person' medications and comorbidities present at the time of the fall, as well as actions that should be taken to prevent the patient from falling again (Gang, 2016). Post-fall huddles should also provide learning opportunities for family household, since they create evidence for unit and hospital fall prevention programs.

2.1.1 Risk factors for fall-related injuries

In recent decades, the body of literature on the epidemiology of and risk factors for falls among old and young people had grown considerably (Tinetti & Kumar, 2016). Many factors, including female gender, advancing age, gait and balance deficits, lack of knowledge of the risk, medication use, alcohol use and chronic disease among older people, have been associated with a higher risk of falling. Furthermore, gender differences have been observed across several populations, with the majority of studies reporting higher rates of falling in elderly women than in elderly men (Peel

et al., 2012; Stevens & Sogolow, 2015). Gender disparities in fall rates might reflect differences in underlying health conditions, as well as lifestyle and behavioural factors. For example, significant reduction in bone mineral density after menopause has been frequently suggested to predispose women to a higher risk of falling and bone fracture (Stevens & Sogolow, 2015).

However, despite the numerous studies on falls among seniors and the youngs, research incorporating gender-specific analyses is relatively scarce and limited in terms of generalizability and range of factors examined. While some investigators in several studies noted gender differences in the associations between falls and certain risk factors, such as diabetes, sleep deprivation and vitamin D deficiency (Menant, Close & Delbaere, 2012), few have provided a fuller picture of gender-specific correlates. Moreover, earlier studies in New Zealand (Campbell *et al*., 2019), Finland (Ryynänen, Kivelä & Honkanen, 2011), and Japan (Yasumura, 2014) revealed distinct fall risk profiles by gender, but most were limited by small sample sizes and consisted of populations representative of smaller communities or geographic areas.

Given the devastating effects of falls on the health and well-being of people, identification of risk factors for falling and a better understanding of potential gender differences can provide important information to guide targeted prevention strategies.

2.1.1.2 Fall-related Injuries

In general, fractures are the most common serious injury resulting from falls in persons. Specifically, fractures of the hip, wrist, humerus, and pelvis in this age group result from the combined effects of falls, osteoporosis, and other factors that increase susceptibility to injury (Fife, 2017). Each year in the United States there are approximately 220,000 each of hip and wrist

fractures in persons over the age of 65 (Nashner *et al*., 2012). Although precise estimates are not available, there are several times as many fractures of other bones in persons aged 65 and older as there are hip and wrist fractures (Fife *et al*., 2014). The proportions of some frequently occurring fractures (e.g., those of the rib, hand, foot, and ankle) that result from falls versus other types of traumas are also uncertain.

Other serious injuries resulting from falls include hematoma, joint dislocation, severe laceration, sprain, and other disabling soft tissue injury. There are few data on fall-related injuries other than fracture in the U.S. population. In a regional study in north eastern Ohio, the rate of emergency room treatment of fall-related injuries in persons aged 75 and older approached 80 per 1,000 per year in women and 60 per 1,000 per year in men (Fife, *et al*., 2014).

Another recent study in Dade County, Florida, found an exponential increase with age in the rate of fall injuries that received hospital and emergency room treatment among persons aged 65 and older. These rates were higher in women than men at all ages (Rubenstein *et al*., 2018). Among those over age 75, fall injury rates in women exceeded 100 per 1,000 per year; in men they exceeded 80 per 1,000 per year. About 40 percent of treated fall injuries were fractures (Robbins *et al*., 2019).

Most falls, however, do not cause sufficient injury to receive medical attention. Only 3 to 5 percent of falls in elderly persons who reside in the community and in nursing homes result in fractures, with fewer than 1 percent of falls causing hip fractures (Gryfe, Amies, & Ashley, 2017). Between 30 and 50 percent of falls result in a variety of minor soft tissue injuries that do not receive medical attention; the remainder cause no injury or only trivial damage (Gryfe, Amies, & Ashley, 2017).

2.1.1.3 Determinants of falls: Risk factors and causes

Current prospects for the prevention of falls are uncertain, although several intrinsic and pharmacologic factors that are associated with an increased risk of falls have been identified. Many falls in the elderly are probably multifactorial, resulting from the convergence of several intrinsic, pharmacologic, environmental, behavioral, and activity-related factors.

However, knowledge regarding the etiologic mechanisms of these risk factors and how they combine to produce falls remains limited. Perhaps even more limited is an understanding of situational and environmental factors that precipitate a fall in persons with predisposing characteristics. Situational and environmental factors may be among the most important determinants of risk in healthy older persons. Finally, a better understanding is needed of factors that affect the risk of injury and other adverse outcomes of a fall.

2.1.1.4 Intrinsic risk factors

Falls are a recognized marker of frailty and mobility impairment in the elderly. The presence and severity of functional disability is a useful indicator of the risk of falling in individuals and populations. Data from the National Health Interview Survey's 1984 Supplement on Aging indicate that persons aged 75 to 84 who require help with activities of daily living are 14times more likely, and those with limitations in walking, transfer, and balance activities are 10 times more likely, to report having two or more falls in the previous 12 months compared with persons with no limitations (Cummings *et al*., 2012; Harris *et al*., 2019). The association of falls with frailty and functional disabilities in the elderly is also evident in the high rates of falls reported in nursing homes (Rodriguez *et al*., 2017). The design of effective preventive measures, however,

requires knowledge of treatable impairments and conditions that contribute to functional disability, frailty, and falls in older populations.

Normal gait and postural stability depend on the proper functioning of sensory, neuromuscular, and musculoskeletal systems. Limb proprioceptive and tactile input, visual input, and vestibular input are critical for maintaining the body's center of gravity within its base of support, and these sensory pathways may be compromised by age and disease (Shumway-Cook & Horak, 2019). In addition, age-related disturbances in the organization and central neurological integration of sensory and motor functions may impair the speed, effectiveness, and reliability of postural reflexes, leading to falls (Beers *et al*., 2018). Age-related slowing of postural reflexes may increase the muscular force required for an effective response to postural disturbances, but the strength of skeletal muscles involved in postural control and walking declines with increasing age (Buchner & Larson, 2018). Weak muscles and unstable or painful joints may also initiate postural disturbances during voluntary movement.

Several studies have found that impaired vision, sensory impairment, reduced lower extremity strength, and reduced grip strength are associated with the risk of falls. Arthritis in lower extremity joints and foot disorders contribute to gait and balance problems and are also associated with falls in several studies. Other sensory problems that may contribute to falls, including cervical mechanoreceptor and vestibular disorders, and the role of impaired central processing in postural instability and falls, need more investigation. A few studies have assessed the association of falls with slowed reaction time, impaired reflexes, and other neurologic signs, with inconclusive results (Campbell *et al*., 2019; Cummings & Nevitt, 2012).

Performance-based measures of gait, balance, and neuromuscular function are strong predictors of falls, probably because they reflect the combined effect of sensory, neurological, and musculoskeletal impairments on postural stability during the activities in which falls commonly occur (Guralnik *et al*., 2009). Impaired cognitive function and depression are associated with an increased risk of falls in several studies.

It is suspected that psychotropic, diuretic, antihypertensive, and antiparkinsonian medications, especially when inappropriately dosed, may contribute to falls in the elderly by decreasing alertness, depressing psychomotor function, or causing fatigue, dizziness, and postural hypotension (Macdonald, 2015). Evidence is strongest for an association of falls with the use of hypnotic-anxiolytic drugs, particularly benzodiazepines.

In sum, many impairments, disabilities, and conditions repeatedly have been found to be associated with the risk of falls in the elderly. This risk appears to increase with the number of risk factors a person has, so that those persons most likely to fall can be identified (Mathias *et al*., 2016). Additional research is needed, however, including controlled trials, to determine which treatable risk factors are causal.

