
UNIVERSITY *of the*
WESTERN CAPE

# The determinants of falls among the elderly living in long-term care facilities in the City of Cape Town

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## DECLARATION

I declare that "*The determinants of falls among the elderly living in long- term care facilities in the City of Cape Town"* 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 complete references.

Full Name: **Nabilah Ebrahim** Date: **December 2023**

Signed: 

## DEDICATION

*This was dedicated to my aunty, Zainonesa Barendse, who passed away on the 7th October 2019 from a short battle with colon cancer. A strong, independent woman who had always been supportive in my academics and sport, who would be so proud of me for completing my Masters. May the Almighty grant her and all marhooms a high abode in jannah Inshallah Ameen!*

*To my mother dearest, Shahieda Barendse for her sacrifices to educate and prepare me for my future. I hope this achievement will fulfil the dream you have envisioned for me.*

*To Nazeefah Ebrahim, for your support and endless patience,*
*you make me proud to be your sister!*

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**ABBREVIATIONS**

| | |
|---|---|
| ADL | - Activities of Daily Living |
| CoCT | - City of Cape Town |
| COVID – 19 | - Coronavirus Disease - 2019 |
| BBS | - Berg Balance Scale |
| BMI | - Body Mass Index |
| DGI | - Dynamic Gait Index |
| FRAT | - Fall Risk Assessment Tool |
| ICD | - International Classification of Disease |
| LMIC | - Low-and Middle-Income Country |
| LTC | - Long Term Care |
| MMSE | - Mini Mental State Examination |
| NPO | - Non-Profit Organisation |
| SSA | - Sub-Saharan Africa |
| Stats SA | - Statistics South Africa |
| TUG | - Timed Up-and-Go |
| WHO | - World Health Organisation |

**UNITS OF MEASUREMENT**

cm - centimetres

kg - kilograms

s - seconds

**STATISTICAL UNITS**

% - percentage

CI - confidence interval

p - significance level

SD - standard deviation

$\bar{x}$ - mean

$\chi^2$ - Chi-Square

OR - Odds Ratio

**ABSTRACT**

**Background**: Falls are a common health burden with a multi-factorial origin causing physical, psychological, and social problems for the elderly and the society at large, especially within low- and middle-income countries, such as South Africa.

**Aim**: Therefore, the aim of the study is to identify the determinants of falls in the elderly who are living in various long-term care (retirement) facilities in the City of Cape Town, South Africa.

**Methods**: This study used the social-ecological theory, which functions on multiple levels in the study, interacting on an individual level, as well as recognising the impact of the environment. The study used a quantitative, cross-sectional, and descriptive design to investigate the elderly, aged 60 years and older, living in retirement facilities in the City of Cape Town. A total of 258 male and female participants were recruited using convenient sampling. A researcher-generated and self-administered questionnaire, based on the following sociodemographic characteristics, namely, age, gender, educational level, marital status, and medical history, was used for data collection in the study. The Fall Risk Assessment Tool, the Berg Balance Scale, the Dynamic Gait Index, the Timed Up-and-Go test, and the Mini Mental State Examination were the research instruments used in the study. The WHO COVID-19 safety protocol was observed throughout the period of physical testing of the participants. The results were analysed using SPSS version 28. Descriptive statistical analysis (means, standard deviations, and frequencies) was used to describe the variables, such as age, height, and weight. The data was checked for normality using a Shapiro-Wilks test. The Chi-square test was used to determine statistically significant associations between the categorical risk factors (facility type, gender, BMI, age, marital status, educational level, medications used, assessment tools and risk factors). The Spearman's rank correlation coefficient was also used to determine associations between falls and fall risk factors, as well as various medications used. A Mann- Whitney U test was conducted on physical characteristics on participants. The odds ratios were also determined.

**Results**: In the present study the prevalence of falls was 32.6% (n = 84). Majority of participants were at low risk (81.8%; n = 211), 15.1% (n = 39) at moderate risk and 3.1% (n = 8) at high risk for falling. Age (p = 0.024), stature (p = 0.001) and body mass (p = 0.001) indicated statistical significance. Poor vision (males: 44.6%; females: 51.6%), concerning behaviours (males: 20.3%; females: 20.7%) and unsafe mobility (males: 15.2%; females: 16.2%) showed the highest prevalence amongst gender. Risk factors pertaining to challenging

environment (30.0% n = 3), and unsafe mobility (22.5%; n = 9) had a high prevalence among the age-group 60-69 year, poor vision (42.2%; n = 54) and incontinence (44.0%; n = 11) in the 70 – 79 year age-group, poor nutrition (72.7%; n = 7), and other risk factors (71.4%; n = 4) not mentioned in the study in the 80 – 89 year age-group. Impaired ADLs (25.0%; n = 2) and unsafe footwear (6.7%; n = 1) in the >90 year age-group. Determinants of falls were strongly associated with facility type ($X^2$ = 7.403; p = 0.007), level of education ($X^2$ = 14.05; p = 0.029), marital status ($X^2$ = 16.49; p = 0.001). Anti-depressant [$\chi 2$ (1) = 4.941; p = 0.026; OR = 2.083 (95% CI: 1.082, 4.012)] and anti-diabetic [$\chi$ 2 (1) = 4.097, p = 0.043, OR = 2.070 (95% CI: 1.013, 4.228)] medications were the only drugs significantly associated with falling. The TUG (p = 0.003) and BBS (p = 0.001) assessment tool were statistically significant with determining a participant at risk of falling.

**Conclusion**: In conclusion, several determinants of falls are mentioned in the study. Certain sociodemographic characteristics, such as age height, weight, facility type, educational level, and marital status have been positively associated with falls. Awareness should be raised on the determinants of falls in the elderly living in the long-term care facilities in the City of Cape Town to decrease the risk of falling.

Keywords: falls, risk factor, elderly, determinants, long-term care facilities.

# CHAPTER ONE: INTRODUCTION

## 1.1 Introduction

Falls are one of the most common health concerns among the elderly, with one in three individuals over 65 years of age being prone to falling (Montero-Odasso et al., 2022). These numbers continue to rise each year, especially with advancing age (Nascimento, 2018). Those living in long-term care (LTC) facilities are at even higher risk of falling, with minimal evidence suggesting that the elderly today, are experiencing better health that aggravates the situation (Jiang et al., 2020).

Given the rising prevalence of the ageing population globally, with 703 million persons aged 65 years and older in 2019, the fall risk continues to rise at a much steeper rate, since the end of the 19$^{th}$ century (Choudhury, 2015). Many falls sustained by the elderly are not because of a single cause, but rather are due to multiple risk factors that collectively increase the risk of falling (R. S. Sharif & Al-daour, 2018). The physical and psychological consequences of a fall are serious, as these can contribute to negative feelings of well-being, such as a loss of confidence, a fear of falling, limitations in activities of daily living (ADLs) and, of particular concern, a decline in functional capacity and overall quality of life (Kioh & Rashid, 2018).

## 1.2 Background of the Study

The world's population is swiftly ageing, and the elderly population is falling at a rate of 35-40%, and suffer the highest rates of injury, the highest rates of hospitalization, as well as the highest rates of death, due to falls (Dillon, 2017). Fall-related injury among the elderly is a major public health burden globally (Pengpid & Peltzer, 2018), and a common source of morbidity and mortality in the elderly (Crowe et al., 2021). In the absence of injury, falls have

a dramatic impact on the quality of life of the elderly, along with the physical and mental changes that accompany ageing (Janakiraman et al., 2019).

According to the World Health Organization (WHO), the burden of non-intentional falls and injuries are higher in developing countries, and older adults are at higher risk, suggesting that data on falls among the elderly in LMICs is sparse (Stewart Williams et al., 2015). Healthcare systems in sub-Saharan Africa (SSA) prioritise communicable diseases, maternal and child health in accordance with the Sustainable Development Goals (SDGs), whereas geriatrics were not ranked as important within the SSA health care system, which has led to minimal attention and organisation for the health needs of the elderly (Kelly et al., 2019).

