EPIDEMIOLOGY OF AND RISK FACTORS FOR FALLS AMONG THE COMMUNITY-DWELLING ELDERLY PEOPLE IN SELECTED DISTRICTS OF UMUTARA PROVINCE, REPUBLIC OF RWANDA.

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ABSTRACT

The elderly population is growing, both in size and in proportion to the total population. The literature has shown that the number of persons aged 60 years and older is estimated to be 629 million worldwide (UN Department of Public Information, 2002). The number is projected to grow to 2 billion by 2050, when the population of older persons will be larger than the population of children for the first time in human history. Although this may be taken to be a positive development, there are a number of implications for health, including an increase in rates of falling, which have been associated with the natural decline in physical activity which brings along with it the biological changes in all the body systems that increase the incidence of falls. Falls among elderly people have been identified as a significant and serious medical problem confronting a growing number of older people. In the current literature, falls in older people are a major cause of morbidity and mortality. Falls have been found to be a leading cause of disability, distress, admission to supervised care and death among older persons that pose a serious problem to public health. The purpose of the study was to determine the prevalence of and risk factors for falls in the community-dwelling elderly persons in the Umutara province of Rwanda. A cross-sectional convenience survey was used, and a sample of 200 elderly persons, both male and female, aged 60 and older was studied. A structured, self-administered close-ended and pre-coded questionnaire was used for data collection. Components of the questionnaire included basic personal data and prevalence of and risk factors for falls. Data was analyzed using SPSS version 10.0, to obtain frequency tables, graphs and cross-tabulations. Chi-squares and Fisher's exact tests, were used to test

associations between variables. The results indicated that 23.2% of the community-dwelling elderly people have had multiple falls in the previous year. Men fell more than women did: 81.6% of the men and 70% of the women were multiple fallers. Men tended to suffer outdoor falls, while women were likely to sustain indoor falls. Injury rates were also high: hip, lower back and ankle injuries were the most prevalent. Hip injuries were high among women, at 97.9%, and lower back (36.9%) and ankle-joint injuries (50%) were most prevalent in men. The following risk factors were found to be significantly associated with increased falling in the elderly: advanced age, gender, joint stiffness, lower extremity weakness, loss of balance and coordination. Other risk factors were vision deficits, drugs use like sedatives. Environmental risk factors mostly happened away from home on the footpath due to slips and trips, host and situational circumstances and behavioral factors, as well as time of the day when falls were experienced. Falls are caused by interacting risk factors, most of which are modifiable. Prevention strategies need to be suited to the most obvious predisposing risks for an individual, with periodic assessment to determine how the mix of factors changes over time. More investigation is required to determine which intervention strategies successfully reduce the chances of falling and sustaining injuries.

DECLARATION

I declare that **"Epidemiology of and risk factors for falls among community-dwelling elderly people in selected districts of Gabiro and Kahi of Umutara Province of Republic of Rwanda"** is my own work, that it has not been submitted for any degree or examination in any other university, and that all the sources I have used or quoted have been indicated and acknowledged by means of complete references.

Egide Kayonga NTAGUNGIRA **November 2005**

Signature……

Prof. José Merle FRANTZ

Witness…….

DEDICATION

To my Parents, Dad KAYONGA Charles and Mom NYIRUBUCYEYE Daphrose, I dedicate to you this work. Your ability to embrace my deepest needs and to accept the challenge to invest in me without reservation. I am awed and thankful that God gave me an opportunity to be your son. You have always loved me, and supported me. You guided me to a good education, and a set of values that have served me well. You laid an excellent foundation in the word of God for all of us your children. These principles taught me wise judgment and kept me from the many mistakes others have made.

I am proud in the Lord and my savior Jesus Christ to be your son and I promise you to pass this legacy to your grand children to come. May God bless you and increase the days of your life. I love you.

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To my parents, thank you for your love, tender and care, your support is beyond measure. Many thanks go to my sisters and brothers for your prayers, support and encouragement. May God richly bless you all.

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ACRONYMS

ADLs: Activities of the daily living

SPSS: Statistical Package for Social Sciences

UN: United Nations

WHO: World Health Organization

UWC: University of the Western Cape

NSW: New South Wales

CSP: Chartered Society of Physiotherapy

CHAPTER ONE

INTRODUCTION

1.1 INTRODUCTION

This chapter highlights the background of the study, under the umbrella term of *population ageing*, in the changing world, including Africa, and then specifically in Rwanda. It also highlights age-related physiological changes and manifestation of age-related health challenges and how these impact on the quality of life of older adults living in a community. Falls, as a serious public-health problem, will be described and the aims and significance of the study highlighted.

1.2 BACKGROUND OF THE STUDY

One of the main features of the world population in the 20th century has been a considerable increase in the absolute and relative numbers of older people in both developed and developing countries. This phenomenon is referred to as "population ageing" (Coleman, 2001; Kalasa, 2004). The elderly population is growing both in size and in proportion to the total population (Daley & Spinks, 2000). The costs to the community of the elderly being in poor health are also growing proportionately (Daley & Spinks, 2000). From a demographic point of view, population ageing is a result of a decrease in both mortality and fertility rates as fewer children are born and more people reach old age (Coleman, 2001, Kalasa, 2004). Literature has shown that the number of persons aged 60 years or older is estimated to be 629 million worldwide (UN Department of Public Information, 2002). The number is projected to grow to 2 billion by 2050, when the population of older persons will be larger than

the population of children for the first time in human history (UN Department of Public Information, 2002). In developed countries, population ageing has evolved gradually after the industrial revolution as a result of an earlier decline in fertility rates and improving living standards for the majority of the population over a relatively long period of time (Kalasa, 2004). The author goes on to state that in developing countries, however, population ageing is occurring more rapidly because of rapid fertility decline and an increasing life expectancy due to medical interventions based on the use of advanced technology and drugs. These interventions have provided effective means to treat and prevent many diseases that used to kill people prematurely (Kalasa, 2004).

Africa is the continent with the youngest population in the world. This does not, however, mean that its population is not also in transition to the ageing process seen in other regions. In fact, with declining fertility and mortality rates, it is estimated that Africa will be one of the continents with the fastest growing elderly population in the world during the period 1998 to 2050 (Kalasa, 2004). The number of older persons in the general population is increasing rapidly in many African countries due to the dramatic gains made in life expectancy during the 20th century. As the number of older people escalates, the question of how to care for them becomes critical. Issues concerning older persons differ from one country to another and from one culture to another (Amosun, 1999).

At present, Rwanda has a population of 8.2 million people, of which 627.427 (7.2%) of the population are older people, among whom 90% are vulnerable and are caring

for orphans of genocide and HIV/AIDS (Kagaba, Nsanzabaganwa & Mpyisi, 2003). There is evidence to suggest that, as time goes by, the number of ageing people is increasing, despite the genocide that took place in 1994 and the occurrence of HIV/AIDS. Umutara Province has 17533 elderly people from whom 2,191,622 are elderly people of Gabiro and Kahi districts (Association of Elderly People, Rwanda, 1995). In Rwanda, older people were traditionally considered as sources of knowledge and wisdom. They were respected by the other members of society and nearly always consulted in decisions involving communities as a whole. Older people were also supported by members of their families. Due to the process of colonization, older people began to be seen in terms of their material possessions (money, land, cows, agricultural products, number of children, and so on). Genocide and the political killings of 1994 seriously affected the social situation of older people in Rwanda. In fact, many were killed and others died through exhaustion or despair and loneliness. Many older people who survived these atrocious times today live in solitude and have no moral or material support (Association of Elderly People, Rwanda, 1995). The 1994 genocide destroyed the country's social fabric, human resource base, institutional capacity, and economic and social infrastructure, and elderly people were left to cope and care for themselves. The Rwandan people are still struggling to overcome the trauma and hardship caused by the violence of 1994. Older people have become one of the most vulnerable groups in an exceptionally poor society in which 64% of the elderly live in rural areas, surviving on subsistence farming (Kalasa, 2004). It is estimated that by 2025, the population of Rwanda will

have doubled from the current amount, and because of this, the number of ageing people will also continue to grow (Kagaba et al, 2003).

Huang, Guan, Lin, & Kernohan (2003) reported that, with the general increase in life expectancy, the population of older adults in developed countries is increasing. Although this may be taken to be a positive development, there are a number of implications for health, including an increase in rates of falling, which have been associated with the natural decline in physical activity. The biological ageing process also includes certain changes in musculoskeletal and neuromuscular systems that can affect complex motor performance, and these changes also tend to increase the incidence of falls (Huang et al. 2003). Greenwald & Graot (1993) speculate that, as people grow older, there is a gradual diminution of function in all of the special senses: vision, hearing, smell, and touch, associated with cardiovascular, neuromuscular, and musculoskeletal changes related to ageing. These changes lead to a decrease in muscular strength, coordination, balance, flexibility, posture, endurance, and speed of motion, together with a delayed response to changes in activity level, which complicate the functional capabilities of the elderly. Acute and chronic conditions are superimposed upon this gradual but continuous loss of adaptive capacity, leading to disability and, hence, to increased susceptibility to falls, which have been identified as one of the leading causes of death among the elderly (Moran 1993; Piotrowski, 1999).

The epidemiological study on falls indicates that falling is a serious medical problem for elderly persons (Kallin, Lundin-Olsson, Jensen, Nyberg & Gustafson, 2002). The

consequences of falls are fractures, fear of falling, impaired function and dependency (Kallin et al. 2002). Among people aged 60 years and older, falls have been estimated to account for a third of the total cost of medical treatment for all injuries in the Swedish population (Kallin et al. 2002). They are thus common among older people and can be disabling and often fatal. A fall is also a major cause of morbidity and mortality (Luxton & Riglin, 2003). A serious fall can lead to both short- and long-term physical disability and pain. Fear of further falls is very common, with corresponding depression, social isolation and reduction in confidence (Luxton & Riglin, 2003). In addition, falls cause the majority of fractures in older persons, with hip fractures being the most common serious injury. Approximately half of all those who fall and fracture their hips will never be able to functionally walk again, and one in five die within six months (Luxton & Riglin, 2003). Similarly, Fuller (2000) reported that the mortality rate for falls increases dramatically with age in both sexes and all races and ethnic groups, with falls accounting for 70% of accidental deaths in persons 75 years of age and older. Falls can be markers of poor health and declining function, and they are often associated with significant morbidity. More than 90% of hip fractures occur as a result of falls, with most of these fractures occurring in persons over 70 years of age (Fuller, 2000).

Gallagher (1994) has reported that falls are a serious health problem confronting a growing number of older people. This author also indicated that a fall can precipitate injury and pain, loss of independence, premature nursing home placement, and in extreme cases, death. Falls can also have a severe psychological impact on older

people: frequent falling can result in fear and immobilization, thereby negatively impacting on quality of life, and the families of the older persons often become worried and may become paternalistic. Falls are the most common type of injury-causing accident in long-term care facilities, accounting for between 75% of all accidents in these settings. An injury rate of 51 per 1,000 residents per year has been found in homes for the aged, with a severe injury rate of 34 per 1,000 residents in the United States (Gallagher, 1994).

1.3 STATEMENT OF THE PROBLEM

Falls in older people are a leading cause of disability, distress, admission to supervised care, and death (Nikolaus & Bach, 2003). To date, no study about falls among elderly people has been done in Rwanda. Due to the fact that elderly people in Rwanda are the most vulnerable group and are left to cope and care for themselves, there is a need to know how the few remaining older people are surviving after the 1994 genocide violence in a poor society with genocide-induced traumas, hardships, HIV and AIDS. It is in this regard that a study of this kind was conducted to look at the prevalence of and risk factors for falls among elderly in the selected districts of Gabiro and Kahi of the Umutara Province, Rwanda.

1.4 AIM OF THE STUDY

The aim of the study was to determine the prevalence of and risk factors for falls among the elderly living in the community in the selected districts of Gabiro and Kahi of the Umutara Province, Rwanda.

1.5 SPECIFIC OBJECTIVES

I. To establish the prevalence of falls among the community-dwelling elderly.

II. To look at the risk factors for falls among the elderly living in the community.

III. To identify gender-related fall differences among community-dwelling elderly.

1.6 SIGNIFICANCE OF THE STUDY

There are no known data on falls among elderly people in Rwanda. Therefore, this study will establish the prevalence of and risk factors associated with falls among the elderly living in the communities of the selected districts of Gabiro and Kahi of the Umutara Province of Rwanda. The study results will serve as a strategy to raise public awareness about the health needs of the elderly. In addition, the results of the study will be a guiding source of information to the decision makers when enacting policies involving older people. Last but not least, the results of this study could contribute to the implementation of a health promotion programme focusing on how to prevent the possible risk factors associated with falls among the elderly living in the community.

1.7 DEFINITION OF TERMS

1.7.1. A fall: According to Gallagher (1994) a fall has been defined as an event which results in a person coming to rest inadvertently on the ground or other lower level, other than as a consequence of sustaining a violent blow, loss of consciousness, or sudden onset of paralysis, as in a stroke or epileptic seizure.