2.1.1.5 Situational and extrinsic risk factors

The risk of falls in apparently healthy persons is substantial, suggesting that behavioral, psychosocial, activity-related, and environmental factors are important in the etiology of falls and may combine with intrinsic risk factors to increase risk (Morse *et al*., 2016). For example, minor environmental hazards that are easily negotiated by a healthy individual can become major obstacles to mobility and safety for a person with gait or balance impairments. More generally, the physical demands of certain activities or tasks may exceed the competence of the individual,

resulting in a fall (Hogue, 2017). Although potentially an important area of inquiry, current understanding of this type of fall risk factor is quite limited.

In healthy, active older persons, situational and extrinsic factors may be the predominant determinants of risk. Compared with frail and impaired elderly persons, falls among the individuals in this group are thought more often to involve overt environmental hazards, risk-taking activities like climbing ladders, hurrying, or running; in addition, they are more often likely to occur away from home (Larsson *et al*., 2019). Exposure to fall risks is spread over a wide range of physical environments and activities. In contrast, falls in health-impaired older persons are thought to occur during routine ambulation and transfer maneuvers, usually without an overt environmental hazard, and to occur at home. Among the functionally impaired elderly, fall risks are focused on activities required for basic mobility within a familiar environment. If these contrasting patterns of fall risk are valid, then preventive efforts may need to be tailored to the health level of the population (Isaacs, 2018).

In addition, the two contrasting patterns of risk define a continuum along which many people move with advancing age and declining function. Behavioral, cognitive, and psychological factors that influence how an individual perceives and adapts to the dynamic and changing fit between his or her capabilities and environmental and task demands are a potentially important focus for fall prevention (Hogue, 2017). Additional research in this area is needed to guide the design of behavior-oriented prevention efforts.

2.1.1.5.1 Environmental Factors

Environmental hazards potentially include poor stairway design and disrepair, inadequate lighting, clutter, slippery floors, unsecured mats and rugs, and lack of nonskid surfaces in bathtubs, among many others. Environmental factors are implicated by self-report as contributing to one-third to one-half of falls, but most studies do not compare exposure to environmental hazards in those who fall with a control group (Kellogg International Work Group on the Prevention of Falls, 2017; Murray *et al*., 2015). Only a few prospective studies have assessed hazards in the home as risk factors, with inconclusive results (Nevitt *et al*., 2014). No studies have assessed hazards outside the home or quantified exposure to hazards (in terms of frequency, duration, and intensity) to develop a true estimate of risk; the usual approach is simply to note the presence of hazards in the homes of subjects. In addition, definitions of environmental hazards and methods for assessing them are difficult to standardize (Nevitt *et al*., 2014).

The contribution of environmental factors to falls depends on both intrinsic risk factors and other situational variables, but these interactions are poorly understood. Persons with functional disabilities may be especially susceptible to a cluttered, poorly designed, or poorly illuminated environment. In addition, postural stability in an older person may be affected by subtle environmental cues such as lighting and visual and spatial design (Overstall, Exton-Smith &Imms, 2017). Although previous experience or familiarity with a particular environmental obstacle may reduce the risk per exposure, factors that suddenly precipitate a misstep or trip in these familiar contexts are poorly understood, and methods to study such questions are needed (Nickens, 2013).

2.1.1.6 Fall Prevention Programs

A systematic review by Maike-Lye *et al*. (2013) of programs consisting of multi-component interventions including signage, wristbands, medication reviews, scheduled toileting, risk

assessments, and people's education concluded, that these multi-component strategies, can reduce falls rates in household by as much as 30%. However, before specific interventions are applied, a gap analysis comparing best practice recommendations and current organizational state is recommended by the National Guideline Clearing House Prevention of Falls Guidelines (Ganz, *et al*., 2013; Degelau *et al*., 2012).

Numerous fall prevention and injury prevention guidelines and toolkits are available to assist health care organizations. Guidelines typically provide evidence-based strategies to guide health care organizations, while toolkits include the tools to support these guidelines, such as forms and measures. All of these guidelines and toolkits provide evidence-based components of fall prevention with recommendations on organizational structure, support and culture; risk assessment and identification of risk factors; communication and education of people; integration.

Major recommendations within the guidelines are organizational structure, support, and culture for fall prevention programs. These recommendations include methods of obtaining organizational support for a falls prevention program and ensuring that there is a committee or team structure to support falls reduction initiatives (Spoelstra, Given, & Given, 2011; Neily, Quigley, & Essen, 2013; Ganz, Huang, Saliba, *et al*., 2013).

A falls reduction program was conducted by Weinberg *et al*. (2011) through implementation of a two-phased intervention: (1) an evaluation of fall prevention efforts and (2) a fall prevention intervention program that addressed fall risk assessments, investigation, planning and identification of falls. This program reduced the fall rate by 64% and the rate of falls with moderate injury by 64%. The initiative included a step-by-step process that held caregivers and staff in workplace accountable with support from senior leadership (Spoelstra, Given, &Given, 2011). The

dramatic reductions in fall rates were achieved by creating a culture of safety, accountability and continuous quality improvement with a focused initiative by leadership.

Dykes *et al*. showed a 22% reduction in falls with an accurate plan and interventions; however, they noted that patient and staff compliance with prevention strategies should be continually addressed, through post-fall follow-up and quality improvement initiatives.

Falls prevention activities are carried out across a range of health disciplines including occupational therapy, physiotherapy, general practice, nursing, geriatric, gerontology health and social care (Lannin, 2017). There is evidence in the falls prevention research literature which suggests that in excess of 50% of potential falls relating to older adults are avoided as a result of ongoing falls prevention interventions (Kannus, 2011). There is a range of clinically established prevention interventions that target fall related risk factors. A number of recent meta-analyses, and systematic reviews considered a comprehensive range of falls prevention intervention studies for preventing falls in community-dwelling older people presents a diagrammatic summary of the key categories of intervention that are considered in these reviews and serves as a high-level overview of the key areas in which falls prevention research has been undertaken in recent years (Gillespie, 2012).

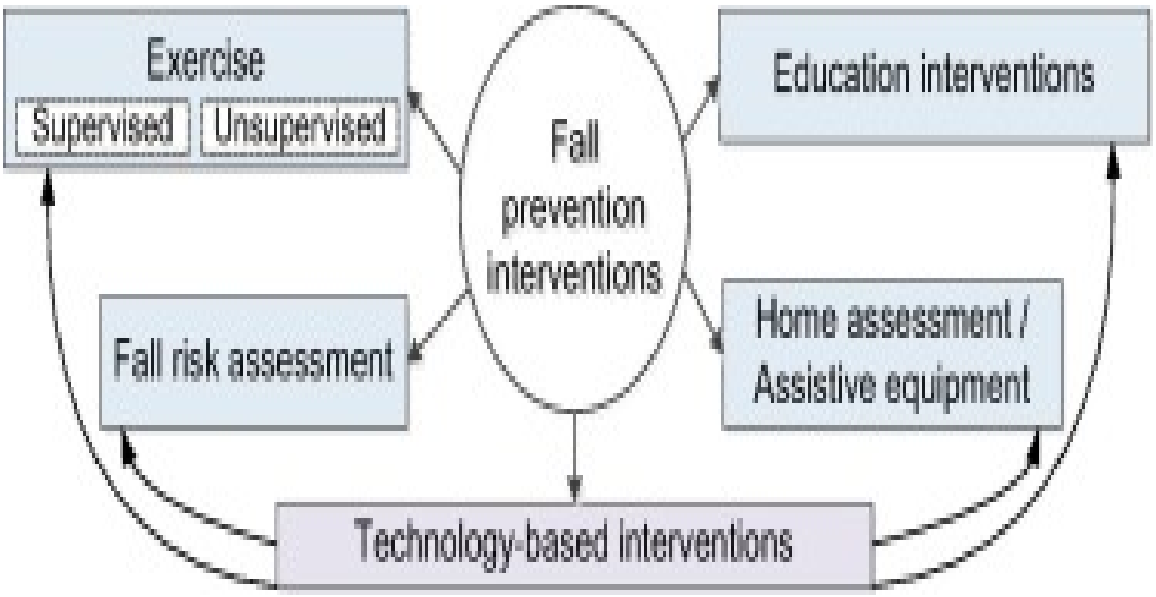

Figure 1: Overview of falls prevention interventions (Gillespie, 2012)