There are many risk factors causing falls, and they have been categorised as intrinsic, extrinsic, or behavioural factors (Fraix, 2012). Understanding these risk factors could contribute largely to the prevention of falls in the elderly (Iamtrakul et al., 2021). For the elderly, being self-conscious of a negative experience or fear of falling often led to a reduction in being physically active and further contributed to a decline in their physical health, which increased the likelihood of falling even more (Iamtrakul et al., 2021). Many falls are associated with one or more identifiable risk factors, such as weakness, unsteady gait, confusion, and type of medication (Fraix, 2012). Research has shown that attention to these risk factors can reduce the rate of falling dramatically (Pengpid & Peltzer, 2018).

The occurrence of a fall is primarily related to the presence of existing risk factors (Castaldo et al., 2020a). Several studies have investigated single or multiple risk factors, of which some risk factors were identified as being modifiable, such as physical activity and physical fitness, whereas others were classified as non-modifiable, such as age and gender (Castaldo et al.,

2020a). However, the elderly are nine times more at risk for falls, especially in LTC facilities (Kioh & Rashid, 2018). Many falls are associated with one or more identifiable risk factors, such as weakness, unsteady gait, confusion, and type of medication(Dhargave & Sendhilkumar, 2016). Research has shown that attention to these determinants can reduce the rates of falling dramatically (Pengpid & Peltzer, 2018). There are many studies that have identified more than 400 risk factors for falling, with no reliable classification thereof for ease of understanding (Ambrose et al., 2013). According to Williams et al. (2015), the numerous risk factors for falls among the elderly include older age, female gender, physical frailty, muscle weakness, poor gait and balance, impaired cognition, and depressive symptoms. Kioh and Rashied (2018) have also shown that these risk factors can be classified as intrinsic and extrinsic. Intrinsic risk factors were related to certain sociodemographic factors, such as age, gender, previous occupation, history of falls and medical comorbidities, whereas extrinsic risk factors included different types of medication, medication side-effects and the environmental surroundings (Kioh & Rashid, 2018). The risk of falling increased with age, and escalated even further with comorbidities, such as cardiovascular disease, arthritis, and diabetes (Stewart Williams et al., 2015)

In 2013, the population aged 65 years and older numbered approximately 2.7 million people, representing 5.0% of the world's population (Lai, 2019). By 2050, this population is estimated to reach 5.7 million, and to represent 10.0% of the total population (Kalula et al., 2017). Developed countries experience a gradual process of ageing, however, ageing in developing countries has escalated exponentially (Statistics South Africa, 2022). In developing countries, 9% of the population are aged 60 years and older, and this is likely to double by 2050 and more than triple by 2100 (Lai, 2019). In low- and middle-income countries (LMICs), the elderly population is growing at a faster rate, especially in sub-Saharan Africa, with minimal attention

given to the elderly (Aboderin & Beard, 2015). Ageing in Africa is taking place in conditions of social and economic hardship, where poverty is uncontrolled and exacerbated by the HIV and AIDS pandemic and the current COVID-19.

More importantly, in developing countries such as South Africa, the rate of falls among the elderly living in LTC homes is much higher than among the elderly living in the community (Baixinho et al., 2017). Many population-based studies exist on the epidemiology of falls amongst the elderly in different settings (Rubenstein, 2006). In low- and middle-income countries, environmental factors could be a contributor as extrinsic causes of falling, because of poor infrastructure, particularly in impoverished environments, such as those with unmaintained roads and public buildings, poor to non-existent street lighting, overcrowding and hazards in clustered, informal settlements (Kalula et al., 2016).

Falls in older people leave them with a sense of helplessness in comparison to much younger and physically active people who can recover easily (Dionyssiotis, 2012). This sense of helplessness leads to a rather serious health outcome, and ultimately leads to a rapid decline physically, emotionally, and financially (Dionyssiotis, 2012). The rates of falls and associated complications rise steadily with age and are doubled for individuals aged 75 years and older (WHO, 2022). Older adults living in LTC facilities have much higher rates of falls, which result in serious complications, with 10.0 – 25.0% of such falls resulting in fractures or lacerations (Jiang et al., 2020a). Once a year, at least one-out-of-three elderly persons report a fall (Marmamula et al., 2020). Approximately 30-50% of people living in these LTC facilities fall each year, with 40% of them experiencing-recurrent falls (Díaz et al., 2020).

Some systematic reviews have indicated that most falls result from the physiological changes inherent in human ageing and indicated that 72.0% of falls could be anticipated (Nascimento, 2018; Neuls et al., 2011a; Valipoor et al., 2020). Various assessment tools, such as balance and cognitive assessments, can be used to predict falls, in that they assess the risk factors for falls (Park, 2018). According to a study done by Nascimento (2018), 8.0% of falls cannot be predicted and are classified as accidental, i.e., being the result of environmental hazards. Self-assessment of the functional limitations in the elderly showed that the collective burdens of physical inactivity, poor health, and increased age, created an increased demand for alternative health care professionals, other than nurses, as the proportion of the elderly population continued to grow (Nascimento, 2018).

Due to the social isolation of the elderly in LTC facilities, this made them more vulnerable to falls (Dhargave & Sendhilkumar, 2016). Seventy percent of the world's ageing population reside in developing countries, where the prevalence and incidence of falls continues to increase at an alarming rate, and fall-related injuries are considered inevitable, largely disproportionate, and preventable (WHO, 2022). Residents in LTC facilities are generally older, tended to have co-morbidities, needed more support in navigating ADLs, often took more medications, and were considered physically and cognitively weaker compared to those living in the community (Jiang et al., 2020). This made them more prone to falls and sustaining critical injuries, such as fractures (Jiang et al., 2020). Risk factors for falls, such as age, functional abilities, chronic diseases, gait disturbances and fear of falling have all been investigated among community-dwelling older people or among hospitalized patients, but very few studies have been performed in LTC settings (Buckinx et al., 2017).

Many population-based studies exist on the epidemiology of falls amongst the elderly in different settings (Fraix, 2012). In LMICs, like South Africa, environmental factors could be an intrinsic contributor to falls.

### 1.3 Statement of the Problem

The world's population is swiftly ageing and falls among the elderly have been a neglected public health burden, particularly in the developing world (WHO, 2022). Injuries and health problems, secondary to unexpected falls, is a rather neglected area (Stewart Williams et al., 2015a). Such injuries, in turn, may lead to a larger influx of the elderly into LTC facilities, due to the rapidly ageing population (Goel, 2018).

High rates of falls have been reported in LTC facilities, often due to the poor functional status of the residents (Towne et al., 2017). So, it is not surprising that falls were a significant concern, particularly among older independently living residents (Goel, 2018). Invariably, they were more prone to falls and suffered from severe injuries, such as fractures (Jiang et al., 2020). Risk factors for falls, such as age, functional ability, chronic disease, gait disturbances and fear of falling, have all been studied among community-dwelling older people or among hospitalized patients, but very few studies have been undertaken in LTC settings (Buckinx et al., 2017).

The elderly population are sustaining falls at a rate of 35.0 – 40.0%, where they suffer the highest rates of injury, the highest rates of hospitalization, as well as the highest rates of death due to falling (Dillon, 2017). Over four decades ago, almost 668 falls were reported for every 1000 person-years experienced, where women in all age groups sustained the highest fall rate (Rudnicka et al., 2020). This data has not changed regarding the various fall rates that have

been reported globally (Goel, 2018). In developing countries, 9.0% of the population is aged 60 years and older, and this will double by 2050, and more than triple by 2100 (United Nations Population Division, 2011). In LMICs the elderly populations are growing at a faster rate, especially in sub-Saharan Africa, with minimal attention given to the elderly (Aboderin & Beard, 2015). Ageing in Africa is taking place in conditions of social as well as economic hardship, where poverty is uncontrolled given the HIV and AIDS pandemic and the current COVID -19 that have a huge impact in this region (Aboderin & Beard, 2015).

### 1.3 Research Questions

This study seeks to address the following research questions:

1. What is the prevalence of falls among the elderly living in various LTC facilities in the City of Cape Town (CoCT)?
2. What risk factors are responsible for determining falls among the elderly living in various LTC facilities in the City of Cape Town (CoCT)?
3. What is the relationship between sociodemographic characteristics and the risk factors of falls in the elderly.

### 1.4 Aim of the Study

The aim of the study is to identify the determinants of falls in the elderly who are living in long-term care (LTC) facilities in the City of Cape Town (CoCT).