1.7.2. Risk factors: Conditions that influence a person's health status and are capable of causing illness or injury, including genetic or biological risk factors, lifestyle, or environmental conditions (www. Deha.org, 2004).

1.7.3. Community-dwelling elders: Gallagher (1994) defines community-dwelling elders as those individuals 60 years and older, living in the community.

1.7.4. Elderly: According to Kallin et al. (2002) an elderly person has been considered to be aged 60 years and above.

CHAPTER TWO

LITERATURE REVIEW

2.1 INTRODUCTION

This chapter reviews the epidemiology and prevalence of falls. Various contributing factors to the occurrence of falls are described, as well as the economic and psychosocial impact of falls on older adults living in the community.

2.2 THE EPIDEMIOLOGY OF FALLS AMONG THE ELDERLY

Falls are the one of the most common geriatric syndromes threatening the independence of the older persons. Between 30 and 40% of community-dwelling adults older than 65 years fall each year (Shobha, 2005). Falls are a significant problem for older adults and treatment and complications result in high healthcare costs (Moreland, Richardson, Goldsmith, Clase & Chir, 2004). Kenny, Rubenstein, Finbarr & Tinetti (2001), in their study of guidelines for the prevention of falls in older persons, identified high rates of falls. They reported that the incidence of falls tends to rise after the age of 60 years, whereas in the age range of 65 years and older, approximately 35% to 40% of persons living in the community fall annually, and after the age of 75 years, the fall rates are higher. Payne, Perkins, & Payne (2003), in their study of falls in older people, reported that the falling incidence rate (>50%) in rural communities in North America was much higher than the usual 30% reported in urban studies. Jensen, Lillemor, Nyberg, & Gustafson (2002) stresses that falls are a major cause of morbidity and mortality among older people and pose a serious problem to public health. Kario, Tobin, Wolfson, Whipple, Derby, Singh, Marantz, &

Wassertheil-Smoller (2001); Fletcher (2002) indicate that falling is the leading cause of injury and the sixth leading cause of death in individuals over the age of 65 years, thus representing a frequent cause of high injury severity and mortality. Moran (1993) reported that falls occur and have been found to be the most frequent cause of death in people aged 65 years and older. It is reported that in the United States, 10% of falls cause serious injuries such as hip fractures or head injuries, and the remaining 90% of older fallers may experience less severe injuries, some warranting attendance at the emergency department or a visit to a general practitioner (Moran, 1993).

According to Ro, Shadden, Blake & Powers (2005), approximately 30% of community-dwelling older adults fall once annually, and 10% to 20% fall two or more times. Falling contributes to 90% of hip fractures in the United States (Ro et al. 2005). The economic burden of falling is substantial. Falling has been shown to contribute to 27% of hospital costs (Ro et al. 2005). With the older adult population increasing worldwide, the problem will likely worsen, with more fractures and even higher health-care costs (Ro et al. 2005).

The prevalence of fall rates for females and males was 6.29 and 3.21, respectively, indicating the occurrence of a larger proportion of falls among females in Canada (Fuller (2000). Nordell, Jarnlo, Jetsén, Nordström & Thorngren (2000) demonstrated that in Sweden, in the adult population, the incidence of falls increases with age and women fall more often than men and sustain injuries more often when they fall. Murenzi (2000), similarly, in her study about falls among older people and their related fractures in South Africa (Groote Schuur Hospital), indicates that the reason for this difference could be osteoporosis that may start at the age of 30 years in

women and accelerate after menopause. The author further stresses that women are more predisposed to falls than are men, with a high probability of sustaining a fracture, especially a hip fracture. The incidence of osteoporosis in men is lower than in women because of higher male bone mass, absence of menopause, lesser tendency to fall, and shorter life expectancy.

Rubenstein, Karen & Robbins (1994) reported that the incidence of falls in older adults and the severity of complications increase steadily with age and increased physical disability. According to Fuller (2000), elderly persons who fall are ten times more likely to be hospitalized and eight times more likely to die as a result of a fall than are younger people. Similarly, Gallagher (1994) indicated that falling among the elderly has become a significant public health issue and a serious health problem confronting a growing number of older people. A fall can precipitate injury and pain, loss of independence, premature nursing home placement, and in extreme cases, death. Kannus & Karim (2001) demonstrated that the problem of fall-related injuries was likely to increase because the number of elderly people and their mean age was increasing everywhere and because there are clear signs that the age-adjusted incidence of fall-induced injury was also rising.

2.3 THE RISK FACTORS FOR FALLS AMONG THE ELDERLY

Falls can be triggered by a host of problems. It is generally agreed that most falls are caused by interacting factors. Over 130 risk factors that contribute to falling have been identified (Ro et al. 2005). The most common of these include poor balance, lower extremity muscle weakness, slow reaction time, decreased lean body mass,

impaired cognition and vision, syncope, and overall impaired mobility (Ro et al. 2005). Poor lower extremity muscle strength might be an especially important fall-risk factor. Ro et al. (2005) found weak ankle dorsiflexors to be one of the primary muscular contributors to falling. Other factors that might contribute to falling include medication and its side effects, alcohol intake, poor footwear, and environmental conditions. The risk factors might also be psychological; older adults often have a activity-related fear of falling (Ro et al. 2005). Fuller (2000) also observed that falls can be attributed to diseases including osteoporosis, arthritis and diabetes, and to alcoholism intake. And then there are prescription medications, specifically antidepressants, sedatives and blood pressure drugs which can cause dizziness, confusion or sedation. These factors, combined with poor lighting, loose rugs, slippery tubs and iced sidewalks, can make a single step disastrous.

According to Rekeneire, Visser , Peila , Nevitt, Caurley, Tylavsky , Simonsick & Tamara (2003), epidemiological studies of falls among community-dwelling elderly persons have identified contributing factors for risks of falls to include gender, selected chronic diseases, medication and disabilities. Poor lower extremity muscle strength may contribute to risk of falling through poorer physical function. Weel (1995) looked at falls from a community perspective and concluded that falls can be caused by the patient's health status, that is, by chronic illness or acute illness (internal factors) and by external factors. External factors (tripping and slipping) are responsible for half the falls encountered in general practice in those over 65 years. However, the external and internal distinction is not clear-cut. Attribution of

causation of falls in the elderly is divided into two broad categories: intrinsic factors and extrinsic factors (Rice, 1994; Fuller, 2000; Ellyn & Miller, 2003). The authors identify intrinsic risk factors as those that include age-related mental changes, normal physical and physiologic changes, and diseases and side effects of medication that interfere with one's balance, hence increasing susceptibility to falling. Extrinsic factors, on the other hand, include safety hazards within the environment that predispose one to slipping and tripping.

2.3.1 Intrinsic risk factors for falls

Intrinsic factors are those individual characteristics that may be due to age (poor visual equity), disease, or medication (intrinsic risk factors are normal physical and mental changes related to aging but not associated with diseases which decrease functional reserve (Fuller, 2000; Payne et al. (2003).

Fuller (2000) contends that the elderly become more susceptible to falls when they are confronted with any challenge. Some age-related changes are not necessarily "normal", but they are modifiable in other words, they may be improved or managed (Fuller, 2000). It was hypothesized that muscle weakness is a potentially modifiable risk factor for falls in older adults (Moreland et al. 2004). The ability of muscle to generate adequate force is a fundamental component of maintaining balance and a strong candidate risk factor for falls (Moreland et al. 2004).

The socio-demographic variables of age, the female gender, and living status have been found to increase the older people's susceptibility to falls. Other noteworthy risks such as being physiologically or functionally impaired have repeatedly been implicated as risk factors for falls (Fletcher, 2002). Chronic illnesses, chronic medication and use of multiple drugs have been identified as intrinsic risk factors for falls among the elderly (Fletcher, 2002). Chronic illnesses among elderly people have been identified as an important risk factor for falls (Fletcher, 2002). Specific chronic conditions or diseases were associated with an increased risk of falling. Physiological changes in the elderly include reduced stature, decreased cardiovascular function, increased risk and occurrence of cardiovascular diseases, elevated blood pressure, reduced aerobic function and decreased neuromuscular level of functioning (Daley & Spinks, 2000).

Various studies have been conducted regarding intrinsic risk factors for falls among the elderly. Fuller (2000) indicates that intrinsic risk factors for falls are normal physical and mental changes related to ageing that decrease functional reserve. As a result, the elderly become more susceptible to falls when they are confronted with any challenge. Increase in age, being of the female sex, posture sway effects on balance, decreased muscular strength, and coordination and flexibility changes increase the possibility of falling (Horn, 2000). Accompanying these gradual changes are changes in special senses (not associated with disease), which include decrease in vision, hearing, touch, and smell, leading to functional decline (Fuller, 2000). Mann, Locher,

Micheal, Wu and Machiko (2005), in a study in which they examine the intrinsic and extrinsic risk factors related to falls among both institutionalized and non-institutionalized elderly, found a positive correlation between fall rates and increasing age, with rates highest among elders over the age of 80 years. The other most commonly reported risk factors included a decline in physical status, mental status, balance and mobility, changes in behavior and medications, dizziness, frequent physical activity, difficulty walking, and difficulty bending down. Having had a previous fall, having more than one chronic disease and taking more than four medications have also proved to be the precipitants of falls among elderly (Fuller, 2000). Functional limitations such as inability to perform the activities of daily living and problems with mobility, especially lack of exercise, may indicate an increased fall risk (Horn, 2000). Huang et al. (2003) assessed risk of falling in older adults and concluded that increasing age brings several physical changes that may cause falls, such as biological transformation that causes loss of balance and muscle-ortho-sensory coordination. Other age-related change conditions, such as arthritis and cardio-respiratory disorders also contribute to the slow gait of older adults. Huang et al. (2003) also stated that disturbances in consciousness, urinary frequency, bowel disorders and failing vision may lead to increased rates of falls. Medication such as thiazide or diuretics may also contribute to falls in older adults. Ellyn & Miller (2003), in an effort to identify risk factors for falls, conducted various studies and identified a variety of intrinsic factors and extrinsic factors: psychosocial factors, physical factors, general health status, lifestyle choices (e.g. alcohol use), sensory and perceptual deficits, cognitive status and medication use are among the intrinsic risk

factors identified as independent variables in studies of falls among the elderly. The study by Ellyn & Miller (2003) examined the effects of specific classes of drugs on elders to determine their impact as intrinsic risk factors for falls. Benzodiazepines, sedative-hypnotics, neuroleptics, tricyclics, antidepressants and opioid analgesics were all identified as associated with increased fall risks (Ellyn & Miller, 2003). Some of these drug categories were found directly associated with chronic pain, such as sedative-hypnotics used to aid persons with sleep disturbances. Other of these drug groups may be prescribed to control pain directly, or to mitigate psychological effects such as the depression associated with chronic pain (Ellyn & Miller, 2003). Kawamoto & Takaaki (2002) in their study, aimed to clarify the relation between sleep disorders and falls among the community-dwelling elderly and to determine whether or not sleep disorders are an independent risk for falls, and pointed out sleep disorders as a latent risk factor for falls. Sleep problems impair the control of postural balance, causing falls, and lack of sleep induces sleepiness, which, in turn, causes inattentiveness, memory disturbance, prolonged reaction time, lowered cognitive function and finally, falling.

2.3.2 Extrinsic risk factors for falls

Published research indicates that extrinsic or environmental factors account for one-third to a half of all falls among seniors (Gallagher, 1994). The same author indicated that environmental factors may play a greater role in falls among healthy, active community elderly, whereas intrinsic factors may feature more prominently for the frail elderly. A one-year study, by Gallagher (1994), of 222 older adults at seniors'

centers indicated that behavioral and environmental risks were implicated more often in fall risks than impaired health, strength and balance. Outdoor extrinsic risks for falling that have been noted in research include stairs, low-lying objects, and cracked and icy sidewalks and roads. Falls at cross walks have also been noted, due to paint being slippery, particularly in the rain. Transition areas like garages, entrances and patios seem to be hazardous areas, as well as areas characterized by rapid changes in illumination and glare (Gallagher, 1994). Indoor risks that have been related to falls among seniors include such features as poor lighting, objects in pathways, slippery rugs and lack of handrails for staircases. Gallagher, (1994) identified slippery surfaces, defective floors, extension cords, bathtubs, shelving inadequacies, doorjambs, cluttered hallways, toys or pets, low beds and toilet seats, and poorly maintained walking aids and equipment as important risk factor for falls.

Environmental hazards such as stairways, slippery bathrooms, bedrails, assistive devices,

improper shoes, loose carpets and mats, and poor lighting are unfortunately common in the homes of many seniors and often cause falls (Rice, 1994). Any change that reduces postural stability, or impairs the stability to correct a trip, will predispose the older person to falls (Rice, 1994; Horn, 2000).