In recent years, one popular approach to falls prevention has been to explore ways of targeting the restoration of muscle strength and balance for prevention of fall risks (Chase, 2012; Pighills, 2011). Exercise interventions are becoming an increasingly popular approach to falls prevention and there is an extensive body of evidence suggesting that these interventions can be effective in reducing falls and the risk of falling (Jorgensen, 2013).

There are many issues, however, with regards to adherence and acceptance of the range of existing exercise interventions. Supervised one-to-one interventions with the patient and the practitioner are resource intensive in terms of cost and time, whilst supervised group exercise interventions require older adults to be able to travel to the location of exercise classes. Furthermore, there are many issues with regards to adherence and acceptance of existing unsupervised home-based exercise interventions, partly due to the lack of interactivity and personalisation that the paper-based exercise interventions typically use in these settings. As such,

3D technology and games are increasingly being seen as a potential means of improving adherence by providing patients with more tailored and interactive exercise programs to engage with (Shubert, 2011).

Older adults who are exposed to fall risks such as gait and balance abnormalities, admitted into hospital for medical attention as a result of falling are at high risk of falling. Consequently, they are offered a multifactorial fall risk assessment that is administered by clinicians in a clinical setting, or within a specialist fall service. Such assessments are a part of multifactorial risk assessment or a singular assessment. It is crucial that older adults who are at high risk of falling are identified using the fall risk assessment tests so that targeted falls prevention interventions can be prescribed. Conducting such assessments has included high cost equipment in specialist fall services. However, 3D technology and games have shown promise as a low cost solution to augment traditional fall risk assessments and to account for low adherence rates of self-assessment of fall risks done at home (Ejupi, 2016).

Education interventions are developed to increase knowledge about falls prevention and educate patients regarding their risk of falling and falls prevention strategies based on the available evidence-based literature. This type of intervention, as a single component, is often part of a multifactorial falls prevention programme, which leads to positive outcomes such as behavioural change, decreased fear of falling and increased mobility. Education interventions typically take the form of fact sheets with evidence-based materials. These inform their readers about the preventive measures to reduce falls, or checklist to help to identify fall hazards in the home and to take preventive measures such as change of behavioural patterns (Kannus *et al*., 2005). As such,

there is little research evidence of education interventions as a single component intervention that reduces the risk and rate of falls (Gillespie, 2012).

Home assessments are carried out and assistive equipment is prescribed to reduce falls within the home environment. Typically, home assessments involve clinicians visiting the older adult's home to assess the suitability of the home environment in relation to the mobility of the patient. Clinicians then propose adaptations, often via the installation of assistive equipment, in order to facilitate independent living and to mitigate any potential fall risks, which could arise during performing activities of daily living (ADLs).

Accordingly, reviews in the falls literature have revealed that home assessments and adaptations as a single intervention do not, in general, significantly reduce the risk of falling. They do, however, have some positive effect for those who are at higher risk of falling (Jorgensen, 2013). Furthermore, identifying environmental risks and adapting the living environment accordingly may reduce fall risks among older adults significantly (Shubert, 2011). By definition, assistive equipment are systems or specialist devices prescribed by clinicians, that provide functional support to older adults to help with mobility, which would otherwise been proven difficult to do and maximises independent living and reduces falls. Assistive equipment includes grab rails, walking frames, hoists, raised toilet seats, stair rails, raised chairs and beds within the patient's home (Bennell, Dobson & Hinman, 2011).

Notwithstanding the benefits of the assistive equipment provision, there are issues which often persist with the use of equipment as it is not always adopted successfully. Consequently, research evidence indicates that more than 50% of home modifications and equipment are rejected (Ejupi,

2016). As a result, there has been an increase in functional decline, leaving older adults vulnerable to the risk of falling. Equipment abandonment is often associated with a number of factors such as lack of knowledge about the equipment's use, involving the users in the decision-making process, their attitude towards the equipment, and a lack of fit of the equipment between service users and their environment.

2.2 THEORETICAL FRAMEWORK OF FALLS

There are a wide range of falls prevention interventions and associated systems, which aim to overcome falls and the risk of falling. Pre-falls prevention intervention systems (Pre-FPIs) are technology applications that focus on supporting individual who have not yet experienced a fall, but may be considered to be at risk of falling. They take a pro-active approach via the development of applications, which support the delivery of targeted physical activities, exercises and education programmes that increase awareness of fall risks and help develop strategies to identify and overcome environmental fall hazards and the complications that may arise after having a fall.

2.2.1 Cognitive Training

This programme is also deployed to encourage older adults to engage in activities that stimulate their cognition, hence slowing down the onset of age-related cognitive decline. Cognitive decline occurs as a natural part of the ageing process and can impact on functional ability and therefore lead to increased risk of falls (Bieryla & Dold, 2103; de Bruin, 2011). Fall risk factors that Pre-FPIs aim to overcome, include intrinsic risk factors that relate to natural ageing changes that affect older adults' physical ability, vision, balance, muscle strength and changes to their cognition. Lack

of mobility could also result in loss of muscle strength and balance impairments, leading to functional decline and resulting ina fall (Hardy, Göbel, & Steinmetz, 2013).

Extrinsic risk factors include factors that are external to older adults' physical health, functional ability and cognition. These include environmental hazards that are apparent within older adults' home environment such as poor lighting, wet floor surfaces, loose rugs, slippery handrails, and seating, toileting and bathing furniture, which is not optimally set up or fitted with suitable assistive equipment for an individual's mobility needs or to carry out ADLs safely (de-Morais, &Wickstrom, 2011).

Post-fall prevention intervention systems (Post-FPIs) are applications of technology which focus on individuals who have already experienced a fall and aim to help assess and deliver interventions to reduce the future risk of repeated falling episodes. The strategies employed by Pre-FPI and Post-FPI often share similarities, i.e. applications that support the delivery of exercise and education programmes with a view to overcoming shared intrinsic and extrinsic fall risk factors. However, the cohort and motivation for delivery of these interventions may be somewhat different in that Pre-FPI takes a pro-active approach and Post-FPI supports the delivery of more re-active interventions. Thus, much of Post-FPIs initially involve fulfilling a diagnostic assessment function, whereby the cause of the fall, which triggered the post fall intervention, is identified along with other intrinsic and extrinsic fall risks.

There are a range of intervention types that are used to carry out functional assessment and cognitive assessment of post-fall individual to assess intrinsic risk factors. Functional assessment involves screening the personal's physical movement for risk factors. As

such, this includes older adults performing intentional physical activities in order for a range of assessment tests to be performed to gather fall risk behaviour data, which helps to determine the type of risk and the appropriate preventive measure to take.