### 1.5 Objectives of the Study

The objectives of the study are the following:

- To determine the prevalence of falls in the elderly in public and private long-term care facilities in the CoCT, South Africa.
- To identify the determinants of falls in the elderly in the above facilities.
- To determine the relationship between sociodemographic characteristics and the risk factors of falls in the elderly.
- To categorize the elderly in the present study in terms of low, moderate, and high-risk groups for falls.
- To determine the probability of falls in the elderly in the above facilities.

### 1.6 Significance of the Study

Falls are the significant cause of death in LTC facilities (Galet et al., 2018). Approximately 1800 elderly within these facilities die annually due to injuries related to falls, which often go unreported (Slade et al., 2017). Fall rates among the elderly living in LTC facilities is three times higher compared to those living in the community, and approximately 50.0% of falls occurred at least once annually, and 40.0% of these falls occurred more than once in these facilities (Francis-Coad et al., 2018).

Falls are a common health burden with a multi-factorial origin causing physical, psychological, and social problems for the elderly, and increased the burden to society, especially within LMICs, such as South Africa. Yet, there is minimal research and support for the elderly regarding falls (Kalula et al., 2016). The consequences of falls were often more serious among the elderly, as they were more vulnerable to injuries, due to their frailty (Kallin, 2004). Falling was often seen as occurring almost naturally, was unavoidable for the elderly, and part of the ageing process, even though it frequently resulted in an increased morbidity and mortality among the elderly (Satariano, 2010). Falls generally occurred in all age-groups, but more

frequently among the elderly, who were relatively safe earlier in their lives, but occurred on a more regular basis with advancing age (Satariano, 2010).

Many elderly residents in LTC facilities struggle with multiple chronic illnesses, and deteriorating physical and mental functioning, which increased their likelihood of falling (Plumb, 2016). The progressive decline with age hindered their ability to live safely and independently in the community and, therefore, many elderly individuals were obliged to reside in LTC facilities, which exacerbated the residents' risk for experiencing poor health outcomes, as well as imposed an additional financial burden (Plumb, 2016).

Literature on the epidemiology of falls among the elderly in African countries is scarce, unlike that in developed countries (Bekibele & Gureje, 2010; Jagot et al., 2013; Kalula et al., 2017; Mapira et al., 2019). The elderly living in LTC facilities are highly dependent on caregivers, who are already overburdened with additional responsibilities (Damián et al., 2013). Despite these high demands on caregivers, additional professional services should be provided for the elderly in these LTC facilities (Damián et al., 2013).

Other studies in Africa reporting on the causes of injuries or deaths in older persons have included falls as a causal factor (Kalula et al., 2016). Consequently, the current research seeks to increase the awareness and understanding of falls in the elderly living in LTC facilities in the CoCT, South Africa. The present study further seeks to highlight how measures and resources, beyond the scope of nurses, can be implemented by multidisciplinary teams of health care professionals to help minimize the risk of falling among the elderly, especially in LTC facilities.

## 1.7 Definitions of Terms

A **fall** is defined by the World Health Organization (WHO) as an event that results in a person coming to rest inadvertently on the ground or floor or other lower level (World Health Organization, 2007).

**Long-term care facility** refers to a facility that provides rehabilitation, as well as medical and personal care to patients and residents who are unable to live independently owing to chronic illnesses, disabilities and/or cognitive impairments (Díaz et al., 2020).

A **Risk factor** (or **Determinant**) is a characteristic or condition that increases an individual's chance or susceptibility for developing a clinical condition, such as cardiovascular disease (Deandrea et al., 2010). Risk factors or determinants can be classified as a direct cause, either intrinsic or extrinsic and associated with the occurrence of disease (Deandrea et al., 2010).

The **elderly** refers to individuals Aged 60 years and older (World Health Organization, 2007).

**Prevalence** refers to the proportion of individuals who have a condition or who are exposed to a risk at or during a particular period (Williams et al., 2015).

## 1.8 Chapter Outline

Chapter 1 highlights the importance of falls among the elderly living in LTC facilities, especially in LMIC's.

Following the introduction, Chapter 2 presents a detailed literature review regarding the prevalence of falls among the elderly living in LTC facilities, as well as literature on the determinants of falls.

Chapter 3 presents the research design, research setting, participant sampling and the data collection procedures used. The instrument reliability and validity are also included. Thereafter, the statistical analysis, followed by the ethical considerations are highlighted.

Chapter 4 presents the results on the prevalence and determinants of falls, as well as the relationships between the sociodemographic characteristics and the risk factors of falls in the elderly living in LTC facilities in CoCT.

The final chapter, Chapter 5, discusses the key findings of the study and the impact of the study on falls in the elderly in LTC facilities. In addition, the strengths and limitations of the study, and the conclusion are also presented.

# CHAPTER TWO: LITERATURE REVIEW

## 2.1 Introduction

The literature review examines the existing literature on the topic of the study by outlining the need for and the importance of research on the determinants of falls in the elderly. This chapter also reviews the impact and risks of falls among the elderly, as well as presenting the sociodemographic characteristics associated with falls in the elderly.

## 2.2 Theoretical Rationale of the Study

This study used social-ecological theory, first proposed by McLeroy and colleagues (1988), as the theoretical framework that guided the research. To understand the determinants of falls among the elderly living in LTC facilities, it was essential to examine the individual and the environment. This theory was chosen based on the principle that it considered the connections between the individual, at all levels, and their environments (Towne et al., 2017). These levels are listed as interpersonal (knowledge, attitudes, behaviours), social environmental (family, spouse, organizations, influence of health professionals), physical environmental (institutions, availability of facilities, safety) and policy-based (education level, social class, and health policies) (Towne et al., 2017). These aspects concerning the individual are important and assume that appropriate changes in the social environment would also produce changes in individuals, and that the support for individuals was essential for implementing environmental changes Figure 2.1 (ACSM, 2014).


Figure 2.1: Illustration of social ecological theory.

Environmental factors, such as the quality of the LTC facility potentially increased the risk of falls in the elderly and, ultimately, lowered their quality of life (Lee et al., 2018). This, in turn, had a significant influence on the health of the elderly, as well as their behaviour (S. Lee et al., 2018). The social-ecological model functions on multiple levels to influence the behaviour of an individual (S. Lee et al., 2018).

As people age, their ability to multitask deteriorates, thereby, placing a huge burden on their cognitive abilities, increases the risk of mental stress, confusion, loss of attention and accidents (Slade et al., 2017). Therefore, it is important to understand the interaction between the individual and the environment, especially considering the changes taking place with an increase in age (Slade et al., 2017). As individuals age, particularly in their home settings, it is important to minimize obstacles in their paths, and ensure that they live in environments that are less challenging to their movement (Dung et al., 2020). Unfortunately, such an awareness

of the environment is less evident in LTC facilities, which highlights the need for efforts to address this important issue (Slade et al., 2017; Yu et al., 2021).

### 2.3 Global Prevalence of Falls

Falls are an important concern and affects the activities of daily living (ADLs) of all individuals (Franse et al., 2017). Among elderly people, falls are one of the main factors causing injury, as well as decreased independent living and, in some cases, results in death (Najafpour et al., 2019). It is a global healthcare burden and causes significant concern within the public healthcare sector (WHO, 2022).

In 2019, it was estimated that there were 703 million elderly persons aged 65 years and older globally, with eastern and south-eastern Asia making up the largest elderly population of 260 million, followed by Europe and North America with 200 million elderlies (Lai, 2019). According to the WHO 2022 global report on fall prevention, people aged 65 years and older fall about 28.0% – 35.0% each year, and this increased as age and frailty level also increased. Although most of the results on falls do not result in serious injuries, about 5.0% of these result in a fracture or require hospitalisation (Bekibele & Gureje, 2010). Invariably, the elderly population in all countries will increase by more than double in 2050, with the second fastest rise in the elderly population being in sub-Saharan Africa (SSA) by more than 218.0%, growing from 32 million in 2019 to an astonishing 101 million by 2050 (Lai, 2019).