Ellyn & Miller (2003) and Huang et al. (2003) acknowledged the impact of the physical environment by examining parameters such as clutter, slippery floors, placement of furniture, presence of cords or wires which pose trip hazards, presence and types of rugs, stairs and the presence or absence of handrails, utilization of proper

lighting, adequate height of chairs and toilet seats, the presence or absence of grab bars, and the use of assistive devices for ambulation. All these were considered to be the foremost extrinsic factors for falls among the community-dwelling elders. Furthermore, the same study highlighted footwear and the circumstances of the fall, such as time of day, season and location of a fall, as extrinsic factors for falls.

2.4 IMPACT OF FALLS

2.4.1 The socioeconomic impact of falls among the elderly

Falls are a major threat to the independence and quality of older adults (Lord & Dayhew, 2001). Falls constitute a substantial socioeconomic problem. The annual cost of caring for elderly fall victims is approaching $1 billion in Canada (Gallagher, 1994). Similarly, Kawamoto & Takaaki (2002) reported falls to be an important factor in causing injury to the elderly, who often become bed-ridden, and that the cost of medical care for falls is enormous. Lord & Dayhew (2001) attempted to clarify economic effects of falls and found that falls contribute to a significant health-care cost that includes doctor visits, prolonged hospital stay and nursing home care, outpatient clinics and rehabilitation stays. Others include diagnostic tests, medication, home care, home modification, equipment and institution care and patient morbidity and mortality costs. Huang et al. (2003) contended that the cost of care for older adults after a fall is very high. From a purely economic viewpoint, the risk factors of

falls are worth serious examination. The United States Health Care Financing Administration and Connecticut Long-Term Care Registry have monitored health-care costs for older adults after a fall. Adding together the costs of hospital stay, nursing home, emergency room, and home health care gave a mean total of $19,440 per year/per person (1998 figures); this imposed high costs on society and reduced the quality of life in older adults. The cost of fall injuries in adults of 65 years and older was in excess of $2 billion in 1994 in the United States. Elders are 10 times more at risk of being hospitalized for falls and 8 times more likely to die as a result of a fall than younger people (Ellyn & Miller, 2003). Kallin et al. (2002) estimate that falls among people aged 60 years and older account for one third of the total cost of medical treatment for all injuries in the Swedish population.

Falls are common, often dreaded events in the lives of older people. A side from the obvious injuries and even death that might result, falling can cause wide-ranging consequences, including loss of independence, mental decline, and decreased activity and mobility (Lord & Dayhew, 2001).

2.4.2 Psychosocial and emotional impact of falls

Gallagher (1994), in a study of falls and the elderly, contend that a fall may have a far-reaching impact on an older person. Falling can threaten a person's self-confidence. Many older adults realize that injury from a fall may end their independent lifestyles. Even one experience may precipitate the onset of chronic fear of falling. The cycle that this sets up is often self-defeating. As people withdraw from

religious, cultural, social and physical outings, they become more susceptible to the negative effects of social isolation and physical inactivity (Gallagher, 1994). This belief that falling is inevitable and unpreventable can lead to feelings of helplessness and an even greater fear of falling, often resulting in isolation and decreased mobility. A large percentage of people who fall claim that it is because they are stupid or do not care, even when there are clear environmental triggers for the accident (Gallagher, 1994). This self-blaming can also lead to low self-worth and feelings of incompetence. Thus, it is clear that falling has negative psychological and social impacts, along with those related to physical and economic outcomes (Gallagher, 1994). Similarly, Fuller (2000), in his study conducted in the United States, stresses that most falls do not end in death or result in significant physical injury. However, the psychological impact of a fall or near fall often results in a fear of falling and increased self-restriction of activities. The fear of future falls and subsequent institutionalization often leads to dependence and increasing immobility, followed by functional deficits and a greater risk of falling. Lord & Dayhew (2001) reported that falls that do not result in physical injuries can result in post-fall syndrome, which includes a loss of confidence, hesitancy and tentativeness, with resultant loss of mobility and independence. According to Lord & Dayhew (2001) and Payne et al. (2003), falls in older people are common and can lead to numerous disabling conditions, extensive hospital stay and death. Additionally, Ellyn & Miller (2003) reported that falls account for 70% of accidental deaths of those of 75 years and older, while 17.2 per 100,000 die as a result of falls in the age group 65 to 84 years old; that number jumps to 107.9 per 100,000 in persons over the age of 84 years, and for those

who survive a fall, the consequences can be serious. Length of hospital stay after a fall for those 65 years and over is nearly double that for elderly persons admitted to the hospital for other reasons. Fifty percent of those hospitalized for a hip fracture are unable to return home or live independently, and one quarter of them will die within six months (Ellyn & Miller, 2003). Those who survive a hip fracture have a 10% to 15% decrease in life expectancy and functional performance, and participation in social activities is also affected (Ellyn & Miller, 2003)

Whatever the cause of a fall, the outcome can be devastating. Ellyn & Miller (2003) found that up to three years after a fall, performance of activities of daily living (ADL) declined. Those with multiple falls or who sustained serious injury experienced greater decline in both basic and instrumental ADLs. For those who had multiple falls or sustained serious injuries as a result of a fall, participation in social activities declined. Falling or even knowing a friend or a relative who experienced a serious fall can result in a fear of falling associated with diminished social interaction, depression, anxiety, and reduced physical activity.

Seniors living in the community are unable to participate in their favorite activities or visit with friends and hence are susceptible to loneliness, depression and fear. That fear is warranted: those who have fallen are two to three times more likely to fall again. More than the physical trauma, seniors dread the possibility that a fall could rob them of their independence; thus, many elderly people keep falls a secret, even from their doctors (Fuller, 2000). When older people fall and have to be admitted to

the hospital, they may subsequently become bed-bound. All those who suffer a fall face the fear of falling again and tend to limit daily activities such as shopping or walking. Thus, falls have detrimental effects on the well-being and quality of life of older adults and their family caregivers (Huang et al. 2003).

2.4.3 Roles of physiotherapists in falls prevention and rehabilitation among the elderly.

In 1989, the World Confederation for Physical Therapy (WCPT), in collaboration with the World Health Organization (WHO), presented a report that focused on the tremendous potential role for physical therapists in providing services that could minimize or reverse the effects of disability associated with ageing (Amosun & Olufunmilayo, 1994).

It is made clear that accidents, such as falls, are an important cause of disability and use of the health services among people over 65 years (Simpson, 1993). Physiotherapists come into contact with older people, especially the very old, who have already sustained at least one fall and have been referred either to a community or to a hospital-based service (Simpson, 1993).

The central message of WCPT was that the provision of a service to elderly people in the 21st century must be planned immediately, and that the planning should be on an international level so that developing countries could learn from the achievements of the developed countries (Amosun & Olufunmilayo, 1994). While there is adequate

information about the role of physiotherapy among the elderly in many developed nations, there is a lack of similar information in many developing African countries (Amosun & Olufunmilayo, 1994). A recent report on the role of physiotherapy for the elderly in an African country raised concern about the poor information on the health problems of the elderly population (Amosun, Mazarire & Mawere, 1995). In Rwanda there is no record of an organized effort to take care of the health needs of a growing ageing population. There is therefore concern that the gains in life expectancy may be offset by disabilities which may result from an increased incidence of age-related chronic diseases and associated complications.

In spite of falling being such a common problem it is hard to find any details in the physiotherapy literature about methods for reducing the risks in old people (Simpson, 1993).

Exercise and physical therapy have been shown to improve balance, strength, and functional tasks, as well as reducing functional decline (Ro et al, 2005). However, little information is available on the types of physical disabilities among the older population, particularly disabilities for which physiotherapy may be beneficial (Amosun et al, 1995). Further there is no information n the use of physiotherapy services by the elderly people (Amosun et al, 1995).

CHAPTER THREE

METHODOLOGY

3.1 INTRODUCTION

This chapter describes the research setting, design, and study population and how they were selected. The sampling technique used and the sample size are also given. Inclusion and exclusion criteria are listed. Research methods used, data collection procedures, pilot study, methods used in data analysis and ethical issues are elaborated on.

3.2 RESEARCH SETTING

The survey was conducted in Rwanda in the Umutara Province, one of the twelve provinces of the country. Within the Umutara Province, there are eight districts, namely, Umutara town, which is the only urban district, and Bugaragara, Kabare, Gabiro, Kahi, Rukara, Murambi and Muvumba, which are rural districts. Umutara Province has 423,642 inhabitants, of which 17533 are elderly persons (Rwanda general census of population and housing preliminary results, 2002). The two rural districts of Gabiro and Kahi were selected out of the eight districts of the province. Gabiro is in the south-east and Kahi is in the south-west of Umutara, the northernmost Province of the country. These districts were chosen due to their geographical characteristic similarities in population distribution, gender distribution, lifestyle and living conditions and culture similarities. The other selection criterion for the study setting was based on the fact that the gender structure of the population of Gabiro and Kahi districts is much more balanced; there are almost as many males

as there are females in most of these rural districts compared to other provinces of the country (Ministry of Finance and Economic Planning, 2003). Umutara Province not only has the smallest population size, it also has the lowest densities in the country. Furthermore, the population is unevenly distributed among its eight districts. In effect, 67% of this population is settled on barely a third of the surface area of the Province, while the two districts of Gabiro and Rukara constitute 58% of its surface area but are home to only 25% of its citizens. The above situation can be explained by the fact that most of the eastern part of Umutara Province is being taken up by the Akagera National Park, in which human settlements have been prohibited (Rwanda General Census of population and housing preliminary results, 2002). According to the report on the results of general census of population and housing (Rwanda General Census, 2002), most of the settlements in this province are of recent creation by repatriated Rwandan refugees devoted to extensive traditional animal breeding, where the elderly are usually self-employed in activities related to livestock, agriculture, credit schemes and income-generating activities, underpinned by capacity building with older people's groups and partners. In the absence of publicly funded social security schemes, the elderly rely on the family, which becomes the main source of security and shelter.

3.3 STUDY DESIGN

A descriptive quantitative study design was used to describe and quantify the prevalence of and risk factors for falls among the elderly. A cross-sectional survey was used to collect information on prevalence and risk factors at a point in time.

According to Katzenellenbogen & Joubert (2002), descriptive quantitative study design sets out to quantify the extent or prevalence of a problem.

3.4 STUDY POPULATION

Elderly persons aged 60 years and older who lived in the two selected districts of Gabiro and Kahi of the Umutara Province of Rwanda, and who have experienced a fall or falls, were eligible for this study. The study participants were 200 subjects that are equivalent to 15.2% of the community dwelling elderly persons of the two districts of Umutara Province who were obtained by reaching out to the community places where the elderly could be found. Also these subjects will be further categorized into three subgroups; the vigorous (60-70 years), transition (71-80 years) and the frail group (>80 years) for analysis purposes.

3.5 SAMPLE SIZE

The study survey was based on a convenience sample because of time and financial constraints and the relatively few older people in the Umutara Province. In Umutara, there are 17,533 elders, among whom 8,051 are males and 9,482 are females. The number of elderly people in the two districts of Gabiro and Kahi were 4383 community-dwelling elders (Ministry of Finance and Economic Planning, 2002). 200 elderly people were obtained from the Gabiro and Kahi districts of Umutara Province, which is equivalent to 15.2% of the community-dwelling elderly people. Because of gender, cultural, ethnic, linguistic and wealth homogeneity within these districts of Gabiro and Kahi, one hopes that the convenience sampling does provide a rough representative sample of the few remaining elderly people who fell. The current

literature clearly shows that 30% of people aged 60years and older living in the community fall at least once in a, (Amosun, Mazarire & Mawere, 1994; Chan, Pang, Chee, Ding & Choo, 2004). Therefore the study sample size calculations were based on the literature statistics above.

3.6 SAMPLING TECHNIQUE

A convenience sampling technique was used to get the elderly who were readily accessible and most easily available until the representative number was obtained. A convenience sampling was chosen due to the limited availability of elderly persons in Rwanda, homogeneity of the provincial population, and time and finance constraints. According to De Vos (2002), when using a convenience sampling technique, the researcher simply reaches out and takes the cases that are at hand, continuing the process until the sample reaches a designated size. Any case that happens to cross the researcher's path and has anything to do with the phenomenon is included in the survey until the desired number is obtained (De Vos, 2002).

3.7 SELECTION CRITERIA

3.7.1 Inclusion Criteria

Eligible subjects were elderly persons living in the community in the selected districts of Gabiro and Kahi of the Umutara Province, who had experienced a fall or falls.

3.7.2 Exclusion criteria

Elderly persons with poor memory and who could not independently answer the questionnaire were excluded from the study. In addition, elderly persons with disabilities that predisposed them to falls, such as blindness, amputations both for the upper and lower limbs as they impact on general body balance and cognitive impairments and other neurological impairments like stroke patients, were also excluded from the study.

3.8 DATA COLLECTION

3.8.1 Instruments

A structured, self-administered, close-ended and pre-coded questionnaire including items regarding prevalence of and factors for falls among community dwelling elderly people was used.