Cognitive assessment includes tests performed to assess cognitive abilities and reduce the progression of cognitive impairments, which typically lead to falls. Delivering this particular intervention provides opportunities for clinicians to determine which preventive interventions are most appropriate to be carried out thereafter and thus, address the intrinsic risk factors identified as a result of the assessment. Environmental assessment involves systems developed to assess extrinsic risks that impact on older adults' ability to function independently within their living environment. This type of assessment aims to remove environmental hazards that obscure older adults' ability to perform ADLs and recommend equipment to aid mobility and reduce fall risks in the home.

2.2.2 Fall injury prevention intervention systems (FIPIs)

This focus attention on patients who are likely and expected to experience falls in the future. Primarily, the aim of many such systems is to detect falls when they occur and to prevent/minimize the injuries that may occur after the event of falling. FIPIs, therefore, often aim to detect falls in order to prevent fall related injuries rather than address the risks that lead to falls. There are three main intervention types used to tackle these risks. Activity monitoring monitors patient movements obtrusively or unobtrusively whilst they perform ADLs and attempts to identify abnormalities, otherwise not apparent. Fall detectors; attempt to distinguish fall events from everyday activity signatures, so as to detect fall events when they occur. Medical assistance involves the provision of support provided by clinicians after a fall.

2.2.3. Cross fall prevention intervention systems (CFPIs)

These are technology applications which attempt to support and deliver a combination of pre-fall, post-fall and fall injury prevention interventions. CFPIs propose technology applications which attempt to deliver system functionality across two or more groups of intervention types i.e. Pre-FPI, Post-FPI and FIPI. An example of CFPIs that includes Post-FPIs and FIPIs is that of Shi *et al* (2013), who develop a smart-phone application which assesses fall risks using traditional clinical tests and detects falls after they have occurred in order to prevent fall-related injuries. Another example which combines intervention types of Pre-FPIs and Post-FPIs is that of Silva (2013), who assess older adults for intrinsic risks and provide an exercise regime of dancing as a type of physical intervention to enhance the uptake and adherence to exercising more often in the older adult population, particularly those who are prone to falls, in an attempt to and reduce those intrinsic risks such as functional decline and a decline in muscle strength.

2.3 EMPIRICAL STUDIES

This study reviewed the different literatures in relation to fall-injuries. However, few studies have tried to understand the effect of behavioural factors (e.g., risk taking) in individuals' risk for falls. For example, Connell and Wolf (2007) conducted an in-depth examination of the environmental and behavioral circumstances associated with falls in a small group of community-dwelling fallers aged 70 to 81 years. They found that there was a dynamic interaction between environmental conditions and behaviour involving use of the environment. The authors argued that most environmental falls can be attributed to poor judgment and not to environmental characteristics.

Another study by van Bemmel, Vandenbroucke, Westendorp, and Gussekloo (2005), showed that participants without preceding falls had a 4-fold risk for falls in the presence of six or seven home hazards compared with those people without home hazards. However, participants with preceding falls had no increased risk of falls with increasing numbers of home hazards, although they had a higher risk of falling. Even though fear of falling was not measured in the study, it is possible that the difference may be due to behavioural differences between recurrent fallers (more cautious) and non-fallers (less cautious).

Finally, Hornbrook, Wingfield, Stevens, Hollis, and Greenlick (2001) asked fallers to describe the events leading up to their falls and to give their perspective of the causes of their falls. The answers were quite surprising. Risk-taking behaviours-such as not being careful or alert, not looking where one was going, and being in a hurry were cited in 63% of the falls. Of those falls, 50% involved behavioural plus environmental factors. Furthermore, most fallers reported that their falls could have been prevented and that their future prevention techniques included increasing caution or reducing high-risk behaviour.

Of the studies that used only modification of the environment as the intervention, the study by Plautz, Beck, Selmar, and Radetsky (2006) and that of Thompson (2006) showed the best results. After a six-month follow-up, Plautz reported falls were reduced by 60% after the intervention, from 0.81 to 0.33 falls per person-year. The intervention consisted of 10 person-hours of unskilled labor and $93 worth of materials on average and included home safety assessments and modifications in the homes of 141 participants.

The authors argue that the community-based program to reduce hazards in the home environments of senior citizens was feasible, well accepted, and probably effective in preventing falls. In

Thompson's study, the total number of falls decreased from 121 falls recorded in the 12 months prior to intervention to 45 falls 12 months after the intervention, which is a 63% reduction. The intervention included a free home safety inspection and simple home modifications, such as grabrails, nonslip floor surfaces, and others. However, the authors recognized that the reduction in falls might have been the result not only of environmental changes but also of behavioural changes. Cumming *et al*. (2009), also recognized the same factors in their study to determine whether occupational therapist home visits targeted at environmental hazards reduce the risk of falls.

Certain factors may predetermine participants' intentions for home modification. For example, a recent study identified three groups that are more likely to express their intentions for modifications: those people who believed home modifications were beneficial; those ones who believed home modifications could prevent falls, and those who had taken action in the past to change their home environments (Yuen & Carter, 2006).

Several studies have successfully used a multifactorial approach, including modification of the environment as intervention, to decrease the risk of falls and improve quality of life (Close *et al*., 2009; Day *et al*., 2002; Gitlin *et al*., 2006). One of these showed the efficacy of a structured interdisciplinary approach to the management and prevention of falls in older people (Close *et al*., 2009). In this study, 141 older adults in the intervention group received a complete medical assessment with modification of risk factors for falls if possible, a home environment modification, and an educational session about safety within the home. The 163 older adults in the control group received only usual care. The results show that the risk of falling was significantly reduced in the intervention group, as was the risk of recurrent falls after a one-year follow-up.

Day *et al*. (2002) tested the effectiveness of and explored interactions among three interventions to prevent falls among older people by dividing subjects over 70 years old into multiple groups. Each group was given at least one intervention (exercise program, home-hazard management, and vision management), and one group received no intervention until after the study. The results showed that the

combined effect of all three interventions produced an estimated 14% reduction in annual fall rate, the largest outcome observed. However, the results for the single and dual intervention groups indicate that the exercise program made the major contribution. In contrast, the results from the home-hazard management group showed no significant reduction in annual fall rate.

In another study, Stevens, Holman, Bennett, and de Klerk (2001), assessed the effect of a one-time intervention program of education, hazard assessment, and home modification to reduce fall hazards that was administered in the homes of 570 healthy older people. After a one-year follow-up, findings indicated no significant reduction in falls or fall-related injuries in the intervention group when compared with the 1,167 healthy elderly individuals in the control group. In summary, results from these studies show that a multi-factorial approach to falls management may help individuals cope better with their physical environment.

Although some of these studies look at the location of the modified environment [e.g., the study by Plautz *et al*. (2006) on grab bars in bathrooms], in general there is a lack of comparative studies examining falls in the modified areas versus non-modified areas of the home. This is a critically neglected area of research since modifying the home environment will not reduce the risks for falls in parts of the home that were not modified, in public spaces (e.g., dimly lit restaurants, broken sidewalks), or in other people's homes.

Intervention programs with the objective of home-hazard modification face several obstacles. Older adult individuals are usually emotionally attached to their environments, and most do not acknowledge the need for interventions to prevent falls. In a study to evaluate the impact of an intervention to reduce fall hazards in the homes of 570 older individuals (Stevens, Holman, & Bennett, 2001), the intervention resulted in a small reduction in the mean number of hazards per house, with many study subjects taking action but removing only a few hazards.

In another study that examined adherence to home-modification recommendations made by an occupational therapist (Cumming *et al*., 2012), the researchers found that of the 419 home modifications that had been recommended in the 121 homes, only 216 (52%) were met with partial or complete adherence when revisited after 12 months. The study also found that the only significant predictors of adherence were a belief that home modifications can prevent falls and having help from relatives at home.