According to the WHO Global Report on fall prevention in older age, falls have been recognized as the top leading cause of death among the elderly aged 65 years and older, with a worldwide incident rate of approximately 20.0% annually (Kioh & Rashid, 2018). The prevalence of falls among elderly Chinese individuals in countries such as Hong Kong,

Singapore and Taiwan ranged from 14.7% to 34.0% compared to the statistics in the Western hemisphere, where the prevalence ranged from 28.0% to 42.0%, which was nearly double (Kioh & Rashid, 2018).

Research on falls in the elderly in Spanish LTC facilities is just as scarce as that in South Africa (Díaz et al., 2020). According to Diaz et. al. (2020), in 2011 the elderly aged 65 years and older living in institutions totalled 270000 and is expected to be much higher presently (Díaz et al., 2020a). In 2020, the rate of this population was 19.6 % and will increase by 2.8% in the next decade (Díaz et al., 2020).

In Malaysia, the elderly population constituted 5.6% of the total population in 2014 and increased dramatically to 6.0% in 2016 (Kioh & Rashid, 2018). According to Malaysian statistics, the elderly population will have the highest increase in population growth, from 5.0% in 2010 to 14.5% in 2040 (Ashari et al., 2021). Literature on falls among the elderly in certain counties, such as Malaysia, is scarce, with only one published study on the elderly living in LTC facilities that reported the prevalence of falls as 30.0% (Ghazi et al., 2017). This study also reported that the prevalence of falls ranged from 19.1% to 47.0%.

In China, 11.4% of the population was aged 65 years and older, and life-expectancy was 76.4 years by the end of 2017 (Jiang et al., 2020). Shanghai had the highest life-expectancy with approximately 3% of the elderly living in LTC facilities (Jiang et al., 2020). According to Zhang et. al. (2019), the design of LTC facilities in Asia has become a huge concern, because the elderly living in the community are less likely to fall than those living in LTC facilities.

In a study conducted in Kerala State, India, researchers found a similar concern as in a Chinese study, where there was a higher prevalence of falls among elderly females living in LTC facilities compared to elderly females living in the community (Dhargave & Sendhilkumar, 2016). The elderly population in India face many problems, and falls are expected to increase from 76.6 million in 2006 to 173.1 million by 2026 (Dhargave & Sendhilkumar, 2016). In high-income countries, such as New Zealand, where the healthcare system is a priority, more than 30 000 elderly individuals were living in LTC facilities, which is a 14.1% increase since 2006 (Carryer et al., 2017). As more residents become older, their individual needs become more reliant on the quality of healthcare provided (Carryer et al., 2017).

The Canadian Community Health Survey in 2008 - 2009 indicated that at least one-in-five Canadians over the age of 65 years experienced a fall in the previous year and, among those who sustained an injury, at least 45.1% received medical attention, while 26.6% were hospitalized (Pirrie et al., 2020). The elderly population are sustaining falls at a rate of 35.0% - 40.0%, and they suffer the highest rate of injury, hospitalization, as well as death (Dillon, 2017). In Canada, over four decades ago, almost 668 falls were reported for every 1000 person-years lived, and females in all age groups sustained the highest fall rate (Pirrie et al., 2020). This data has not changed for the various fall rates reported globally (Goel, 2018).

### 2.4 Determinants of Falls in the Elderly

All individuals are susceptible to falling, however, compared to much younger individuals, the elderly population are more at risk of falling, due to increasing age and various health conditions (Bjerk et al., 2017). Physiological age-related changes in the elderly and health problems have a significant impact on the increased likelihood of falling and the inability to maintain balance (Bjerk et al., 2017). Additionally, cognitive impairment, drugs, medications,

and environmental changes among the elderly were associated with the increased risk of falling (Najafpour et al., 2019). This, in turn, resulted in physical, social, psychological, and financial consequences (Florence et al., 2018). In hospitals, more than 84.0% of incidents reported were related to falling, which often led to longer and more complicated recovery (Obayashi et al., 2013). These incidents, however, increased with the amount of risk factors (Shankar et al., 2017). Therefore, there is a need to highlight which risk factors were responsible for increasing the risk of falling among the elderly in LTC facilities (Shankar et al., 2017).

There are many studies that have collectively identified more than 400 risk factors for falling, with no reliable classification of these risk factors into categories for ease of understanding (Callis, 2016; Deandrea et al., 2013; Rubenstein, 2006). According to Williams et al. (2015), there are numerous risk factors for falling among the elderly, which include older age, female gender, physical frailty, muscle weakness, poor gait and balance, impaired cognition, and depressive symptoms. The risk of falling increases with age, and escalates even further with comorbidities, such as cardiovascular disease, arthritis, and diabetes (Stewart Williams et al., 2015a). In a review by Callis (2016), a detailed review of the risk factors that contributed to falls amongst the elderly in a hospitalized setting were reported. The risk factors associated with in-patient falls were medications, unsteady gait, alterations in mental status, and environmental hazards. Callis (2016) concluded that risk assessment was a primary intervention for fall prevention. According to WHO, the burden of non-intentional falls and injuries were higher in developing countries, and older adults were at higher risk, suggesting that data on falls in LMICs was sparse (WHO, 2022).

In their cross-sectional study, Zhang et al. (2019) looked at epidemiological characteristics and fall risk factors of residents in LTC facilities. The sample composed of 218 participants residing

in thirteen LTC facilities in Xiamen, China. The results indicated that 71.0% of participants who fell were female. The variables associated with increased falls were poor balance and gait, chronic medical conditions, decreased cognitive status, sensory loss, poor living environment, unsafe footwear, and poor foot health (Zhang et al., 2019). Among the Chinese elderly, a broad range of factors increased the risk of falling, namely, being female, not participating in regular physical exercise, using multiple medications, having comorbidities, increasing age, and the fear of falling (Peng et al., 2019a). Females had higher levels of physical and cognitive impairment (Pengpid & Peltzer, 2018). Pillay et al. (2021) also reported that fall-related injuries occurred more frequently in females than males. Balance, gait characteristics, cognitive status, and the number of medications should be considered as important risk factors for falls (Pillay et al., 2021).

According to Dhargave and Sendhilkumar (2016), a total of 163 elderly living in LTC homes in India were investigated, and they reported that having a history of falls, poor vision, use of multiple medications, chronic disease, using walking aids, and presenting with vertigo and poor balance were all highly associated with falls, which was much higher in this high-risk group, and especially among elderly females. The loss of autonomy was a major risk factor for falls, and difficulties experienced with ADLs or instrumental activities of daily living (IADLs), doubled the risk of falling (Dhargave & Sendhilkumar, 2016).

In a systematic review regarding the incidence of fall rates among older patients in LTC facilities, 12 peer-reviewed articles were selected with results indicating that the risk factors for falls among the elderly were attributed to personal and environmental factors, including medication, a previous history of falls, and having comorbidity, irrespective of the setting (Odenigbo, 2020). This study concluded that multifactorial interventions, including regular

structured exercise and assistive devices, were quite effective in preventing falls compared to no interventions or interventions with single strategies (Odenigbo, 2020).

A major concern contributing to the increased prevalence of falls is that the causes are complex and multifaceted, which can be either external or internal in nature to the individual and, invariably, lead to an elevated fall-risk (Rashid et al., 2019). The risk factors can be divided into four categories, namely, behavioural (i.e., consuming multiple medications, alcohol, lack of exercise and inappropriate footwear), biological (i.e., sociodemographic, chronic illness, gait, vertigo, visual and cognitive deficits), socioeconomical (i.e., due to social interaction, access to resources and socioeconomic status) and environmental (i.e., physical hazards, poor lighting and inappropriate building design) (WHO, 2022).

The elderly living in LTC facilities, are generally cared for in large groups, and minimal attention is given to each elderly resident, on a one-on-one basis (Lloyd-Sherlock, 2014). Within these LTC facilities, nurses are usually the sole care providers having relatively minimal training and knowledge about falls and the prodromal warning signs associated with them (Satariano, 2010). Additionally, care is not always given to those who sustain injury after a fall, especially for conditions such as open, bleeding wounds, fractures, sprains, and dislocations (Tricco et al., 2017). The stress associated with these complications often overwhelms staff in LTC facilities leading to burnout and an increased risk of unintentional errors, to the detriment of the elderly (Pillay et al., 2021). In LTC facilities, the elderly, often struggle with ADLs, due to failing cognitive abilities, and being confused and disorientated, so they are more likely to stumble into unfamiliar items, and are less likely to locate support devices, such as walking aids and spectacles (Callis, 2016). Furthermore, fall rates are increasing in LTC facilities, due to healthcare staff having excessive workloads and less time

to provide individualised care, and they lack knowledge on fall prevention to act pre-emptively (Kosse et al., 2015).