The questionnaire was comprised of three different sections, all with close-ended questions. Section A was comprised of only three questions about the basic personal data. Section B only had a single question about the prevalence of falls, whereas Section C was comprised of 14 questions about the risk factors for falls among the elderly living in the community. The questionnaire had the identification number for reference purpose. The questionnaire was made up of 18 of which 4 questions were fill in type of questions and 14 were “yes” and “no” multi-optional questions from which participants were requested to tick the most appropriate alternative.

3.8.2 Validity and reliability of the instruments

Validity is a determination of the extent to which an instrument measures what it is supposed to be measuring (Sarantakos, 1997). To ensure validity and reliability of the instruments, the questionnaire was adapted from previous similar studies by Rice (1994), whose study was about "Reducing the risk factors for falls", and Gallagher (1994), whose study was about "Falls and the elderly". The variables adapted from these studies were modified to be used in this study to identify the prevalence of and risk factors for falls. To ensure reliability of the results, the participants in the pilot study were requested to undergo test-retest; in other words, participants were requested for a second time to fill the questionnaire to check once more for the same results, prior to the main study being conducted. Some corrections were made, such as excluding and modification of some of the questions for purposes of clarity in order to match the main study with the reliability co-efficient of $r^2 = 0.80$.

3.8.3 Language used in the data collection

One language was used, Kinyarwanda, the national [vernacular] language, which was found culturally and socially appropriate since the majority of the respondents could easily read and write the language without difficulties. The original questionnaire was in English. The information was translated into Kinyarwanda by a professional translator to ensure the content of the questionnaire would be accurately retained in the translation from Kinyarwanda to English and later the Kinyarwanda version was again translated into English.

3.8.4 Procedure

Permission was obtained from the Higher Degrees Committee of the University of the Western Cape (UWC). Informed consent was obtained from the Ministry of Local Government, Community Development and Social Affairs, Rwanda. The study was explained to the participants, and written and verbal consent was obtained from each study participant. Participants were informed that they could withdraw from the study at any time. Research assistants were trained on how to issue and collect questionnaires. The researcher and research assistants reached out to the community and took cases at hand, continuing the process until the sample reached the designated size. Appointments with respondents were made at their homes, and those gathered from the church were consulted after the service. The time to fill the questionnaire was 20 to 30 minutes; this was decided after the pilot study and data collection were conducted from 30th December 2004 through 30th January 2005.

3.8.5 Pilot study

The pilot study was done prior to the study to pre-test the instrument and test the approximate time it took to fill the questionnaire. Twenty (20) elderly persons were used for the pilot study in Gabiro district of Umutara Province. The pilot study took only one week for the first phase of data collection; thereafter, test-retest followed in the second week, in which the participants were requested to once again fill out the questionnaire to check for questionnaire reliability, so the entire process took two weeks. These participants were not included in the main study results to avoid bias

due to previous exposure to the questionnaire among the study participants. The reliability co-efficient

$r^2 = 0.80$ implies a marked relationship between the pre-test and re-test results of the pilot study.

3.9 DATA ANALYSIS

Questionnaires were checked for completeness on site and prior to data entry. The completed data was captured in Excel for thorough data cleaning, Do uble data entry was done to ensure data quality. Cleaned data was transferred to SPSS for analysis. Descriptive statistics was used to determine the prevalence of falls and to identify the associated risk factors. Inferential statistics were used to determine association between various variables such as falls and age, falls and gender, and falls and chronic illnesses. Analyses included frequencies and cross-tabulations for the nominal categorical data and variance for the continuous data. Chi-square tests and Fisher's exact tests were used to test the associations between various variables.

3.10 ETHICAL CONSIDERATIONS

The study received ethical approval from the Higher Degree Committee of the University of the Western Cape prior to carrying out the study. Signed, informed consent was obtained from each participant. The study was explained to the respective authorities in the Ministry of Local Government, Community Development and Social Affairs, Rwanda, which gave permission to have elderly persons as study participants. Participation in the study was voluntary, all the information collected

was confidential, and anonymity was ensured. The right to withdraw from the study by any participant during the course of the study at any time was guaranteed. The study results will be made available to the participants publicly through the Ministry of Local Government, Community Development and Social Affairs, Rwanda and all institutions working with elderly in the country.

CHAPTER FOUR

RESULTS

4.1 INTRODUCTION

In this chapter, the descriptive and inferential statistic results of the study are presented. The descriptive results mainly present the demographic and background characteristics of the study participants. In the same way, inferential statistic results highlight the relationship and associations found between various variables in demographic background, falls, and risk factors for falls, as regards falls among the elderly people.

4.2 DEMOGRAPHIC CHARACTERISTICS OF THE PARTICIPANTS

Two hundred (n=200) self-administered questionnaires were distributed to community-dwelling elderly persons in the selected districts of Gabiro and Kahi of the Umutara Province who had experienced a fall since they were 60 years old. All 200 questionnaires were completed and all the questions were answered except 5 participants who did not respond to one question about the frequency of falls sustained in the previous year, hence excluded from the data. Epidemiology of falls calculations based on 195 participants and further calculations based on 200 participants, giving a response rate of 100%. Of the 200 community-dwelling elderly, 127 (63.5%) were males and 73 (36.5%) were females. The study participants were aged from 60 to 102 years, with the mean age for males being 69.38 years (SD= 7.66) and for females being 68.37 years (SD=8.66). The study participants were categorized into age groups, namely 60-70 years, who accounted for 67.5%, 71- 80 years, who

comprised 21.5% and >80 years, who comprised 11%. Most of the study participants were married couples (67%), with 21% widowed, and 9.0% separated. Only 2.0% were divorced and 1.0% was single (never married).

4.3 THE EPIDEMIOLOGY OF FALLS

In the sample, only 195 participants responded to the item about the number of falls they experienced in the previous year. In this survey, 151 elderly (77.4%) had experienced more than one fall during the previous year and were hence categorized as multiple fallers, and 44 elderly (22.6%) had experienced only one fall during the previous year and were thus considered to be single fallers. The mean number of falls experienced during the previous year was 2.94 ˜ 3 falls per person in a year. Males accounted for 125 of the participants compared to their female counterparts, who accounted for 70. Among the males, approximately 82% experienced multiple falls compared to the 70% of the females (Fig 4.1). The association between falls and gender, using the Fisher's exact test, was found to be significant ($p<0.05$).

Fig 4.1 Epidemiology of falls among the elderly

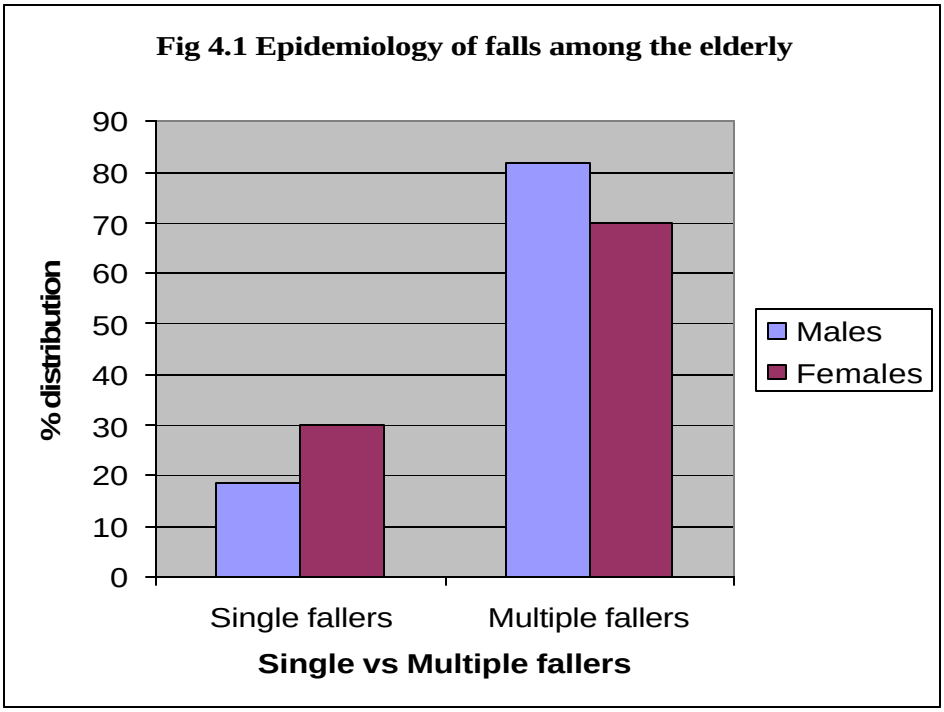
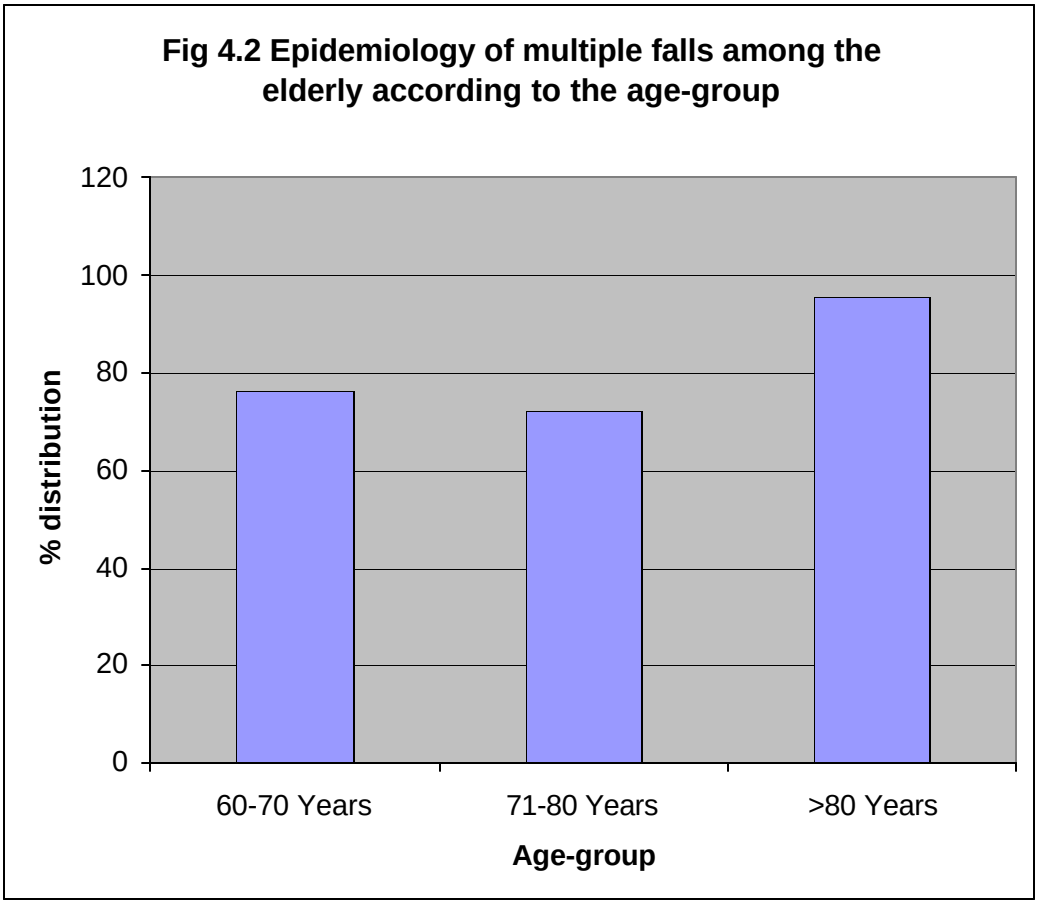


Fig 4.2 indicates that increased age was associated with increased prevalence of multiple falls. Among the elderly persons aged above 80 years, only 4.5% experienced a single fall in the previous year, whereas of those of age range 71-80 years, 28% were single fallers and among those within the age range 60-70 years, 23.8% were single fallers. However, the association between falls and age, using the Chi-square test, was not found to be statistically significant (p=0.086).