Among people with cognitive impairment, the risk for falls increases greatly in people with cognitive impairment and dementia. Based on prospective studies, it is

estimated that the annual incidence of falls among individuals with dementia is between 70% and 85%-which is twice that of the cognitively intact population (van Doorn *et al*., 2003). Not only are individuals with cognitive impairment more prone to falling, but they are also more prone to sustaining a serious injury due to the fall (Shaw, 2003). The incidence of hip fractures is approximately 4% in people with cognitive impairment and 2% for the population without cognitive impairment (Shaw, 2003). Dementia can increase the risk of falling mainly by impairing judgment and limiting the ability to recognize and avoid hazards. Other factors include gait problems, postural instability, visual spatial perception, and psychotropic medication (Strubel,

Jacquot, & Martin-Hunyadi, 2001). Consequently, special attention has to be paid when designing or assessing the physical environment of people having these conditions.

However, in a study to examine the frequency of environmental hazards in the homes and care environments of 65 dementia patients, Lowery, Buri, and Ballard (2000), found that patients' own homes had a significantly larger number of environmental hazards when compared to care environments, 5.4 and 1.8 hazards respectively. Nevertheless, this study indicated that there was no significant difference in the likelihood of falling between home and care environments. The researchers stated that there is no support for a significant association between environmental hazards and falls based on these results.

In another study comparing fallers and non-fallers (both groups having cognitive impairment), Clemson *et al*. (2006), showed that fallers with cognitive impairment had significantly more hazards than non-fallers with cognitive impairment, suggesting that home hazards might increase the risk of falls in this group. Findings from a study by van Doorn *et al*. (2003), indicated that nursing home residents with dementia were nearly twice as likely to fall compared to those without dementia. The study pointed out that the presence of an Alzheimer care unit in the facility or a better environmental score on the Therapeutic Environmental Screening Survey for Nursing Homes (TESS-NH) were related to an increased risk for falls. The relationship of these two variables indicates that dementia is an independent risk factor for falling even in safer environments.

CHAPTER THREE

MATERIALS AND METHODS

3.1 Research design

This community-based study employed a cross-sectional descriptive to determine the factors associated with household falls among adults in Owerri Zone in Imo State. Choosing the research design was supported by the observation of Thomas and Nelson (2017) that stated the purpose of survey is to reveal current condition and to show the need for change. The cross-sectional survey research design is considered appropriate for this study, because it was successfully used by Bajunirwe and Muzoora (2015) to determine the risk factors in the prevention of community falls in Uganda. Therefore, it can be adopted too for this study and the data will be collected using structured questionnaires, and through physical assessments.

3.2 Study area

Owerrri North LGA is one of the 27 LGAs in Imo State with headquarters in Orie-Uratta. It has an area of 198 square km and a population of 175,395 at the 2006 census. Owerri North is semi urban government area, consist of the following communities: Egbu, Orji, AmakohiaUratta, Emii, Azaraubo, EzimbaUlakwo, Agbala, Awaka, Naze, Emekuku. Imo State was created from the former East-Central State under the leadership of the late military ruler of Nigeria, General Murtala Muhammad and is located in the southeastern geopolitical zone of Nigeria with Owerri as its

capital. It is divided into three senatorial zones; Owerri, Okigwe and Orlu. Imo State occupies an area of about 5,100sq km and is located between the lower River Niger and the upper and middle Imo River. The state lies within latitudes 4°45'N and 7°15'N, and longitude 6°50'E and 7°25'E, and is bounded on the east by Abia State, west by the River Niger and Delta State; north by Anambra State, and Rivers State to the south (Fig 2).

Imo State has an estimated population of about 4.8 million and the population density varies from 230-1,400 people per square kilometre. Christianity is the predominant religion of the people whose major occupation is agriculture, civil and public service and trading. The state is culturally homogeneous as it is a predominantly Igbo speaking state with minor differences in dialects.

Imo State has two main geographical regions- the central and southern coastal plain; and the northern plateau and escapement zones with the former comprising of sandy/loamy soil and rainforest vegetation and the latter, clay soil with rich savannah vegetation. Imo State has two seasons namely the rainy season that spans from March/April to October/November with an annual rainfall of 1,500mm to 2,200mm (60 to 80 inches) and a dry season, characterized by hot weather between January and April (LawNigeria.com, 2015).

Fig. 2: MAP of IMO STATE SHOWING OWERRI NORTH LGA.

Source: Imo State Blog 2013

3.3 Population for the study

The population for the study comprised elderly persons 65 years and older members of every household in Owerri North, Imo State who lived within the household.

Inclusion criteria: It includes elderly persons 65 years and older members of every household in Owerri North, Imo

Exclusion criteria: It includes persons less than 65 years and who do not reside in Owerri North, Imo State

3.4 Sample size estimation

The sample size formula by Kish and Leslie for cross-sectional descriptive studies is used in calculating and determining the sample size needed to be representative of the given population. It was also adopted from the same formula used by (Fisher *et al.,* 1998) for a population > 1,000.

$$n = \frac{z^2 q\,(1-P)}{d^2}$$

n = Minimum sample size

Z = Standard normal deviation usually set at 1.96 which corresponds to the 95% confidence level.

p = Assumed population prevalence in %, Population of the study is estimated to be 50% to represent the target population in this study

q = 1-p

d = Maximum acceptable random sampling error in %

In this case,

P= 50%= 0.5

q = 1- 0.5 =0.5

d = 5%= 0.05

Therefore,

$$\text{Sample size (n)} = \frac{(1.96)^2\,(0.50)\,(0.50)}{(0.05)}$$

n =384

For more clarity and coverage, the figure was rounded up to 400 in order to give an adequate reflection of the study population.

3.5 Sampling technique

In determination of sample size through the application of multistage sampling, at the first stage, a cluster sampling is employed to obtain five (5) communities out of the 12 districts in Owerri North, Imo State. The selected communities go through simple random technique are Uratta, Orji, Emii, Emekuku, Ulakwo. In each of the selected communities, 10 households are to be selected such as for the sample collection. The households are selected through systematic technique. In each community, eighty (40) participants are selected to give a total of 400 participants. The study participants are selected on the basis of the following criteria as; participants must be involved in the selected household activities at family, the participants must have stayed in the family for at least six months.

3.6 Instruments for data collection

The questionnaire is used as the instruments for data collection. The questionnaire is constructed following a thorough review of literatures. The questionnaire comprised of sections A, B, C and D. Section A consists of questions on socioeconomic data of respondents. Section B consisted of the Environmental factors associated with the occurrence of falls in family household in the elderly, Section C consist of the biological factors associated with the occurrence of falls, Section D consist the behavioral factors in occurrence of household falls. All questions are based prepared in line with the research objectives.

3.7 Validity of instruments

The face validity was done by my supervisor who checked the questionnaire and of the research instruments was established through the advice of three (3) experts in occupational/environmental health practitioner and the judgments of five lecturers in the Department of Public Health. They

critically cross-checked that the items contained in the questionnaires are simple, clear with understandable language and comprehensive to achieve the research objectives.

3.8 Reliability of instruments

The reliability coefficients of the research instrument were determined using Cronbach's Alpha and the reliability coefficient using forty participants for the questionnaire in households outside the selected areas. The reliability coefficient for questionnaire is 0.8 which is considered reliable for the study.