Literature has shown that the elderly living in LTC facilities had lower educational levels, poorer health status, higher dependency levels, higher risks of falls, lower physical activity levels and lower decision-making abilities (De Medeiros et al., 2020). Diaz et al. (2020) found a significant difference between fallers and non-fallers, in which fallers were older and had lower levels of functional independence than non-fallers. In the absence of injury, falls had a dramatic impact on the quality of life among the elderly, along with the physical and mental changes that accompanied ageing (Janakiraman et al., 2019). According to Bloch et al. (2010), identifying the sociodemographic characteristics of the elderly could help produce a profile of those who were at increased risk of falling. This data could be extremely useful in advising individuals at risk, and in developing specific programmes that reduced fall rates (Bloch et al., 2010).

Walking gait and balance disorders affected 20.0% - 40.0% of people aged 65 years and older, and 40.0% - 50.0% of those aged 85 years and older (Moreland et al., 2020). These disorders affected the ability of the elderly to maintain control or to correct their posture, after slipping or tripping (Rubenstein, 2006). Tripping, slipping, and impaired judgement increased the risk of falling among the elderly, especially when other risk factors were present, such as poor vision (Tuunainen et al., 2014). An additional risk factor for falls was dizziness that was induced by cardiovascular disorders, hyperventilation, orthostatic hypotension, alcohol intake, drug side-effects, anxiety, and depression (Himes & Reynolds, 2012).

Many studies have found urinary incontinence to be a risk factor for falls in the elderly (Dhargave & Sendhilkumar, 2016; Peng et al., 2019; Rubenstein, 2006; Tinetti et al., 1988). Incontinence and urgency create anxiety and increased the risk of slipping and tripping, which increased the likelihood of falling (Magnuszewski et al., 2020). Foot disorders, such as bunions and metatarsal pain, often lead to compensation in normal gait and balance, and increased the risk of falling (Díaz et al., 2020; Morris et al., 2004). Older women were reported to have a greater number of comorbidities, increased medication usage, increased fears of falling, increased gait and balance disorders and higher depression rates than men, which increased their likelihood of falling (L.-W. Chu et al., 2008).

Equally important, inappropriate clothing and unsafe footwear (Menant et al., 2008; Reuben et al., 2017), as well as a high body mass index (BMI) were reported as significant risk factors for falls (Himes & Reynolds, 2012). Obesity was also reported to increase the risk of falling compared to normal weight individuals (Himes & Reynolds, 2012). Many falls occurred during walking, however, the effect of unsafe footwear, as a risk factor, has not been investigated in many studies (Rapp et al., 2012). Also, poorly fitting clothing that was too long or made of slippery material also contributed to tripping and slipping (Rapp et al., 2012).

In a review of the literature, it was reported that many interventions regarding falls among the elderly, included behaviour change (Francis-Coad et al., 2018). This, therefore, indicated that behaviour was a significant risk factor and an important consideration in the prevention of falls (Francis-Coad et al., 2018). According to various researchers, a change in behaviour also reduced the risk of injury and the fear of falling (Sleet et al., 2009).

A large proportion of the elderly will require LTC in the future, as the aging population dramatically increases (WHO, 2022). In the last half century, LTC has been a vital public health issue in many countries (WHO, 2017). The need for LTC has rapidly grown and the provision of suitable care has also faced many challenges, such as poor financing, staff shortages and various complications regarding facility infrastructure (Chen et al., 2021). A poorer quality of life was observed in the elderly living in LTC facilities compared to those living in the community (De Medeiros et al., 2020). With this taken into consideration, affordable LTC facilities and support services should be provided to the elderly. This, however, could be a key component in many cost-effective solutions that are aimed at addressing the challenges confronting the elderly, especially from low-income backgrounds (De Medeiros et al., 2020). In turn, the elderly will be more amenable to behaviour change and maintaining their health, given the required healthcare support and social services that they need (De Medeiros et al., 2020; Francis-Coad et al., 2018).

### 2.5 Prevalence of Falls in South Africa

In sub-Saharan Africa (SSA), minimal consideration has been given to the elderly and, in essence, the health status of many of the elderly has significantly worsened compared to the elderly living in high-income countries (WHO, 2022). In 2011, South Africa's population aged 65 years and older numbered approximately 2.5 million and by 2050, the elderly population is estimated to be more than double and will reach approximately 5.7 million (WHO, 2022). This swell in the elderly population will lead to an increase in various disorders, which include falling (WHO, 2022). With the projected future increase in the elderly population and their increased risk of falling, and the associated injuries, there is also the financial cost of falls and the associated suffering that pose a substantial burden to society (Tricco et al., 2017). South Africa constitutes one of the highest elderly populations compared to other African countries,

such as Angola, Burkina Faso, Gambia, and Uganda (Satariano, 2010). In 2015, South Africa had the third highest proportion of elderly in SSA (Motsohi et al., 2020). Individuals in South Africa aged 65 years and older currently make up 5.0% of the population (Climate Transparency Report, 2020).

In SA, among the elderly between the ages of 65 and 75 years, approximately 35.0% to 45.0% require assistance, compared to Switzerland, where the percentages are between 5.0% and 20.0% (WHO, 2017). In 2011, the highest proportion of elderly persons was recorded in the Eastern Cape province (9.7%), followed by the Western Cape (8. 9%) and Limpopo (8.7%) (Statistics South Africa, 2014). Currently, the highest proportion of elderly persons aged 60 years and older are found in the Eastern Cape (11.5%), Western Cape (10.7%) and Northern Cape (10.1%) (Statistics South Africa, 2022) (Figure 2.1).

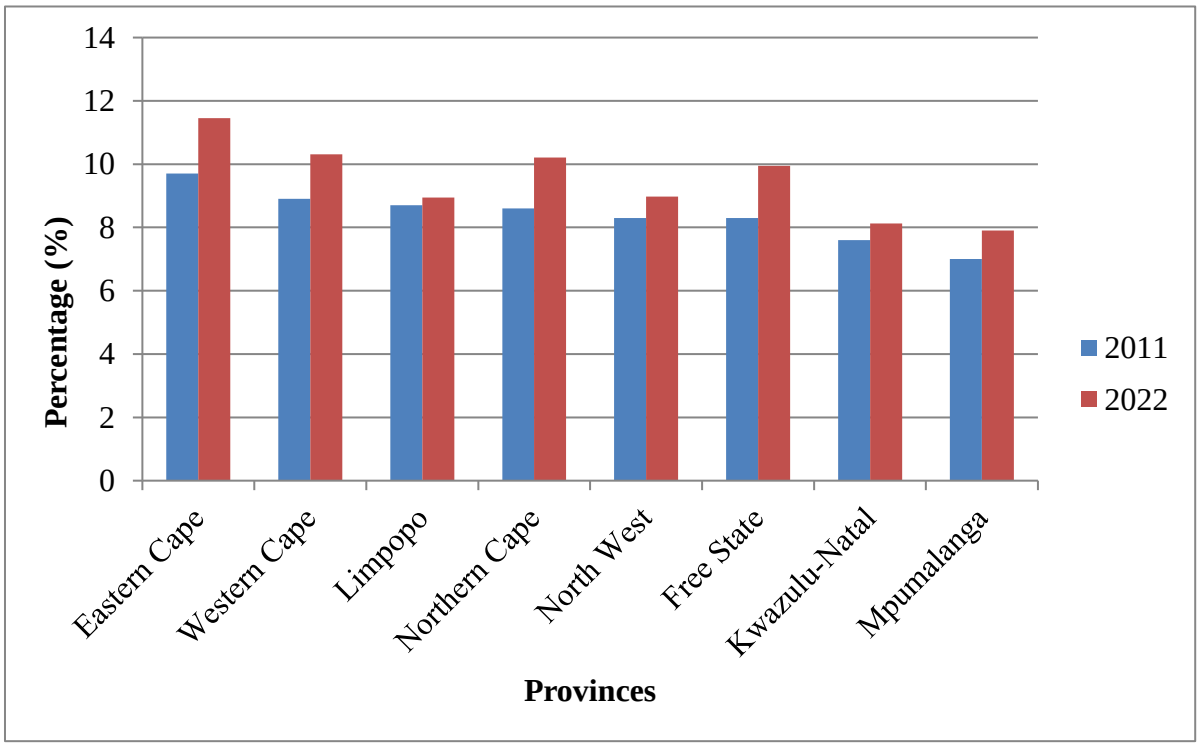



Figure 2.2: Percentage of elderly aged 60 years and older in each province in SA.