4.4. INJURIES ASSOCIATED WITH FALLS

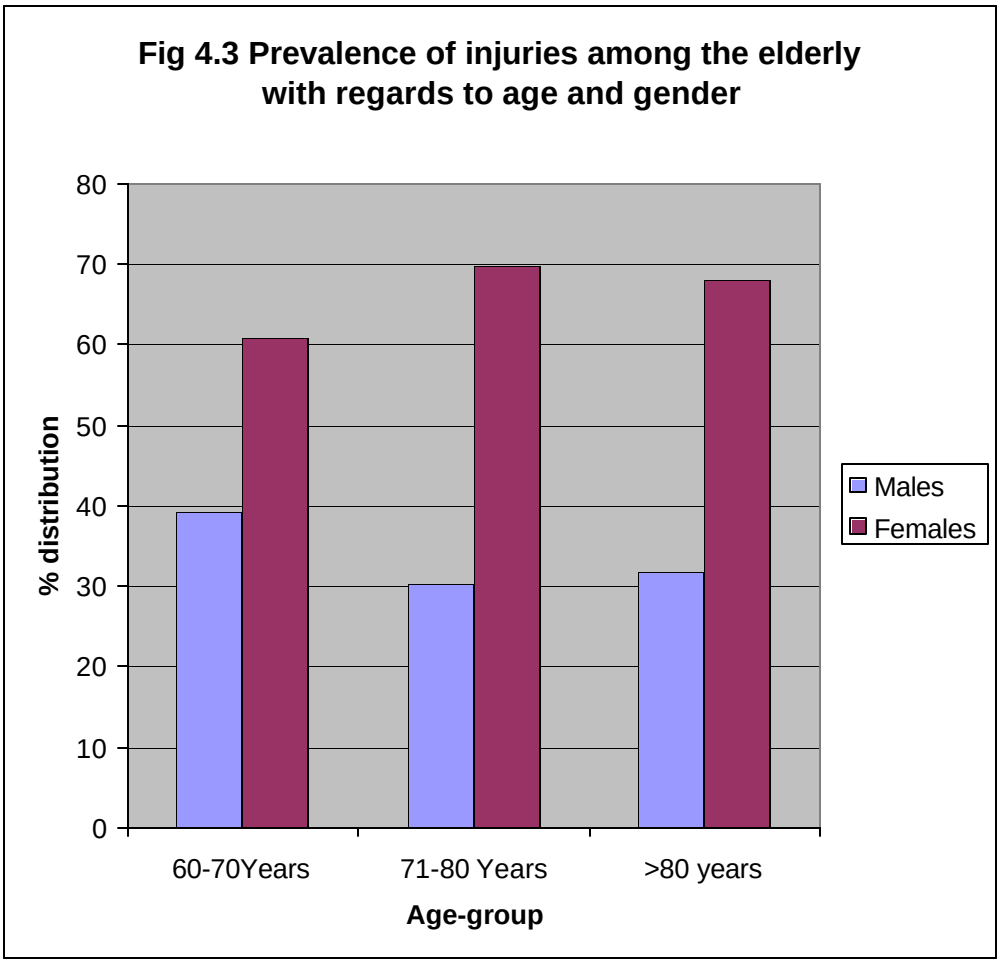
The majority of the study participants (84%) sustained injuries as a result of their falls. According to the study survey, 45% broke their hips as a result of a fall, 27% suffered lower back pain, approximately 24% suffered bruises, 18% broke their ankles, 15% broke their ribs, 15% sustained broken wrists, 12.5% sustained cuts and grazes, and 3.5% sustained other injuries not listed above.

Table 4.1 Type of injuries

Type of injuries suffered	Yes	No	p-value
	Frequency (%)	Frequency (%)	
Broken hip	90 (45)	77 (38.5)	.000*
Back pain	54 (27)	113 (56.5)	.040*
Bruises	47 (23.5)	120 (60)	.088
Broken ankles	36 (18)	131 (65.5)	.580
Broken ribs	30 (15)	137 (68.5)	.402
Broken wrists	30 (15)	137 (68.5)	.988
Cuts and grazes	25 (12.5)	142 (71)	.180
Other injuries	7 (3.5)	160 (80)	.880

Significant ($p<0.05$)

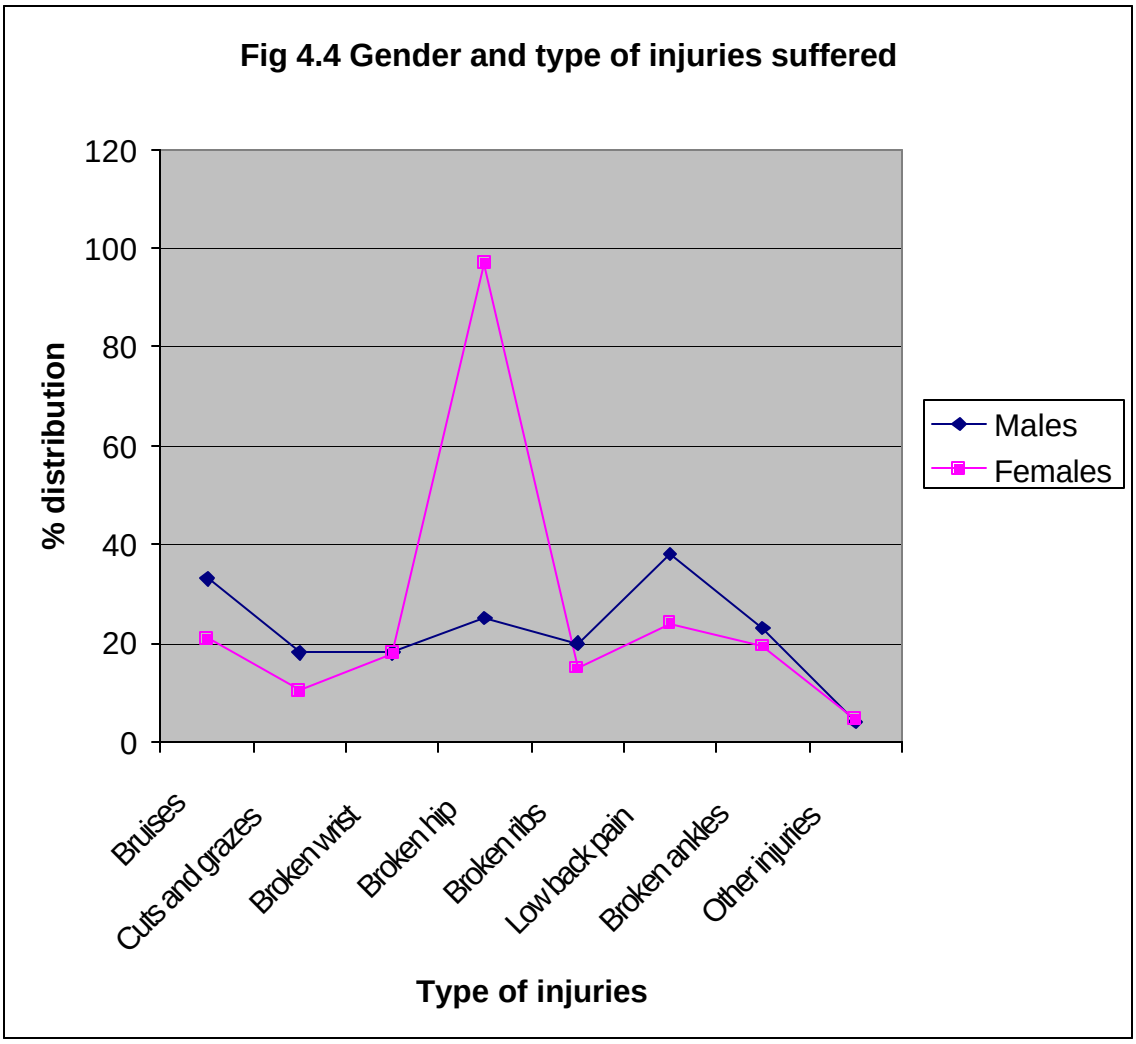
The associations between gender and type of injury suffered were found significant: p=0.000 for females and hip-joint injuries and p=0.040 for males and back pain. The most prevalent fall-related injuries among older adults were injuries of the hip and back (Table 4.1). The frequency of lower back pain was higher in males than among females; 70% of males and 28.6% of females in the age range >80 years reported back pain as a result of falls. Half (50%) of the male participants in the age-range >80 years reported ankle injuries.



There was no association between injuries sustained and age. However, injury rates are high in the age range 71-80 years old, with 88.4% sustaining injuries. This was followed by the age-range 60-70 years old, in which 83.7% sustained injuries, and 77.3% in the >80 years age range had sustained injuries. Females were found to have higher injury prevalence (93.2%) compared to the males (78.7%). The association between gender and injuries suffered, was found to be significant (p=0.007).

4.4.1 Gender and type of injuries suffered

There was a significant association between gender and type of injury suffered among the community-dwelling elderly when they fall (p=0.000). Females tended to injure their hips 97.9%, whereas males were more likely to injure their backs (38%) as they fell (p=0.040).



4.5 RISK FACTORS FOR FALLS

Risk factors for falls are conditions that influence an elderly person's health status and are capable of causing illness or injury, including genetic or biological risk factors, lifestyle, or environmental conditions that can lead to falling among the elderly.

4.5.1 The intrinsic risk factors for falls

4.5.1.1 Age

The study results indicate that increased age is associated with increased prevalence of falling, as indicated in figure 4 .2.

4.5.1.2 Gender

Gender has been identified as a risk factor for falls. The study results show that approximately 82% of the males and 70% of the females had suffered multiple falls in their previous year, as indicated in figure 4.1.

4.5.1.3 Chronic illnesses

Table 4.2 describes the chronic illnesses common among the participants in the study survey. Diseases have been regarded as related to falls among older people and have been reported as important predisposing factors for falls. Chronic illnesses among elderly people have been identified as an important risk factor for falls. Specific chronic conditions or diseases were associated with an increased risk of falling. The most common chronic illnesses were visual deficits (58.5%), painful joints (48%), and balance deficits (24.5%). Others that were less prevalent included muscle atrophy (24%), urinary incontinence (21%), hearing deficits (19.5%), touch deficit (14%), low

blood pressure (14%), high blood pressure (10.5%) and other chronic illnesses such as malaria and asthma; peptic ulcers accounted for 10.5% and diabetes for 4%. No significant association was found between falls and having a chronic illness among elderly (p=0.077).

Table 4.2 Chronic Illnesses

Chronic Illnesses As Intrinsic Factors	**Yes Frequency (%)**	**No Frequency (%)**	**p- value**
Vision deficit	117 (58.5)	59 (29.5)	.978
Painful joints	96 (48)	80 (40)	.732
Balance deficit	55 (27.5)	121 (60.5)	.599
Muscle atrophy	49 (24.5)	127 (63.5)	.915
Urinary incontinence	42(21)	134 (67)	.730
Hearing deficit	39 (19.5)	137 (68.5)	.983
Touch deficit	28 (14)	148 (74)	.857
Low blood pressure	28 (14)	148 (74)	.737
High blood pressure	21 (10.5)	155 (77.5)	.729
Others chronic illnesses	21 (10.5)	155 (77.5)	.634
Diabetes	8 (4)	168 (84)	.772

4.5.1.4 Body changes that increase the possibility of falling

The following are the age-related physiological and biomechanical body changes that predispose the elderly people to falls. Biomechanical changes include decreased muscle strength. Changes in mobility include joint stiffness, reduced muscle strength and impairment of balance and gait, leading to an increased risk of falling.

Table 4.3: Self-reported body changes that predispose the elderly to falls

Reported body changes as intrinsic factors of falls	Yes Frequency (%)	No Frequency (%)	p-value
Joint stiffness	155 (77.5)	19 (9.5)	.091
Muscular weakness of lower extremities	144 (72)	25 (12.5)	.000*
Loss of balance	130 (65)	23 (11.5)	.393
Loss of coordination	117(58.5)	34 (17)	.010*
Nocturia	91 (45.5)	41 (20.5)	.115
Acute illness	84 (42)	37 (18.5)	.235
Posture sway	42 (21)	76 (38)	.723
Other body changes	6 (3)	3 (1.5)	.134

Significant ($p<0.05$)

Not all body changes had a strong relationship with falls except for lower extremity muscle weakness (p=0.000) and loss of coordination (p=0.010) as indicated in Table 4.3.

4.5.1.5 Chronic medication and multiple drug use among elderly

Among the participants of this study, 49.5% used chronic medication. At least 40.5% of those who used chronic medication took multiple drugs, and the common drugs used were sedatives (51.5%) and antidepressants (19.5%). Table 4.4 indicates the most common drugs used in order of frequency.

Table 4.4 Most common drugs used

Drug class used	Yes Frequency (%)	No Frequency (%)	p-value
Sedatives	103 (51.5)	27 (13.5)	.006*
Antidepressants	39 (19.5)	91 (45.5)	.587
Hypotensives	14 (7)	116 (58)	.796
Diuretics	8 (4)	122 (61)	.746
Hypnotics	10 (5)	120 (60)	.420
Estrogen replacement	2 (1)	128 (64)	.420
Other drugs used	34 (17)	94 (48)	.409

**Significant ($p<0.05$)*

There was a strong significant association between falls and sedative class use among elderly people who fell (p=0.006) as indicated in Table 4.4. Of the multiple fallers, 84.5% were using sedatives.

4.5.2 Extrinsic risk factors for falls

Extrinsic risk factors that have been reported among the community-based causes of falls involved the type of activity being done and the location of a fall (inside the home, outside but near the home entrance, and away from home). Various environmental hazards that the elderly may be confronted with at the time of the fall, assistive devices and the time of day when a fall or falls were experienced have also been identified.

4.5.2.1 Host factors and situational circumstances causing falls.

Among the study participants, 56% who fell attributed their falls to tripping, 49.5% attributed their falls to slipping and 46% to fainting. In addition, 25% fell because their legs gave way, 17.5% lost their balance, 15% felt dizzy, 9% fell because they were acutely sick, 7% fell because they were drunk, and 1% were not sure why they fell.

4.5.2.2 Place of fall occurrence and associated risk factors.

Table 4.5 indicates the indoor causes of falls. These are situational circumstances (what the person was busy doing or the type of activity that was in progress during the event of falling) as well as the behavioral causes of falls.