3.9 Method of data collection

In order to facilitate access to the area of study and to obtain maximum cooperation from the respondents, a letter of introduction from the Head, Department of Public Health will be present to the leaders of each of the communities visited in the selected household. The distribution and collection of the questionnaires are enhanced by training research assistants to be familiar with the contents of the questionnaire, manner of approach and the location of the household. The completed copies of the questionnaire will be collected immediately from the respondents. It was an interviewer-administered

3.10 Method of data analysis

The data will be collected with the aid of questionnaire and to be entered into computer software called Statistical Package for Social Science (SPSS version 20.0). It will be analyzed using a descriptive statistical analysis and qualitative data will be presented on tables, percentages and charts while inferential analyses were to be done using simple Statistical technique. Hypothesis will be tested using odd ratio statistics at 5% which can be considered statistically significant.

3.11 Ethical considerations and informed consent

The study and verbal consent process received approval from the Department of Public Health, Federal University of Technology Owerri. Informed consent will be provided by the participant in the studied area.

CHAPTER FOUR

RESULTS

4.1 Socio- demographic characteristics of the participants

Details of the socio-demographic characteristics of the respondents are summarized in Table 4.1. It was shown that out of the 390 respondents used for the study, age bracket of majority of them was 65-74 years 260 (67%) followed by those within 75-84(66%) whereas equal 32(8%) least age was 85-94 and >95 years. Slightly higher proportions of them 196 were female unlike their male 194 counterparts. Larger proportions of them were married 195 (50%) compared to the widowed 163 (42%) and single 32 (8%). Based on the educational level of the respondents, most of the participants 157 (40%) did not have any formal education unlike some that achieved their highest formal education level at secondary school level 99(25%) followed by those with primary school 98(25%) whereas the least of them achieved tertiary 36(9%) school certificate. Moreover, the results showed that majority of the elderly participants samples were retiree 194(50%) followed by farmers 98(25%), business/traders 66 (17%) and public servants 32(8%). On religion, greater proportions of them were Christians 325(83%) while few of them belonged to the African/traditional religion 65(17%).

Table 4.1: Socio- demographic characteristics of the participants

Criteria	Frequency N=390	percent(%)
Age(years)		
65-74	260	67
75-84	66	17
85-94	32	8

>95	32	8
Gender		
Female	196	50
Male	194	50
Marital status		
Married	195	50
Single	32	8
Widowed	163	42
Educational qualification		
Primary	98	25
Secondary	99	25
Tertiary	36	9
No formal education	157	40
Occupation		
Farmer	98	25
Business/trading	66	17
Public servant	32	8
Retiree	194	50
Religion		
Christianity	325	83
African/traditional religion	65	17

4.2 Environmental factors in the occurrence of household falls among the elderly

Results of Table 4.2 are the environmental factors in the occurrence of household falls among the elderly subjects studied. 357(92%) of the 390 participants agreed that slippery floor can be a factor in the occurrence of fall whereas few of them 33(8%) disagreed. poorly secured rugs/carpets was also agreed by majority of them to lead to fall 357(92%). A larger number of them 357(92%) agreed that inadequate lighting around the house can lead to fall unlike few that disagreed 33(8%). Similarly, a good number of the participants 357(92%) agreed that non studded bathtubs can cause fall. In addition, all the respondents 390(100%) agreed that poor arrangements of items around the house can lead to fall. Results of Table 4.2 also showed that all the participants 390(100%) agreed that poor architectural features like sloppy floor contribute to household fall.

Table 4.2: Environmental factors in the occurrence of household falls among the elderly

Criteria	Frequency N=390	percent(%)
Slippery floor can be a factor in the occurrence of fall		
Yes	357	92
No	33	8
Poorly secured rugs/carpets can lead to fall		
Yes	357	92
No	33	8
Inadequate lighting around the house can lead to fall		
Yes	357	92
No	33	8
Non studded bathtubs can cause fall		
Yes	357	92
No	33	8
Poor arrangements of items around the house can lead to fall		
Yes	390	100
No	0	0
Poor architectural features like sloppy floor contribute to household fall		
Yes	390	100
No	0	0

4.3 Biological factors in the occurrence of household falls among the elderly

Results of Table 4.3 displayed the biological factors in the occurrence of household falls among the elderly. As shown, 293(75%) of the participants were on medications for medical conditions compared to few 97(25%) that were not. All the participants 390(100%) agreed that old age can be a factor in the occurrence of household fall. Majority of them 293(75%) were of the view that among the medical conditions that can lead to fall arthritis was the highest that can lead to fall. As displayed in figure 4.1, it was shown that 347 (89%) of them have fallen in the past six months unlike few of them 43 (11%) that have not. Majority of them 145 (43%) claimed to have fallen at least once within the last six months. The order of what they perceived can cause fall was slippery floor 101 (29%), sickness 133 (38%), spiritual attack 35 (10%), dizziness 38 (11%), poor lighting 40 (12%). More than half of them 184 (53%) had bruises after fall, 98 experienced pains whereas 65 had dislocation 65 (19%).

Table 4.3: Biological factors in the occurrence of household falls among the elderly

Criteria	Frequency	percent (%)
On medications for an ailment		
Yes	293	75
No	97	25
Old age can be a factor in the occurrence of fall		
Yes	390	100
No	0	0
Total	**390**	**100**
Pre-existing medical conditions can lead to the occurrence of fall		
Visual impairment	65	17
Arthritis	293	75
Stroke	32	8
Total	**390**	**100**
Fall in the past six months		
Yes	347	89
No	43	11
Total	**390**	**100**
Times that fall occurred in the last six months		
One	145	43
Two	124	35
More than three	39	11
Never	39	11
Total	**347**	**100**
Causes of the fall		
Slippery floor	101	29
Sickness	133	38
Spiritual attack	35	10
Dizziness	38	11
Poor lighting	40	12
Total	**347**	**100**
Fall related injuries		
Bruises	184	53
Pain	98	28
Dislocation	65	19
Total	**347**	**100**

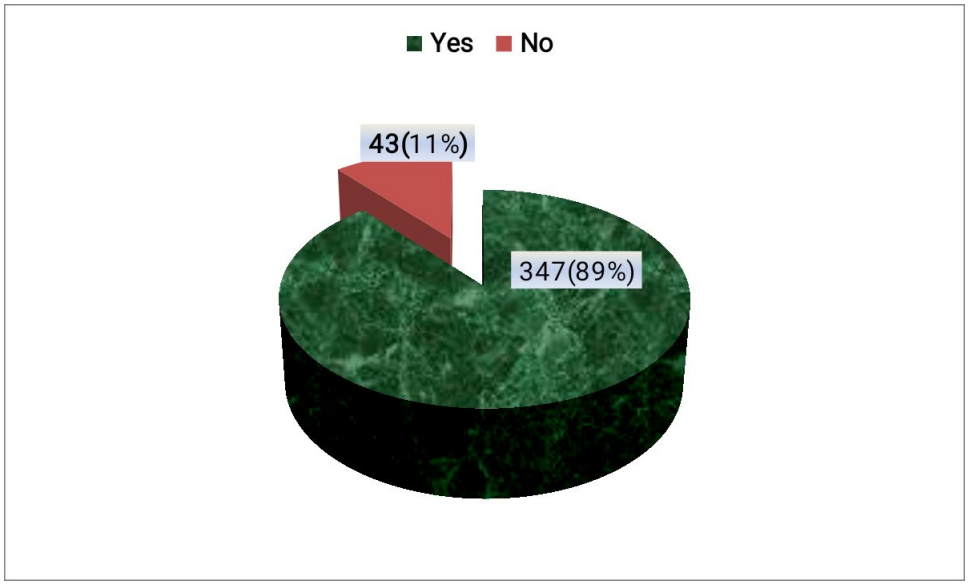

Figure 4.1 Fall in the past six months

4.4 Behavioural factors in the occurrence of household falls in the elderly

Displayed in Table 4.4 are the results of behavioural factors in the occurrence of household falls in the elderly. From the results, all the participants 390 (100%) agreed wearing unsafe foot wares like rubber and high heeled sole shoes can lead to fall. During the study. Based on rate of physical activity, majority of them not very physically active 182(47%) unlike the least of them who were very physically active 20(5%). Rate of alcohol consumption was 1/2 times per month 175(45%) whereas the least of them consume almost every day 4 (1%). Amongst majority of the participants, smoking of any tobacco products (such as cigarettes, cigars or pipes) was 1/2 times per month 174(45%) whereas the least of them 7(2%). Results of Table 4.4 also showed that few 43(11%) of the participants were always in a hurry unlike majority who are not 195(50%), however, 152(39%) are sometimes in a hurry. Habit of standing/lowering for a long-time was observed among few of them 89 compared to those that don't and sometimes stand/lower for long-time.