Since 2011, the elderly population in each province has increased dramatically (Statistics South Africa, 2022). The number of South Africans aged 70 years and older will almost double between 2015 and 2040, reaching 3.5 million people, with the majority being female (Lloyd-Sherlock, 2019). Persons who are aged 85 years and older are rapidly growing and constitute a higher fall risk group (Statistics South Africa, 2022). South Africa has the highest percentage of elderly in Africa (8.7%), which will increase to 17.4% by 2050 (Statistics South Africa, 2022).

In 2017, it was reported that LTC facilities in South Africa were mostly (79.0%) available in metropolitan or smaller urban areas, with only 5.0% of these facilities being available within informal settlements and 16.0% in rural areas (Mapira et al., 2019). The Report further indicated that the cost related to LTC facilities was a barrier to protecting the rights of the elderly, since many could not afford the fees and, therefore, relied on their families to contribute to their residency payments (Maros & Juniar, 2016).

### 2.6 Role of Biokinetics in Falls and Rehabilitation Among the Elderly in SA

A biokineticists scope of practise specifically focuses on the quality of life of all individuals, such as children, adolescents, adults, and the elderly, by using evidence-based, prescribed exercise programmes (HPCSA, 2020). These programmes are tailored to specific needs and goals of the client and/or patient. Falling can be a traumatising event for older adults, especially when they lack understanding of the circumstances that contributed to the fall (Galet et al., 2018).

In a study conducted in SA, it was reported that LTC facilities were deficient in caring for residents, especially those with higher dependency needs, such as those with dementia, with over a fifth of the facilities having untrained nurses (Lloyd-Sherlock, 2019). Despite the increasing numbers in the elderly, SA presents with similar statistics to the global trend of having growing numbers of elderly with large functional limitations (Lloyd-Sherlock, 2019). According to a study conducted in Cape Town, the findings indicated that healthcare workers grappled with the demands of LTC facilities, due to various factors, such as working overtime, having a lack of basic caregiving skills, inadequate social and emotional support, and a lack of specific training in caring for the elderly (Mapira et al., 2019).

In a study conducted in China in 2022, healthcare service provision and health outcomes were highly dependent on the quality of the healthcare workers employed (Ye et al., 2022). The study concluded that the lack of professional knowledge, as well as the lack of skills of healthcare professionals negatively impacted the fall-prevention strategy (Ye et al., 2022). Fall-prevention strategies, such as including strength and balance training, environmental modification, the allocation of adequate resources toward helping the elderly age well and taking part in fall prevention activities were considered effective in addressing the challenges among the elderly and mitigating the risk (WHO, 2022).

According to a study on fall-prevention impact in nurses, it was reported that due to the 24-hour presence of nurses, this had a significant impact on reducing falls by monitoring the elderly residents around the-clock or 24/7 (King et al., 2018). The study concluded that no research had been conducted on how nurses approached or used various strategies to prevent or reduce the risk of falls among the elderly (King et al., 2018). By understanding the risk factors that increased the likelihood of an elderly individual falling, then healthcare

professionals could assist in reducing the number of falls (King et al., 2018a). Therefore, there is a need to examine the roles of the LTC staff to ensure the appropriate healthcare professionals were employed and assigned specific roles, so that the elderly within these facilities were provided with the necessary care (Mapira et al., 2019). By employing specific healthcare professionals in LTC facilities, the prevalence of falls could be substantially decreased and the associated costs, in turn, reduced dramatically (Mapira et al., 2019).

## 2.7 Summary

The world's population is swiftly ageing. Falls among the elderly have become a global concern, especially for those living in LMICs. Many risk factors for falls are modifiable, thus, doing regular assessments and follow-ups could lead to the early detection and preventions of falls.

Falls among the elderly have also been a neglected public health burden, particularly in LTC facilities. Injuries and health problems, secondary to unexpected falls, are rather neglected areas of research. Such injuries may, in turn, lead to a larger influx of elderly into LTC facilities, due to the rapidly aging population. These increased numbers of falls experienced by older adults pose a serious problem for all health services. Falls can also have a devastating effect which could possibly lead to a decrease in confidence, mobility and ultimately their overall quality of life. Within the elderly population, it has been well-documented that most falls occur among those individuals living in LTC facilities (Jiang et al., 2020).

The elderly population generally has lower physiological reserves and increased chronic disease, which require multidisciplinary interventions. These present important challenges for

healthcare workers who frequently lack specific training (Kelly et al., 2019). Falls can be prevented with the assistance of specific professional healthcare workers who can assist by targeting the determinants of falls among the fast-growing elderly population. There is a need to raise awareness and educate healthcare professionals on the determinants of falls in the elderly, and to implement fall-prevention strategies within LTC facilities.

# CHAPTER THREE: RESEARCH METHODS

## 3.1 Introduction

In this chapter, the research design used in the study is described. The geographical area where the study was conducted, the sample and sampling criteria are highlighted. The data collection includes the research procedures, the assessment tools used, and instrument reliability and validity. Thereafter, the statistical analysis, followed by the ethical corrections, are presented.

## 3.2 Research Design

Quantitative methods are associated with quantifying measurable variables in a systematic way and determining the relationships between variables (Apuke, 2017). For the present study, a quantitative cross-sectional study design was used. This design was considered the most suitable for the study in that it produced reliable research data that allowed for meaningful interpretation.

## 3.3. Sampling of Participants

There are 50 residential care facilities in the City of Cape Town, with approximately 100 residents in each LTC facility. This totals a study population of about 5000 persons in the CoCT. A study sample of 357 participants was calculated from these LTC facilities to provide sufficient power in the study, based on Slovin's formula as shown below:

$n = \frac{N}{1+Ne^2}$ $n = \frac{5000}{1+ (5000 \times 0.05^2)}$ $n = 357$

Key: N = total population; n = sample size; e = margin of error.

Identification of potential participants was facilitated by the nursing managers and therapists in the homes. Males and females older than 60 years of age living in LTC villages for at least one year and who were independently ambulatory, without the support of a walking aid, were approached to participate in the study.

The study sampling strategy entailed convenient sampling to select the participants. Potential participants were identified by the nursing managers and, thereafter, an information session about the research was held with the potential participants. The participants who consented to participate in the study then indicated the times and days to complete the various battery of tests. Each LTC facility had a designated rehabilitation or therapy room that was used to conduct the tests. Testing of the participants was done on an individual basis, with the researcher and research assistants adhering strictly to the WHO COVID-19 safety protocols. Due to the COVID-19 pandemic, only 258 participants could be recruited for this study.

### 3.4 Delimitations of the Study

#### 3.4.1 Inclusion Criteria of the Study

The following inclusion criteria were used in the study:

- Elderly individuals, both males and females, aged 60 years and older living in LTC facilities in the CoCT.
- Elderly residents living in the LTC facilities for a minimum of one year.
- Elderly residents who were independently ambulatory, without the support of a walking aid.

### 3.4.2 Exclusion Criteria of the Study

- Elderly individuals who were not living in LTC facilities.
- Elderly individuals with physical disabilities who were dependent on a walking aid for ambulation.
- Elderly individuals who were frail, wheelchair-bound, or bed-ridden.

## 3.5 Research Procedures

### 3.5.1 Research Setting

A World-Wide Web (WWW) search was conducted to identify private and non-profit organization (NPO) LTC facilities in the CoCT. There were fifteen LTC facilities for the elderly in the CoCT. Among the fifteen LTC facilities, ten were public LTC facilities and five were private ones. These facilities were then contacted telephonically to participate in the study. The fifteen facilities that consented to participate in the study were in the Atlantic Seaboard, Southern Suburbs, and the Northern Suburbs of Cape Town. Data collection was conducted from September to November 2021.