Table 4.5 The indoor causes of falls.

Place of occurrence of a fall or falls (inside) and associated risk factors	Yes Frequency (%)	No Frequency (%)	p-value
Wet or slippery floor surfaces	68 (34)	62 (31)	.097
Transferring on or off the bed, chair, toilet	54(27)	76 (38)	.787
No lighting in the house	37 (18.5)	93 (46.5)	.429
Fell when getting out of the bed	26 (13)	104 (52)	.304
Loose carpets, mats, rugs, electrical extension cords	23 (11.5)	107 (53.5)	.020*
When walking in a straight line	23(11.5)	107 (53.5)	.000*
When bending over and picking up things from the floor	16 (8)	114 (57)	.779
When showering/Bathroom	14 (7)	116 (58)	.813
When putting on ill-fitting shoes	12 (6)	118 (59)	.706
Inappropriate heights of chairs, beds and toilets.	5 (2.5)	125 (62.5)	.124
Fell due to other causes not mentioned above.	3 (1.5)	126 (63)	.375
Inappropriate assistive devices	2 (1)	127 (63.5)	.580

*=Significant ($p<0.05$)

Statistical association was only found between the indoor falls that occurred when walking on a straight line (p=0.000). Also Loose carpets, mats, rugs, extension electrical cords were found significantly (p=0.020) associated with indoor causes of falls and the actual fall as indicated in Table 4.5.

Table 4.6 indicates the outdoor causes of falls (that is, falls that occurred outside the home). These include trips and slips on the footpath, in the garden, falls on

stairs, unfamiliar environment and others. No significant association was found between outdoor causes of falls and the actual fall.

Table 4.6 The outdoor causes of falls that happened at the home entrance and outside home.

Place of occurrence of a fall and associated risk factors	**Yes Frequency (%)**	**No Frequency (%)**	**p-value**
Fell near the home entrance on the footpath	88 (44)	19 (9.5)	.113
Fell near the home entrance in the garden	29 (14.5)	78 (39)	.225
Fell when descending/ascending stairs	24 (12)	106 (53)	.231
Fell away from home in a crowded or unfamiliar environment	12 (6)	95 (47.5)	.998
Fell after leaving home due to other causes not mentioned above	-	107 (53.5)	-

Table 4.7: These are the outdoor causes of falls that happened away from home, that is, falls that occurred at a considerable distance away from home, depending on the individual daily living demands. No association was found between the outdoor causes of falls and the actual fall.

Table 4.7 The outdoor causes of falls that happened at a considerable distance away from home.

Place of occurrence of a fall and Associated risk factors	**Yes Frequency (%)**	**No Frequency (%)**	**p-value**
Fell away from home on the footpath	113 (56.5)	51 (25.5)	.775
Fell away from home on a kerb or gutter	56 (28)	109 (54.5)	.714
Fell away from home in the garden or on the farm	53 (26.5)	112 (56)	.721
Fell away from home in a public building	9 (4.5)	156 (78)	.578
Fell away from home in another person's home	7 (3.5)	158 (79)	.264
Fell away from home due to others	4 (2)	161 (80.5)	.400

4.5.2.3 Age and place of fall occurrence

The association between age and place of fall occurrence, using the Chi-square test, indicated a strong statistical association ($p<0.05$). More study participants aged 80 years and older (40%) suffered indoor falls compared to other age ranges. The causes were loose carpets, mats, rugs or electrical extension cords ($p=0.020$). Other age ranges did not show any statistical significance. The other indoor falls associations were found in the particular age-range 71-80 years and walking on a straight line ($p=0.000$).

4.5.2.4 Assistive devices used by study participants

Most of the participants (68.5%) used a stick as an assistive device, 22.5% used hearing devices, 7% used spectacles and other assistive device including walking frames (7%), a cane (5.5%) and a walker (3.5%).

Table 4.8 Assistive devices used by participants

Assistive devices	Yes Frequency (%)	No Frequency (%)	p-value
Stick	137 (68.5)	19 (9.5)	.323
Hearing devices	45 (22.5)	155 (77.5)	-
Spectacles	14 (7)	141 (70.5)	.804
Walking frame	14 (7)	141 (70.5)	.335
Cane	11 (5.5)	144 (72)	.946
A walker	7 (3.5)	148 (74)	.747
Others devices	-	156 (78)	-

4.5.2.5 Assistive device-induced falls among the participants

Despite the support given by assistive devices to elderly people, various assistive devices have been reported to have predisposed elderly people to falls. Among the 68.5% participants who used a stick, 8.8% fell as a result of the use of the stick. With regard to the participants using a walking frame, 21.4% fell as a result of the walking frame (Table 4.8). Furthermore, 21.4% fell due to bifocal spectacles and their effects, 27.3% fell due to a cane, and 28.6% fell as a result of a walker. However, no fall by the study participants could be attributed to hearing devices or other devices.

Although some injuries are caused by assistive devices, the total number may not be of statistical significance. There was no association between the assistive devices and falls.

4.5.2.6 Fall occurrence and the daytime when falling event happened.

Table 4.9 indicates the daytime when falls were experienced relating to the individual circumstances. Daytime changes affect older people differently.

Table 4.9: Daytime when falls were experienced

Time of the day falls were experienced	Yes Frequency (%)	No Frequency (%)
Fell in the evening hours	90 (45)	110 (55)
Fell in the morning hours	83 (41.5)	117 (58.5)
Fell in the afternoon hours	79 (39.5)	121 (60.5)
Fell during night hours	55 (27.5)	145 (72.5)

Most of the participants over the age of 70 years (62%) were likely to fall in the evening (p=0.010). There was a significant association (p =0.045) between gender and daytime when falls were experienced. Females (45%), tended to experience more falls in the afternoon hours, whereas males (48%), fell more in the evening hours. There was a significant association (p= 0.047) between gender and indoor falls. With regard to indoor causes of falls, (63.3%) of the females suffered indoor falls due to wet or slippery floor surfaces, as opposed to males (45.7%). Males (37.3%) were more likely to fall at some distance from home, on the footpath or in the garden or on the farm, compared to their female counterparts who accounted for 21.8%. No statistical association was found between outdoor causes of falls and the actual fall.

CHAPTER FIVE

DISCUSSION

5.1 INTRODUCTION

This chapter will discuss the results of the study in the context of the overall aim of the study, study objectives and the current literature. The aim of the study was to determine the prevalence of falls and the risk factors for falls among the elderly living in the community in the selected districts of Gabiro and Kahi of the Umutara Province of Rwanda.

5.2 EPIDEMIOLOGY OF FALLS

In the current study, more than three-quarters (77.4%) of the study participants had recurrent or multiple falls (defined as having more than one fall) within the previous year. The results found that 23.2% of the community-dwelling elderly people have had multiple falls, with approximately 3 falls as the mean number of falls per person in the previous year. The above evidence demonstrates that the rate of falls among the study participants was higher than reported by other studies. Cumming (1998) contends that about 30% of people aged over 65 years and living in the community fall at least once in a year, and nearly 10% fall twice or more per year. A similar study reported similar results; stating that, annually, approximately 30% of the community-dwelling older adults fall once, and 10%-20% fall two or more times (Ro et al., 2005).

In this current study, men fell more than women, and 81.6% of the men and 70% of the women were multiple fallers. This was similar to the results of the study by Ro et al. (2005) who observed the effects of exercise intervention to improve strength and dynamic balance among community-dwelling older adults and reported that the incidence of falls was higher in men than in women.

Most of the falls among men happened outside. This may indicate a difference in social roles, with elderly men more inclined to face risky situations. Men were much more involved in outdoor functional activities, as opposed to women, who fell inside but had far fewer falls. Further support for the study results come from Gallagher (1994) who, in the study of falls and the elderly, found men and women who fell tended to do so under different circumstances; men were more apt to fall outdoors and at higher level of activity, while women were more likely to fall inside. This study also adds that the most frequent activities associated with falls were walking, carrying something, and hurrying. Most falls in this current study occurred outside, with the high peak in the evening. The high incidence of falls in the sample can be explained by the fact that the majority of the study participants (67%) were in the vigorous age group, who would remain on the move for many hours of the day, and the risk increases during the day, with a peak in the evening. This points to the complexity of factors related to falls that are frequently caused by a coincidence of health status (general and temporary), environmental circumstances, tiredness, and difficult manoeuvres such as getting in and out of the bed.

Another explanation for the high incidence of falls in the evening could be attributed to visual deficits that compromised people's sight as the majority

(58.5%) of the study participants had visual impairments. The other high incidence of falls was in the morning; this could be a reflection of the older people's schedule of everyday functional roles. They leave their homes in the morning for outdoor activities like walking long distances, most of the time in a hurry and sometimes carrying something, hence making them more susceptible to falls. Some studies have shown that increased activity in very old people can mean more falls and injuries (Campbell, Robertson, Gardner, Norton, Tilyard & Buchner, 1997). In Rwanda, all the age groups, namely, 60-70 years (vigorous group), 71-80 (transition group) and the frail group aged >80 are exposed to risky situations despite gender and cultural norms and values being in place. This has subjected them to high fall rates during their daily living activities. The issues related to the rural elderly and to the ageing of rural populations in Rwanda differ from those of urban elderly population in other countries in a number of aspects. In Rwanda, there is no database on falls among the elderly, or any other academic publications in the geriatric field, and in this study, being the first study in this field in Rwanda, it is of importance for the researcher to use his observations, opinions and experience to explain some of the study results in relation to other studies in the current literature. In Umutara Province, the roles of elderly men are mostly concerned with outdoor activities such as looking after cattle, tilling land, shopping, and walking long distances in search of water and grass for their animals. Other activities are milking cows and transporting milk to marketplaces, and many of these tasks are beyond their strength, hence increasing their chances of falling. On the other hand, women are involved in

indoor activities most of the time, and these include cleaning the house, producing handcrafts, preparing meals, giving care and support to their grandchildren, looking after the home and, on some occasions, tilling the land in the absence of the husbands, especially in the case of the widows. Other activities are visiting in their neighborhood, attending local gender-based meetings and partaking in other local community events. In Rwanda, the gender-ascribed roles for each sex vary through the life cycle, and the status of elderly men and women are different from those ascribed at younger ages. The explanation may be that older males try to manage independently in activities which are too demanding, relative to their abilities. More important, from a rural perspective, is the modification of gender roles due to declining activities of husband and/or wife and to widowhood at older ages. This means the roles and the obligations of the ageing spouses are altered if one spouse becomes too frail to perform his or her normal role, and with more women being widowed, they often need to take over the roles ascribed to men, putting them at greater risk of sustaining injury. The situation can vary considerably from culture to culture and thus needs to be analyzed accordingly. Older people in Rwanda today are being seen in terms of their material possessions (money, land, cows, agriculture products, number of children and so on) and this has worsened after the 1994 genocide and its political killings. This has affected the social situation of elderly people in the country: many were killed, others died through exhaustion, despair and loneliness. Many older people who survived have no moral or material support; yet older people have become the heads of households and breadwinners for

their families (Association of Elderly People, Rwanda, 1995). It is for this reason that elderly people have no choice of what activity suits them in relation to their strengths and they have to expose themselves to risky situations that increase the risk of falling and the prevalence of falls. From the researcher's point of view, another explanation could be that older men in the Rwandan culture do not believe they are too old for some activities, especially those in the vigorous and transitional age group categories, and because they have no other source of support and care, find themselves in vigorous activities which are beyond their abilities and hence become susceptible to falls. Conversely, the female elders with functional deficits are more careful because they respect their limitations. Ishizuka, Gennaro, Massako & Filho (2005), in a study of falls by elders with moderate levels of movement functionality in Brazil, observed that vigorous active elders were found to fall more frequently than the less active ones, and their falls resulted in more serious injuries because, it is thought, they expose themselves to risky situations, whereas elders with functional deficits are more careful because they respect their limitations. The authors also indicated that the elderly population in transition from the vigorous to the frail age group has been shown to fall less frequently than the frail elderly population, but these individuals must certainly be undergoing changes that may result in a higher frequency of falls as they age, which agrees with the results of this current study. This province being mostly undeveloped land and a rural area becomes, at the same time, a hazardous environment to elderly people, increasing the possibility

of falling. This might have been the reason why 56% of falls were a result of tripping, which reflects the environmental risk factors for falls.

It is found in the current literature that some other studies do negate the findings of the present study. Nordell et al. (2000) demonstrated that in the adult population, women fell more often than men. Cumming (1998) also reported that falls are more frequent among elderly people living in nursing homes than among the elderly living in the community, and women fall more often than men. The results, as well as the current literature, show a clear increase in frequency of falls with advancing age and decreasing functional disability, and, in view of the fall trends and the continued aging of the population, it is likely that the prevalence of falls will continue to increase or even worsen among the community-dwelling elders if no substantial continuous efforts to engage older adults in health promotion behavior and effective management of the underlying causes of falls among this population, such as chronic conditions, are made.