Table 4.4: Behavioural factors in the occurrence of household falls in the elderly

Criteria	Frequency N=390	percent(%)
Wearing of unsafe foot wares like rubber and high heeled sole shoes can lead to fall		
Yes	390	100
No	0	0
Physical activity		
Very physically active	20	5
Fairly physically active	129	33
Not very physically active	182	47
Not at all physically active	59	15
Alcohol consumption		
Not at all in past year	32	8
≤1-2 times per year	159	41
1-2 times per month	175	45
≥ 1-2 times per week	20	5
Almost every day	4	1
Smoking of any tobacco products such as cigarettes, cigars or pipes		
Not at all in past year	41	11
≤1-2 times per year	150	38
1-2 times per month	174	45
≥ 1-2 times per week	18	5
Almost every day	7	2
Always in a Hurry		
Yes	43	11
No	195	50
Sometimes	152	39
Long-time standing/lowering		
Yes	89	23
No	175	45
Sometimes	126	32

4.5 Influence of sociodemographic factors on the occurrence of household falls among the elderly

Depicted in Table 4.2 are the results of association between socio-demographic variables and the occurrence of household falls among the elderly. As shown, some of the socio-demographic including age, gender, marital status and occupation had strong association with ($p \leq 0.041$) occurrence of household falls. Falls happened most among the participants who are 85 years and above (94%). Comparatively, there was more falls within the males 178(92%) than their female counterparts 169(86%) with significant association. Marital status also showed strong influence on falls with the widowed 98% falling most than other categories. With insignificant association ($p=0.309$), fall was more in those without formal education 145(92%). Moreover, the results indicated that there was more fall among the respondents who are retirees 176(91%) whereas the least fall occurred in those engaged in business/trading with significant association. Moreover, out of the 347 who have experienced falls in the last six months, 288(89%) who are Christians have experienced fall most.

Table 4.5: Association of sociodemographic factors on the occurrence of household falls among the elderly

Criteria	Yes	No	Total	X^2	P-Value
Age(years)					
65-74	232(89%)	28(11%)	260(67%)		
75-84	55(83%)	11(17%)	66(17%)		
85-94	30(94%)	2(6%)	32(8%)		
>95	30(94%)	2(6%)	32(8%)		
Total	**347(89%)**	**43(11%)**	**390(100%)**	**13.65**	**0.023**
Gender					
Female	169(86%)	27(14%)	196(50%)		
Male	178(92%)	16(8%)	194(50%)		
Total	**347(89%)**	**43(11%)**	**390(100%)**	**12.04**	**0.041**
Marital status					
Married	166(85%)	29(15%)	195(50%)		
Single	22(69%)	10(31%)	32(8%)		
Widowed	159(98%)	4(2%)	163(42%)		
Total	**347(89%)**	**43(11%)**	**390(100%)**	**28.49**	**< 0.001**
Educational qualification					
Primary	86(88%)	12(12%)	98(25%)		
Secondary	86(87%)	13(13%)	99(25%)		
Tertiary	30(83%)	6(17%)	36(9%)		
No formal education	145(92%)	12(8%)	157(40%)		
Total	**347(89%)**	**43(11%)**	**390(100%)**	**3.59**	**0.309**
Occupation					
Farming	86(88%)	12(12%)	98(25%)		
Business/trading	55(83%)	11(17%)	66(17%)		
Public servant	30(94%)	2(6%)	32(8%)		
Retiree	176(91%)	18(9%)	194(50%)		
Total	**347(89%)**	**43(11%)**	**390(100%)**	**13.64**	**0.033**
Religion					
Christianity	288(89%)	37(11%)	325(83%)		
African/traditional religion	59(91%)	6(9%)	65(17%)		
Total	**347(89%)**	**43(11%)**	**390(100%)**	**0.26**	**0.613**

CHAPTER FIVE

DISCUSSION, CONCLUSION AND RECOMMENDATION

5.1 DISCUSSION

Household falls in older individuals are very common and may lead to serious health implications. They can be associated with various factors including biological, socio-economic, environmental factors. The study aimed to assess the factors affecting the occurrence of household fall among the elderly in Owerri North Local Government Area of Imo state. A total of 390 participants were recruited for the study and these respondents were dominated by female (50.2%) Christians (83%) who were within the age group of 65-74 years (67%). Most of them had no formal education (40%) and half of them were married (50%) retirees (50%). In similar study conducted by Worapanwisit *et al*. (2018), there were 406 community-dwelling older adults aged 60–69 years, with slightly more (52.2%) in the older category. In their study also, there were slightly more females (56.0%) than males. About two-thirds (63.85%) were living in towns, the rest in cities. Nearly half (46.8%) were married, with another 31% self-identifying as part of a couple.

From the results of the present study, almost all the participants were of the view that slippery floor (92%), inadequate lighting around the house (92%), poor arrangements of items around the house (100%) and poor architectural features like sloppy floor (100%) contribute to household fall. This finding is in line with who reported that over one-third of elderly fall at least once annually due to various intrinsic and extrinsic risk factors (Frick *et al*., 2010). Also, 30–50% of falls among community-dwelling elderly are due to environmental factors (Feder *et al*., 2000).

From the study, it was also identified that old age and pre-existing medical conditions especially arthritis (75%) can lead to the occurrence of fall. The main cause of fall was shown to be sickness

(38%) whereas the related injury from most of the fall was bruises (53%). Several researchers (Resnick and Junlapeeya, 2004; Huang *et al*., 2003) also reported that prescription medications can contribute to fall risk. Moreover, in the study of Lin *et al*. (2022), the common injuries caused by falls were bruise/scrape (40.0%) and fractures (15.5%), respectively.

In the present study, majority of the participants had fallen in the past six months (89%) and with the number of falling being once for majority of them (43%). These results are very low compared to the reports of Lin *et al*. (2022) who reported that among the 5374 older adult participants, 640 (11.9%) fell at least once in the past year, 452 (8.4%) fell once, 110 (2.1%) fell twice and 78 (1.5%) fell more than three times. The prevalence of falls in different reports may be related to ethnic, behavioural and cultural factors, as well as reporting bias. Although the prevalence of falls was lower than in other countries, studies have shown that between 1990 and 2019, the incidence of falls among elderly people in mainland China increased significantly, regardless of gender, age and province (Ye *et al*., 2021). This highlights the importance of falls as a growing healthcare problem and underscores the urgent need for the exploration of risk factors and implementation of evidence-based interventions to prevent falls in older adults in this present study area.