### 3.5.2 Research Assessment Instruments

Stature was measured using a calibrated portable stadiometer. Participants were asked to stand on the HI-CARE stadiometer, facing forward with their arms hanging loosely at their sides. Their feet were placed flat and positioned slightly apart, in line with their hips. The participant's head was then placed in the Frankfort plane (Lahner et al., 2017). The head is in the Frankfort plane when the horizontal line from the ear canal to the lower border of the orbit of the eye is parallel to the floor and perpendicular to the vertical backboard. Next, the stadiometer head piece was lowered so that it rested firmly on top of the participant's head, with sufficient pressure to compress the hair. Participants were instructed to stand as tall as possible, take a

deep breath, and hold this position. Stature was then measured twice, to the nearest 0.1 cm, and the average of the two measurements was recorded as the final score for each participant.
Body mass was measured using a calibrated scale with participants placing both feet on the electronic scale (Casa Electronic Smart D-quip Scale) with their body mass evenly distributed across both feet. Each participant wore minimal clothing, was bare feet on the scale, and body mass was measured to the nearest 0.1 kg based on the WHO recommendations (WHO, 2000).

Body Mass Index (BMI) was calculated based on body mass and stature and used as a measure for indicating nutritional status in adults (WHO, 2020). This is an index of weight-for-height, which is calculated by dividing weight (in kilograms) by height (in metres squared) to classify nutritional status into different groups, such as underweight, normal weight, overweight and obesity. Underweight was classified as a BMI < 18.50 $kg \bullet min^{-2}$; normal BMI was from 18.50 to 24.99 $kg \bullet min^{-2}$; overweight was from 25.00 $kg \bullet min^{-2}$ to 29.99 $kg \bullet min^{-2}$; and obesity was a BMI ≥ 30.00 $kg \bullet min^{-2}$.

To determine the risk factors for falls in the elderly, the researcher used the following five performance test instruments: (1) the Fall Risk Assessment Tool (FRAT); (2) the Timed Up-And-Go (TUG) Test; (3) the Berg Balance Scale (BBS); (4) the Dynamic Gait Index (DGI), and (5) the Mini Mental State Examination (MMSE). These instruments enabled the researcher to not only identify the determinants of falls in the elderly, but also allowed the researcher to categorize and compare the elderly in terms of fall risk (e.g., high-risk, moderate-risk and low-risk). A combination of assessment tools were used rather than one to increase the accuracy thereof and that assessing the elderly with only one fall risk assessment tool was not sufficient.

The FRAT was a previously validated 4-item fall risk assessment tool used in residential care settings, and was composed of two sections, i.e., part one was a screening tool used to obtain a risk score. Participants were screened for high-risk fallers. Questions were asked regarding recent falls (composed of three categories: no falls within the last 12 months, one or more falls between the last 3-to-12 months, and one or more falls in the last 3 months, whilst being a resident), medications used, and the participants' psychological and cognitive status. Cognitive status was scored using the Abbreviated Mental Test Score (AMTS) (Appendix C). These were made up of ten individual questions giving a total score out of 10. The AMTS score ranged as follows; an AMTS of 9 or 10/10 indicated an intact cognitive status, an AMTS of 7-8 indicated being mildly affected, while an AMTS of 5-6 indicated moderate cognitive status, and a score of 4 or less indicated severe cognitive status. The total score for the fall-risk status indicated a low (5 – 11), moderate (12 – 15) or high fall-risk (16 - 20) for the participants.

The second part of the FRAT was a risk factor checklist to identify possible risk factors that contributed to falling. These were identified as major risk factors for falls in hospitals and residential care facilities, which included poor vision, unstable mobility, unsafe transfers, concerning behaviours, impaired ADLs, challenging environment, poor nutrition, incontinence and other. These risk factors were marked as either yes or no to indicate which risk factors were present or absent for the participants.

The Dynamic Gait Index (DGI) assessed eight components of gait and was used to determine the functional balance of participants. The DGI tested the ability of the participant to respond to different task demands and not lose balance, while walking. A 4-point Likert scale was used to assess functional balance, ranging from 0 (lowest level of function) to 3 (highest level of function). The eight components assessed walking movements, such as walking on level

surfaces, changing walking speeds, performing head rotations in horizontal and vertical directions, while walking, walking, and turning 180 degrees to stop, stepping over and around obstacles, and stair ascent and descent. The maximum score that could be achieved was 24. An interpretation of the test scores was as follows: a score from 0 - 19 was predictive of falls (high-risk), while a score from 20 - 21 indicated being at moderate-risk, and a score of 22 and higher indicated safe ambulation.

The Berg Balance Scale (BBS) was a 14-item scale used to objectively determine static balance, which was different from functional balance assessed with the DGI. For most of the test items, the participant was asked to maintain a given position for a specific period. Progressively more points were deducted, if the time or distance requirements were not met, if the participant's performance needed supervision, if the participant touched an external support or if the participant received assistance from the researcher. Each item consisted of a five-point Likert scale ranging from 0 (lowest level of function) to 4 (highest level of function). The maximum score that could be achieved was 56. An Interpretation of the test scores was as follows: from 0 - 20 indicated being at high-risk for falling from 21 - 40 indicated moderate-risk, and from 41 – 56 indicated a low fall risk.

The Timed Up-and-Go (TUG) test was used to determine fall risk and the progress of balance. Participants were instructed to sit back in a standard armchair and a 3-metre distance was shown to them. The participant was instructed to stand up, walk the 3 m distance, turn around and walk back at their normal pace and sit in the chair. Upon the instruction "go" the participant was timed for the full test. A participant who took 12 seconds or longer to complete the TUG test was considered at-risk for falling.

To assess cognitive impairment, the Mini Mental State Examination (MMSE) was used. This included a questionnaire that assessed the participant's cognition regarding orientation, registration, attention and calculation, memory, language, and visual spatial skills. The maximum score was 30. A score of 12 or less indicated severe dementia. A score ranging from 13 - 18 indicated moderate dementia. A score from 19 - 26 indicated early-stage dementia. A score of 27 – 30 indicated normal.

### 3.5.3 Data Collection

The executive management at each LTC facility was informed about the study, initially in writing via a formal letter, but also verbally, i.e., telephonically on an online Zoom meeting. The executive management had to approve the research to be conducted within the facility. Once the research was discussed and approved by the executive management at each LTC facility, this gave the researcher permission to conduct the research. Following the permission letter received from the facility, a visit date was agreed upon via an email that also stated all necessary information regarding the procedures on the testing day. Potential participants were identified by the nursing managers and an information session about the research was held with the potential participants. The participants who consented to participate in the study then indicated the times and days to complete the various battery of tests. Each LTC facility had a designated rehabilitation or therapy room that was used to conduct the tests. Testing of the participants was done on an individual basis, with the researcher and research assistants adhering strictly to the WHO COVID-19 protocols.

The researcher completed the data recording sheet (Appendix C) for all participants, except for the cognitive assessment, where the participants were assessed independently. For those participants who were unable to draw, motivations from the researcher and research assistant

were given to them to try drawing and, if not, to then leave it blank. Only four participants were motivated to draw.

A researcher-generated questionnaire (Appendix C) was used to obtain the participants' sociodemographic information and physical measurements, such as age, gender, educational level, marital status, and medical history. The participants were initially familiarized with the physical assessments, before proceeding with the actual testing. When conducting the physical tests, there was minimal risk of injury to the participants, such as sustaining a fall. The total testing time was approximately 40 minutes per participant. Participation in the study was voluntary, and participants had the right to decide whether to participate in the study or not, and declining to participate or stopping participation at any point did not negatively affect the participants in any way. Participants were asked to complete a consent form before any information or data was recorded. Participation ranged from filling in a questionnaire to participating in risk assessments of a physical nature to gather relevant research information. The researcher and research assistant conducted the physical tests and gathered information via the questionnaires. A staff member at the LTC facility was always present to assist and make sure that when the tests were being conducted, participants felt safe and secure.