5.3 INJURIES RELATING TO FALLS AND ITS IMPACTS

Falls among older people are common, disabling and often fatal (Luxton & Riglin, 2003). Similarly Wang & Wollin (2004) reported that falls can result into injury, reduced quality of life and even death for older people. Wang & Wollin (2004) added that half of all older people who fracture their hips never regain their pre-fall level of mobility; a factor that adversely affects their quality of life by decreasing mobility, independence and increasing mortality. In the current study, the most prevalent fall-

related injuries among older adults were injuries of the hip being the most prevalent, back injuries, and broken ankles. Other injuries that were less frequent include bruises, broken ribs, broken wrists, cuts and grazes. Still other injuries that were reported include injuries of the pelvis and dislocation of the hip joint.

Kannus & Karim (2001) reported that about 70% of fall-induced injuries sustained by elderly people are bone fractures, hip fracture being the most common, the most devastating and the most costly for the modern health-care system to treat. Cumming (1998) reported that hip fractures are the most serious consequences of a fall. The incidence of hip fractures increases spontaneously with age. In this study, hip injuries are more common among women of all age groups especially those within the vigorous age group than the literature shows. Cumming (1998) reported that the age-specific incidence of injury in women is about half of that in men. The incidence rates of fall injury gradually increased in men after 80 years; however, in this study women sustained a higher fall injury rate incidence across all age ranges. Ro et al. (2005) reported that falling contributes to 90% of hip fractures in the USA. Incidences of falls and hip fractures in older adults increase steadily with age and gender (Robenstein et al. 1994). Murenzi (2000) contends that the reason for the high incidence of hip injuries among females could be due to osteoporosis that can start at the age of 30 years in women and accelerates after menopause. A report by NSW Health (2000) considered that these age groups roughly coincide with different types of needs and risks of fall injury. Women experience higher levels of fall injury than men do, but as the male life span is shorter and other causes intervene, the incidence of serious fall injury is somewhat lower.

Suzuki, Ohyama, Kiyomi, & Kanamori (2002) speculate that among elderly people, falls resulting in hip fractures are a major factor contributing to immobility and prolonged confinement. Even when there is no direct physical injury, the experience of falling may create a fear of spontaneous collapse and loss of control, and this leads to anxiety about self-sufficiency and independence. Kallin et al. (2004) added that falls and their consequences, such as fractures and other injuries, fear of falling, impaired function, and dependency are serious health problems in the older population. Moran (1993) reported that in the USA, 10% of falls cause serious injuries, such as hip fractures, and the remaining 90% of older fallers may experience less severe injuries, some warranting attendance at an emergency department or a visit to a general practitioner. Kenneth (1994) reported that physical injury is only one aspect of the consequences of a fall. Fear of repeated falls often severely restricts travel, shopping and attending church, resulting in social isolation and depression. The author continues by saying that one-quarter of elderly patients who have fallen report that they avoid essential activities such as mobility in the home, bathing and dressing because of fear of falling again. According to Kannus & Karim (2001), the problem of fall-related injuries is likely to increase because the number of elderly people and their mean age is increasing everywhere and because there are clear signs that the age-adjusted incidence of fall is also rising.

5.4 FACTORS INFLUENCING FALLS

Most falls results from a complex interplay of predisposing and precipitating factors in a person's environment (Shobha, 2005). In this current study, the

potential risk factors for falls include characteristics such as: physiological changes, chronic illness, chronic medication and multiple drugs. Environmental, host and situational circumstances, assistive devices and time of the day were also potentially identified risk factors in the sample.

In this study, the most commonly identified normal physiological changes and their effects as a result of the aging process were: advanced age, neuro-muscular and musculoskeletal impairments such as joint stiffness, lower extremity muscle weakness, loss of balance and loss of coordination were the most prevalent and symptomatic health problems identified among the study participants. Although there is no perfect definition of the aging process, Jette, Branch & Berlin (1990) defines aging as the "manifestation of biological events that occur over time". The term "aging" refers to a process or group of processes occurring in a living organism that, with the passage of time, leads to a loss of adaptability, impairment, functional limitation, and disability, eventually leading to death (Jette et al. 1990). Advanced age and the high prevalence of falls are due to normal physical and mental changes related to aging, such as decreased functional reserve and physiological or functional impairments (Fuller, 2000). Simpson (1993) explains that the reason why increased age is a risk factor for falling is that the information processing in the nervous system slows with advancing age and leads to an increase in the time needed to organize appropriate response stimuli.

According to Lemier (2002), the relationship between age and falling is partly explained by physiologic changes that occur as people grow older. These changes could be due to osteoporosis, arthritis, decreased muscle strength and discomfort and pain. Lemier (2002) contends that individuals with these changes may respond more slowly during difficult or emergency situations or develop early and excessive fatigue, which might lead to a fall. The loss of lower extremity muscle strength relates to the increased number of falls experienced by the elderly observed in this study. According to Gallagher (1994) elderly persons with reduced muscle strength stand a greater risk of falling because muscles hold up the body's skeletal structure. Lower extremity muscle weakness is common in the elderly and has been identified in some studies (Gallagher, 1994). Kenneth (1994) reported lower extremity muscle weakness as the second most prevalent cause of falls. The author indicates that individuals with leg weakness have about a fivefold increased risk of falling, while those with gait and balance disorders have a threefold increased risk of falling. Loss of balance and loss of coordination were also common body changes that increased the possibility of falling in this study. Ro et al. (2005) speculates that age-related changes in balance are the result of changes in every system in the body. Neurologic changes include slowed response to loss of balance, decreased righting response, and abnormal sensory selection or weighting (Ro et al. 2005). Changes in muscle activation patterns may impair the ability to maintain or recover balance response to perturbations especially when stepping onto an uneven surface or being bumped (Huang et al. 2003).

With increasing age comes an increased probability of experiencing chronic debilitating conditions and loss of functional capacity (Huang et al. 2003). The causes of falls are numerous and there are a number of pathological conditions to be considered (Eisenberg, 2004). The author claims that any condition that reduces or impairs well-being, such as painful joints, balance deficits, muscle atrophy, urinary incontinence, hearing deficits, touch deficits or reduced judgment, and high or low blood pressure are the common causes of falls among older adults (Eisenberg, 2004). These conditions impair many functions, increasing the chance of falling (Eisenberg, 2004). The presence of chronic illnesses has been consistently linked to falls among older persons.

In this current study visual deficits and painful joints were the most prevalent chronic conditions or diseases associated with an increased risk of falling. Huang et al. (2003) adds that aging is often accompanied by a deterioration of general health. These changes increase the likelihood of illnesses and fatigue or feelings of distress (Simpson, 1993). Accompanying these gradual changes are changes in special senses, which include vision, hearing, touch, and smell, leading to functional decline (Simpson, 1993). Vision deficits were the most prevalent causes of falls of which 58.5% participants fell as a result of vision impairments. Eisenberg (2004) contends that decrease in visual acuity is at least one factor involved in falls. Besides visual equity, contrast sensitivity and depth perception also all decrease as patients age (Eisenberg, 2004).

Painful joints accounted for 48% of the study participants' falls. Fletcher (2004) and Horn (2000) indicate that specific conditions or diseases of joints and arthritis were associated with an increased risk of falling. Horn (2000) further stresses that a history of arthritis and impairment that decreases the range of motion of joints have been shown to increase the risk of falling. Other chronic illnesses that were less prevalent among the study participants included muscle atrophy, urinary incontinence, hearing deficits, touch deficit, low blood pressure, high blood pressure, and other specified chronic illnesses that included chronic malaria, asthma, peptic ulcers and diabetes.

Gallagher (1994), in the study on falls and the elderly, found that 10% of falls were a result of chronic illness. The incidence of chronic conditions has been shown to increase with advancing age, and this population is especially vulnerable to loss of function and independence following a fall that leads to injury or illness. Elderly individuals often suffer from several diseases at the same time, such as cardiovascular disorders, arthritis, and diabetes, with its various complications. These disease processes interact and their effects are additive (Gallagher, 1994).

Associated with chronic illness is chronic medication use. Medications are another risk factor that has been consistently implicated in falls among the elderly population. As the human body ages, it becomes less able to tolerate medication (Gallagher, 1994). Drug effects and reactions can affect cognition and mobility, thus contributing to falls (Gallagher, 1994). It appears that the propensity for an older adult to fall

increases with the number of medications consumed. Ability to follow dosage regimes may be impaired due to cognitive and memory problems in some elderly persons (Gallagher, 1994). Kenneth (1994) adds that medication plays an important part in the pathophysiology of falls. The author continues by saying that drugs such as sedatives may directly lead to falls related to postural hypotension, sedation, decreased reaction time or decreased cognitive abilities. The risk of falling is greater for patients receiving medication with extended half lives (greater than 24 hours), and increases exponentially with the number of medications used (Kenneth, 1994). The use of large numbers of medications from multiple categories compounds the risk of falls (Kenneth, 1994). With regard to medications, there was a higher statistically significant association between falls and sedative drug use ($p<0.05$). Among those who fell due to the side effects of drugs, 84.5% of multiple fallers and 61.3% of single fallers were taking sedatives, whereas other drug classes did not show any statistical significance.

In this study, most falls were as a result of tripping, slipping, fainting and the legs giving way. Host and situational circumstances precipitated most of the falls among the participants; some fell because they lost their balance during activity or felt dizzy during the activity. Others fell when acutely sick or drunk, and a few did not know why they fell. Homes of elderly people often contain many environmental hazards. Most falls were related to movements, and since elderly people will want to preserve their freedom to move around, tripping and slipping cannot be avoided altogether. The most commonly cited extrinsic causes of falls that happened inside the home were due to trips and slips on loose rugs, slippery wet floor surfaces, and uneven door thresholds, in association with poor lighting that compounds visual changes associated with aging. Mostly these falls

were aggravated by host and situational circumstances in association with the type of activity in progress when a fall was sustained. This could be a reflection of the high fall peaks reported in the evening. Most falls happened in the evening among males as opposed to females who tended to fall in the afternoon hours (p=0.010). This could be a result of exhaustion and tiredness, as most elderly people are returning home for rest. This may also be linked to visual impairments that were compromised by poor lighting or no light at all, which makes it difficult for elderly persons to negotiate and identify the underlying obstacle. Koski (1998) reported that tiredness during the active hours of the day obviously disturbs the functioning of the protective reactions and impairs perception among the independently moving elderly, making them liable to injurious falls. Tripping on loose carpets, mats, and electrical extension cords has been recognized as a serious cause of falls among the study participants in this study. Other falls were incurred when walking on a straight line, which is very demanding as it requires balance and stabilization of the whole body. However, this could be attributed to various health problems like joint stiffness, poor lower extremity muscle strength, loss of balance and loss of coordination which were most prevalent among the sample. The study findings are consistent with the findings of Weel (1995) who stated that External factors (tripping and slipping) are responsible for half the falls encountered in a general practice in those over 65 years. The author continues to say that the distinction between external and internal risk factors is not clear-cut; for instance, a rug on a highly polished floor may cause an infirm woman to fall when a fit one could have saved her. Gallagher (1994) and Kenneth (1994) reported that extrinsic risk factors for falls also play important roles in falls and are often included in the "accident" category when causes of falls were analyzed.

Assistive devices were used by the study participants to improve their functional independence. Most used sticks, hearing devices and spectacles. Others, like walking frames, canes and walkers, were less used. Elliot (1991) contends that assistive devices can allow a person with disabilities to function more

independently, thus gaining self-respect and greater acceptance in mainstream society. According to Elliot (1991), assistive devices have the potential to reduce the need for expensive human help and intensive informal care. A stick was found to be the most highly used assistive device, perhaps because a stick is the most accessible and affordable assistive device in such an economically disadvantaged society. Within the sample, 8.8% fell due to poor use of a stick and 21.4% fell as a result of a walking frame, which could be attributed to lack of upper-arm muscle strength, since a walking frame requires upper-arm strength and requires that the user be able to maintain his or her balance while lifting the walker up and then placing it down again. When this becomes too difficult for the person to accomplish, he or she begins to push the walking frame along the floor, which can increase the risk of falling. Within the sample, 21.4% fell due to spectacles used; this could have been the effect of bifocal glasses. Gallagher (1994) speculates that bifocal glasses may contribute to falls by distorting vision while descending stairs. There are other problems like lack of assistive device technology to provide appropriate devices by matching an individual's needs and abilities with appropriate equipment. This requires a solid knowledge of physical needs assessment techniques and a strong background in the constantly changing field of available technology. Many problems result from mismatches between individual needs and assistive devices. What works perfectly for one person may be a dismal failure for another, due to the unique characteristics of the people involved.

5.5 IMPLICATIONS FOR PHYSIOTHERAPY INTERVENTION

Older people fall but not because they are old. The risk factors for falling are multi-factorial. Falling has many potential contributing factors, yet is often a preventable health condition (Robinson, Gordon, Scott & Visio, 2004). Falls are a complex interaction between intrinsic and extrinsic risk factors, there is uncertainty surrounding some of these risk factors, and one explanation is that risk of falls and

injurious falls varies with functional status of an individual (Nuffield Institute for health and national health survey,1996); Koski et al, 1998; Langlois, Smith, Nelson, Sattin, Stevens & DeVito, 1995). Frail older people are at high risk of falling and of injuring themselves, but at the other end of the spectrum, healthy older people who engage in large quantities of diverse and challenging physical activities, also have a disproportionately high risk of falling (Koski et al., 1998).