Based on the behavioural factors that can cause falls, most of the elderly were found not to be very physically active (47%), majority of them consume alcohol (45%) and smoke tobacco products such as cigarettes, cigars or pipes (45%) at the rate of 1-2 times per month. In addition, few of the participants were shown to always be in a hurry (11%) and stand/lower for a long time (23%). Previous research (Ahuja *et al*., 2017) identified risk factors for hip fracture to include negligence towards osteoporosis, alcohol consumption, smoking, reduced physical activity levels, obesity, and migration status all of which could lead to occurrence of fall.

From the present study, most of the socio-demographic variables including age, gender, marital status and occupation had strong association with the occurrence of household falls among the elderly. Fall was more common among the respondents who are 85 years and above years (94%). Comparatively, there was more fall among the males 178(92%) than their female counterparts 169(86%) with significant association. Previous research demonstrated that gender was significantly associated with an increased risk of accidental falls (Ryu *et al*., 2017), which was consistent with the findings in our study. This may prompt that the difference in falls in older age may stem from gender-related factors. Furthermore, gender differences have been observed across several populations, with the majority of studies reporting higher rates of falling in elderly women than in elderly men (Peel *et al*., 2012; Stevens and Sogolow, 2015). Gender disparities in fall rates might reflect differences in underlying health conditions, as well as lifestyle and behavioral factors. For example, significant reduction in bone mineral density after menopause has been frequently suggested to predispose women to a higher risk of falling and bone fracture (Stevens and Sogolow, 2015).

Marital status also showed strong influence on falls with the widowed (98%) falling most than other categories. With insignificant association (p=0.309), fall was more in those without formal education 145(92%). Moreover, the results indicated that there was more fall among the respondents who are retirees 176(91%) whereas the least fall occurred in those engaged in business/trading with significant association. Moreover, out of the 347 who have experienced falls in the last six months, 288(89%) and are Christians have experienced fall most. Similarly, univariate analysis in similar study of Lin *et al*. (2022), showed that 14 factors were associated with falls among older adults in Guangdong province, including gender, age, residence,

occupation, education level, balance ability, the situation of cognition, disease, depression, living arrangement, marital status, the behaviour of exercise, drinking and drug use ($p<0.05$).

5.2 CONCLUSIONS

From the findings of this study, almost all the participants agreed that slippery floor, inadequate lighting around the house, poor arrangements of items around the house and poor architectural features like sloppy floor contribute to household fall. Old age and pre-existing medical conditions especially arthritis were biological factors that can lead to the occurrence of fall.

It was clearly shown that the prevalence of fall was very high (89%) and much of the fall was once in the past six months. Besides, the related injury from most of the fall was bruises. Not being physically active, alcohol consumption and smoking of tobacco products such as cigarettes, cigars or pipes at the rate of 1-2 times per month were behavioural factors that can cause falls. Nevertheless, very few of the participants were shown to be always in a hurry whereas few of them stand/lower for a long time.

All the socio-demographic variables with the exception of educational qualification and religion had obvious association ($p\leq0.04$) with the occurrence of household falls among the elderly. The male widowed respondents who are 85 years and above years experienced fall most. There was also higher occurrence of household falls among the retirees.

5.3 RECOMMENDATIONS

Based on the findings of this study, the following recommendations are made:

1. The high prevalence of falls among older adults makes it clear that steps should be taken to prevent them. Prevention strategies should be focused on vulnerable groups at higher

risk for falls, such as older male people who are widowed. In particular, community health education should popularize preventive measures for the elderly according to locations and activities, including the construction of barrier-free environments and the transformation of housing for the elderly should be accelerated in the future in order to reduce the risk of falls in the elderly.

2. Occupational and environmental health education on lifestyle (e.g reducing alcohol and cigarette intake, handrails installation on the staircase, studded mats/ tiles in the bathroom) is also recommended. Therefore, society and family members of the elderly should intervene in these influencing factors.
3. Further studies in our population are needed to identify others risk factors like cognition, grip strength, environmental hazard etc. contributing to fall. This may lead to development of various fall preventive measures that can be socially, culturally and economically be accepted by elders in our country.

LIMITATIONS OF THE STUDY

A major limitation of this study is the collection of retrospective data about falls that may be susceptible to recall bias, and some elderly subjects may under report the number of their fall episodes, leading to possibility of a reported lower prevalence rate in this study.

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QUESTIONNAIRE

FACTORSAFFECTING THE OCCURRENCE OF HOUSEHOLD FALLS AMONG THE ELDERLY IN OWERRI NORTH LGA, IMO STATE.

INSTRUCTION: Please tick right ( ) in the box that most represent your response to the following questions.

SECTION A: SOCIO-ECONOMIC CHARACTERISTICS

1. What is your age range?
   (a)65-74years (b) 75-84 years (c) 85-94 years (d) 95 and above
2. What is your gender?

   Male ☐ (b) Female ☐
3. What is your marital status?

(a) Single ☐ (b) Married (c) ☐ Widowed (d) Others (Specify) …….
4. What is your highest level of Education?

(a) Primary (b) ☐ Secondary (c) ☐ Tertiary (d) No Formal Education ☐
5. What is your occupation?
   (a) Farming ☐ (b) ☐ Business/Trading (c) ☐ Civil/Public Servant (d) ☐ Artisan ☐
   (e) Others (Specify)……...
6. What is your Religion?
   (a) ☐ Christianity (b) ☐ Islam (c) ☐ African Traditional Religion (d) ☐ Others (Specify)

SECTION B: ENVIRONMENTAL FACTORS ASOCIATED WITH THE OCCURRENCEOF HOUSEHOLD FALLS AMONG THE ELDERLY.

7.Can slippery floor be a factor in the occurrence of household fall? (a) Yes (b) No
8.Can poorly secured rugs/carpets lead to fall? (a) Yes (b) No
9.Can inadequate lighting around the house lead to fall? (a) Yes (b) No
10. Can nonstudded bathtubs lead to fal6l? (a) Yes (b) No
11. Can poor arrangement of items(House keeping) around the house lead to fall?
    (a) Yes (b) No

12.Can poor architectural features like (sloppy floor) be a contributor of falls inthe household? (a) Yes (b) No

SECTION C: BIOLOGICAL RISK FACTOR IN THE OCCURRENCE OF HOUSEHOLD FALLS IN THE ELDERLY

13. Can old age be a contributing factor to household falls? (a) Yes (b) No
14. Can pre-existing medical conditions like stroke, arthritis, insomnia, visual impairment, lead to fall?

(a) Yes (b) No

15. Can fall lead todisability, dependence on other people or even death in the elderly?
(a) Yes (b) No)
16. Can household falls lead to injury, bone fractures in the elderly?
(a) Yes (b) No
17 Can poor nutrition(either hunger or malnutrition) lead to fall? (a) Yes (b) No

18.Can urinary incontinence lead to fall? (a) Yes (b) No

SECTION D: BEHAVIOURAL RISK FACTORS IN THE OCCURRENCE OF HOUSEHOLD FALLS IN THE ELDERLY.

19. Can wearing unsafe foot wares like rubber sole shoe lead to fall? (a) Yes (b)No
20.Are you on medication for any health ailment (a) Yes (b) No
21 Physical activity? (a) Very physically active (b) Fairly physically active (c) Not very physically active (d) Not at all physically active.
22. Alcohol consumption rate (a) Not at all in past year (b) ≤1-2 times per year (c) 1-2 times per month (d) ≥ 1-2 times per week (e) Almost every day
23. Smoking of any tobacco products such as cigarettes, cigars or pipes (a) Not at all in past year (b) ≤1-2 times per year (c) 1-2 times per month (d) ≥ 1-2 times per week (e) Almost every day
24. Always in a hurry (a) Yes (b) No
25. Long-time standing/lowering (a) Yes (b) No