Physiotherapists are identified as one of the essential members of specialized falls prevention teams (Chartered Society of Physiotherapy, 1999). Physiotherapists working in all specialties, particularly acute medicine, orthopaedics and neurology, should also be able to be aware of dangers of falling, be able to identify risk factors and take appropriate action (Chartered Society of Physiotherapy, 1999). The risk factors for falling that were the most consistently reported in this current study, and that all physiotherapists should be aware of were: advanced age, gender, joint stiffness, lower extremity muscle weakness, loss of balance and coordination. Chronic illnesses (vision deficits, painful joints), chronic medication (sedatives and antidepressants), multiple drug use, environmental hazards such as the presence of obstacles in the way, host and situational circumstance, assistive devices and time of the day also contributed to falls.

Gillespie, Gillespie, Cumming, Lamb & Rowe, (2001) contends that fall prevention is a recent development in medical rehabilitation and public health. Physiotherapists are more likely to be involved with people who are in high-risk groups. Working in

primary care, physiotherapists may come into contact with a range of older people, from healthy to significantly disabled (Gillespie et al., 2001). The most frequently encountered risks are impairments of gait, balance, areas in which physiotherapists have considerable expertise (Gillespie et al., 2001). In this study, lower extremity muscle weakness, difficulty walking on a straight line perhaps due to loss of balance, loss of coordination together with lose carpets, mats, rugs and electrical extension cords and sedative drug use were statistically significant potential risk factors for fall ($p<0.05$).

In programmes for the community-living elderly people at risk of falls, examination of successful exercise programme was essential (Piotrowski, 1999). Physiotherapists are key providers of exercise interventions for elderly people and knowledge of beneficial programme components is essential for the design of appropriate exercise programmes for those considered at risk of falling (Piotrowski, 1999). The same author adds that an appropriately prescribed programme of exercise taught initially by a physiotherapist and continued at home by elderly subjects, can reduce fall incidence. Similar findings were reported by Gillespie et al. (2001); Gardner, Robertson & Campbell (2000) who suggested that for exercise interventions to be more effective it should be prescribed by appropriately trained personnel, such as a physiotherapist. However other similar studies reported that exercises have been found effective in reducing risks of falls when combined with other treatments (Campbell et al. 1997). However, the effectiveness of an exercise programme depended much on the manner in which it was conducted (Gardner et al. (2000). The

same author adds that exercises should focus on improving strength and postural stability and should be graded from simple to complex approach, starting with seated and supported exercises (Gardner et al. (2000); Gillespie et al. 2001).

Physiotherapists form the major component of most interventions because impairments of gait and balance are one of the most significant and prevalent risk factors of falling (Gillespie et al., 2001). However, because of the widely recognized multi-factorial nature of falls the most common models of service delivery used is multi-disciplinary team to work hand in hand with physiotherapist for the cost-effective fall prevention outcomes (Gillespie et al., 2001). Cryer & Patel (2001) similarly, speculates that there is an increasing consensus that no single intervention can effectively prevent falls or reduce injuries, hence a need for multi-intervention approach. Conversely, Chartered Society of Physiotherapy, (2001) demonstrates that the overall available evidence strongly supports the use of physiotherapists in falls prevention, either as part of a fall prevention team, or in higher risk groups by the therapy alone. Whatever model of service delivery used, physiotherapists should use an integrated approach to the prevention and rehabilitation of falls, drawing on the evidence based practice and applies it to the needs of individuals (Chartered Society of Physiotherapy, 2001).

CHAPTER SIX

SUMMARY, CONCLUSION, RECOMMENDATIONS AND LIMITATIONS OF THE STUDY

6.1 INTRODUCTION

This chapter will present the summary and conclusion of the study as well as recommendations made to respective authorities based on the results of the survey. The limitations of this study are also represented.

6.2 SUMMARY AND CONCLUSION

The aim of this study was to determine the prevalence of and risk factors for falls among the elderly living in the community in selected districts of Gabiro and Kahi of the Umutara Province of Rwanda. Falling among the elderly living in the community is a significant public health issue. This study showed that the prevalence rate of falls amongst the community-dwelling elderly people was 23.2%, all of whom suffered multiple falls during the previous year. The following factors were found to be significantly associated with increased falling in the elderly: advanced age, gender, neuromuscular and musculoskeletal impairments (such as joint stiffness and lower extremity weakness), loss of balance and loss of coordination. Others were chronic illnesses (such as vision deficits, painful joints and muscle atrophy), chronic medication (sedatives) and multiple drugs (sedatives and antidepressants).

Falls among the elderly are caused by interaction of different factors like environmental hazards that led to trips and slips aggravated by host and situational

circumstances as well as behavioral risk factors. However, most of the falls happened as a result of tripping and slipping in association with the intrinsic factors in both indoor and outdoor falls. Other risks were related to the time of the day when falls were experienced, with peaks in the evening, some in the morning and in the afternoon, and the fewest occurring during the night. Place of fall and assistive devices were related to falls. The fall rate was higher in men than in women: with 81.6% of men sustaining multiple falls compared to 70% of their female counterparts. It was also found that men tended to fall outside, beyond the home entrance on the footpath (83%), and at a distance away from home (37.3%), compared to females whose falls happened inside (63.3%) and females who fell at the home entrance on the footpath (only 68.4%). Men had significantly more mobility and more activities concerned with daily living compared to females. Falls and their effects are suffered by the entire spectrum of the older population and can result in serious short- and long-term consequences for those who sustain them.

The rate of injuries across the age groups was as follows: 88.4% was the fall-related injury rate for those within the transition age-group, followed by 83.7% for the vigorous age group and 77.3% for the frail age group. Injury rate by gender was: more females (93.2%) sustained injuries as a result of falls than did males (78.7%). While some falls in the older population are to be expected, a significant proportion could be prevented if risk factors were assessed and appropriate interventions instituted. This is especially true of falls occurring in the community.

Preventive strategies also need to be tailored to reflect individual fall risk factors. For example, the contribution of intrinsic factors, activity, and environmental factors will vary depending upon the older person's functional level. Prevention strategies need to be focussed on the most obvious predisposing risk for the individual, with periodic reassessment to determine how the mix of factors changes over time. While protecting the elderly people from falling, interventions should focus on maintaining optimum function and maximum autonomy. Prevention measures should not focus on avoiding activity, unless unreasonably hazardous, but rather on safe conduct. More investigation is required to determine which intervention strategies successfully reduce the chance of a fall or a fall injury event. Research also needs to address environmental factors and intrinsic factors such as age-related changes like age and gender. The aging process and normal body changes not necessarily associated with diseases are increasing, and chronic illnesses as well as chronic medication and multiple drug use are significantly associated with falls. The research needs to address these areas.

6.3 RECOMMENDATIONS

As the main focus of the study was to determine the prevalence of and risk factors for falls, most of these recommendations are aimed at preventing falls among the elderly people living in the community. Falls are among the most common and serious problems facing elderly persons. Falls generally result from an interaction of multiple and diverse risk factors and situations, many of which

can be corrected. This interaction is modified by age, diseases, gender, and the presence of hazards in the environment. Frequently, older people are not aware of their risks of falling, and neither recognize risk factors nor report these risk issues to their families or to their health-care attendants. Consequently, opportunities for prevention are often overlooked, with risks becoming evident only after injury and disability have already occurred. A key concern is not simply the higher incidence of falls in older persons but rather the combination of high incidence and a high susceptibility to injury. This propensity for fall-related injury in elderly persons stems from a high prevalence of co-morbid diseases and age-related physiological decline that make even a relatively mild fall potentially dangerous. The following recommendations are put forward based on the findings of the study:

6.3.1 Short-term recommendations to the participants and family members

1. **Most often, falls occur in and around home. Older people and their family members should be counseled on removing slipping (drying wet floor surfaces and water spills) and tripping hazards such as loose rugs, mats, pets. Should also be able to identify irregular walking surfaces, proper footwear and a need for a supportive aid.**
2. **Specific environmental modification, such as adequate lighting, non-slip bath, mats, put stair rails next to the toilet and in the shower or tub and raised toilet seats and appropriate bed and chair heights should be considered in homes of elderly people.**
3. **Family members staying with older people should restore their confidence in their ability to move about safely and to increase the safety**

of their surroundings and to help them to cope with any further falls by teaching them strategies for summoning help and preventing the consequences of long lie.

4. **Preventing falls among the elderly with non-modifiable risks like vision deficits, joint stiffness, balance and coordination deficits accompanying aging can be more challenging, careful investigations and rectifications are important, family members should report any strange health problem to the near by health-care center or professionals for advice and intervention.**
5. **Fear of falling among older adults with a history of recurrent falls is common. This limits their activities of daily living that leads to functional deterioration and social isolation which also in turn leads to dependency and institutionalization. Family members should be able to assist older people in managing their personal life needs without despair.**
6. **The family members and older people should be able to work as a team especially when an external support is needed, for instance when working with a trained health-care professional to evaluate what is being done at home.**

6.3.2 Recommendations to the Umutara Province Department of Health for Physiotherapists.

1. **One of the goals for physiotherapists working with older people at risk of falling is to reduce that risk. As these are older people living independently, increasing their muscle strength, flexibility and bone density and improving balance and gait, through exercise have been shown to be associated with a reduction of falls or fall related injuries in older people.**
2. **The relationship between physical activity or exercise, falls and injuries due to falling is a complex. There is growing evidence that participation**

in regular exercise improves balance, mobility and reaction time and can reduce the risk of injury following a fall.

3. **Physiotherapists working with older people should restore their confidence in their ability to move about safely and to increase the safety of their surroundings and to help them with education and advice on how to cope with any further falls and teach them strategies for summoning help and preventing the consequences of long lie.**
4. **Physiotherapists attending older people should take thorough analysis of a history of falls for better follow-up plan. When prescribing exercises should target strength and balance component exercises to promote patients general strength and postural stability to avoid the future falls.**
5. **Physiotherapists should be able to detect the need for and prescription of appropriate assistive devices to the older people to meet their functional dependence.**
6. **Physiotherapist in rehabilitation and hospital settings should develop a standard fall risk assessment and treatment strategies to guide those involved in care for older people.**
7. **Physiotherapists should initiate a facilitated home modification programme after hospital discharge of older people for successful fall prevention to ensure a fall risk-free environment.**
8. **Physiotherapists should initiate a community based exercise intervention for easy service delivery mechanism to older people in their communities where they can reach with ease for education, advice, assessment and guidance on how to conduct exercise classes.**

6.3.3 Recommendations to the Umutara Province Department of Health for General Practitioners and the Nurses

1. **General practitioners and nursing staff attending elderly patients should ask them about their health problems relating to falls. Remediable deficits like vision impairments should be formally assessed and treated.**
2. **General practitioners and nurses should reduce the number and dosage of prescribed medication to older people to prevent the occurrence of medication induced-falls especially those using sedatives and antidepressant drugs.**
3. **The nursing staff should make sure that the patients' medications are reviewed and altered or stopped as appropriate in the light of their risk of future falls.**
4. **There is a need for a multi-disciplinary approach among the general practitioners and the nursing staff to enhance a referral system that gives older patients optimal opportunities to access adequate care.**

6.3.4 Recommendations to the association of older people and stakeholders

1. **There is an urgent need for facilitating the national geriatric research and scientific societies by providing financial support and helping them to publicize their findings throughout the Rwandan community.**
2. **This current study provides compelling evidence, male adults sustained high fall rates than females, which contradicts with the current literature. There is a need for more research to find out what could be the exceptions with the Umutara Province population of elderly people.**
3. **The association of elderly people should advocate for nationwide fall prevention policy as priority on the agenda of the on-going health promotion, education and training of health-care professionals in the country.**
4. **Association of elderly people should advocate for a community-based geriatric facilities nationwide. This needs to be incorporated with day care geriatric centers and emergency units to receive those with acute care needs.**
5. **The rate of hip injury is escalating with its complications among the females. There is a need to advocate for the availability of the hip protectors to reduce the severity of fall-related injuries.**

6.4 LIMITATIONS OF THE STUDY

Limitations in the current study are indicated below:

1. The study only focused on a sample of community-dwelling elderly who reported a fall or falls in the previous year. Self-reporting, especially when asking participants to recall a full year of experience, is not as reliable or accurate as observation or self-report on a monthly basis or on any other shorter period of time and, therefore, were subject to error.
2. Some of the intrinsic risk factors needed to be identified experimentally, using valid tools, which was beyond the scope of a mini-thesis. Other compounding factors were time and finance constraints. This was identified as a weakness by the researcher because it was time-consuming to explain the process to the participants so they would have a clear understanding of their situation.

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