### 3.5.4 Instrument Reliability and Validity

The FRAT correlated moderately with the BBS and TUG tests ($r = 0.535$ to $0.690$; $p < 0.001$). Downs et al. (2013) found-high intra-rater (interclass correlation coefficient = 0.88) and inter-rater (ICC= 0.77) scores for the BBS. Cruz et al. (2022), concluded that the TUG is recommended as a screening tool in guidelines published by the American Geriatric Society, the British Geriatric Society as well as the National Institute of Clinical Evidence (NICE). The DGI for test-retest and inter-rater reliability were good (0.96 and 0.96, respectively) and the

reliability for single-item scores was moderate-to-good (Jonsdottir & Cattaneo, 2007). The DGI correlated with the BBS (r = 0.78), but inversely with the TUG test (r = -0.72) (Steffen, 2012). The TUG test is a sensitive predictor for recurrent falls (Fudickar et al., 2020). According to Hörnsten et al. (2020), the MMSE inter-rater reliability was high (mean kappa value 0.97), and the test-retest reliability-ranged between 0.45 and 0.50.

### 3.6 Statistical Analysis

All data was captured into a Microsoft Office Excel spreadsheet, and then cleaned of errors. It was then exported to the Statistical Package for the Social Sciences (SPSS) version 28 for analysis. All electronic back-up copies of the data were stored on computer in the UWC data management repository in password-protected files, with access limited to the researcher and supervisors only. Each participant was allocated a number to protect their identity, when capturing the data onto the spreadsheets.

To analyse the data, both descriptive and inferential statistics were used. The descriptive statistics served to determine the central tendencies and dispersion of each variable, whereas the inferential statistics were used to test for significant differences between groups, to deduce the relationships between variables, to determine the degree of association between variables, as well as to identify the determinants of falls in the elderly. The data was checked for normality using the Shapiro-Wilks test. Descriptive statistical analysis (means, standard deviations, and frequencies) was used for describing the variables, such as age, height, weight, and BMI. Spearman's correlation coefficient and Pearson's Chi-square test were used to determine statistically significant associations between categorical variables (facility type, gender, age-group, marital status, education level, medications, and FRAT risk). The Spearman's rank correlation coefficient was also used to determine relationships between falls and risk factors,

as well as various medications. The Mann-Whitney U test was used to indicate significance among physical characteristics of participants. Odds ratios were also presented.

### 3.7 Ethics Considerations

Approval to conduct the study was obtained from the Biomedical Research Ethics Committee (BMREC) at the University of the Western Cape (REF: BM21/6/18). Approval from the City of Cape Town (CoCT) was obtained to conduct the study at the LTC facilities. Information about the study was initially shared with the participants, and written consent was obtained from all participants prior to enrolment in the study. Permission to conduct the tests within the various LTC facilities was obtained either from the Chief Executive Officer (CEO), operational manager or the nursing care manager at each LTC facility. Participation in the study was voluntary, and participants had the right to decide whether to participate in the study or not, and declining or stopping participation at any point did not negatively affect the participants in any way. The information sheet (Appendix A) was in English, Afrikaans and Xhosa to enable all participants to read and understand the research being conducted in their mother tongue.

The ethical principle of confidentiality was maintained throughout the study. Specifically, confidentiality was maintained by assigning a number to each participant and not revealing each participant's identity. Hard copies of the data collection sheets were stored in locked filing cabinets with the supervisor, and electronic data was stored in password protected computer files in the university's research repository with access restricted to the researcher and supervisors only. All participants' information will be destroyed after a period of five years. If the research is published as manuscripts or presented at conferences, then the participants confidentially will be maintained.

### 3.8 Summary

A quantitative cross-sectional study design was used in this study. A study sample of 357 participants was calculated from fifteen LTC facilities in the CoCT. The inclusion criteria consisted of elderly individuals, both males and females, aged 60 years and older living in LTC facilities for a minimum period of one year and who were independently ambulatory. A researcher-generated questionnaire was used to obtain the participants' sociodemographic information. Physical and cognitive measurements were also conducted. Descriptive and inferential analysis were conducted on the data.

# CHAPTER FOUR: RESULTS

## 4.1 Introduction

This chapter provides an analyses and interpretation of the results in the study. Both descriptive and inferential statistical analyses were used to present the results in various tables and graphs. The results of the study focus on identifying the prevalence of falls among the participants, the different mechanisms of falls in the elderly, the risk factors associated with falls in the elderly, the determinants of falls in the elderly and determining the relationship between sociodemographic factors and the risk factors for falls in the elderly.

The target population for this study was specifically the elderly, aged 60 years and older, who were independently ambulatory and living in LTC facilities in the CoCT in the Western Cape Province, SA. A total of 357 participants consented to participate in the study, however, only 258 participants answered all the questionnaires and participated in the physical measurements (response rate of 72.3%).

## 4.2 Sociodemographic Characteristics of Participants

The sociodemographic characteristics of the participants comprised gender, age, education level, marital status and fall history (Table 4.1).

In this study, a total of 28.7% (n = 74) of the participants were male and the majority (71.3%; n = 184) were female. The mean ($\overline{X}$ ± SD) age of the participants was 78.2 ± 7.4 years. The 60 – 69 year age-group compromised 13.2% (n = 34) of the sample, and the 70–79-year age-group was 39.9% (n = 103). Most of the participants (43.0%; n = 111) fell into the 80–89 year age-group, and the smallest group was aged 90-years and older (3.9%, n = 10).

A total of 43.8% had a normal BMI that was similar across gender with 44.0% female and 43.2% male. Furthermore, 33.7% and 18.6% fell into the overweight and obesity categories, respectively, that was slightly higher for males in both categories, i.e., overweight males and females were 36.5% and 32.6%, respectively, while obese males and females were 20.3% and 17.9%, respectively. The results indicated that most of the elderly (52.3%; n = 135) were either overweight or obese. A total of 3.9% (n = 10) participants fell into the underweight category that consisted of females only.

Regarding the participants' level of education, 50.4% matriculated (grade twelve) with 30.6% (n = 79) from mainstream schools, and 19.8% (n = 51) from technical schools. A total of 16.3% (n = 42) graduated with a bachelor's degree from university, while 2.3% (n = 6) and 1.9% (n = 5) graduated with master's and doctoral degrees, respectively. None of the participants in this study completed an honours degree, as their highest level of education. Thus, the results indicated that 20.5% of the participants were in possession of a graduate qualification from a tertiary institution.

A total of 24.4% (n = 63) of the participants were married, with 15.9% (n = 41) who were single and 15.1% (n = 39) who were divorced. Almost half (43.4%; n = 112) were widowed.

In this study, 32.6% of the participants had a fall in the past three months, with more than half (67.4%; n = 174) not sustaining a fall in the past three months. Falls relating to slipping/tripping (15.5%, n = 40) was the main fall mechanism, followed by loss of balance (10.5%; n = 27) and dizziness (5.0%; n = 13). A small number of participants fell due to collapsing (3.5%; n = 9) and legs giving way (0.8%; n = 2).

Table 4.1: Sociodemographic characteristics of the participants.

| Category | n (%) |
|---|---|
| **Gender** | |
| Male | 74 (28.7) |
| Female | 184 (71.3) |
| Total | 258 (100) |
| **Age (years)** | |
| 60 – 69 | 34 (13.2) |
| 70 – 79 | 103 (39.9) |
| 80 – 89 | 111 (43.0) |
| ≥ 90 | 10 (3.9) |
| Total | 258 (100) |
| **Body mass index (kg•min-2)** | |
| Underweight | 10 (3.9) |
| Normal weight | 113 (43.8) |
| Overweight | 87 (33.7) |
| Obese | 48 (18.6) |
| Total | 258 (100) |
| **Educational level** | |
| Grade 7 or lower | 32 (12.4) |
| Grades 8 - 11 | 43 (16.7) |
| Matriculated from mainstream school | 79 (30.6) |
| Matriculated from technical school | 51 (19.8) |
| Graduated with a bachelor's degree | 42 (16.3) |
| Graduated with a master's degree | 6 (2.3) |
| Graduated with a doctoral degree | 5 (1.9) |
| Total | 258 (100) |
| **Marital Status** | |
| Married | 63 (24.4) |
| Single | 44 (17.1) |
| Divorced | 39 (15.1) |
| Widowed | 112 (43.4) |
| Total | 258 (100) |
| **Fall History (in the past 3 months)** | |
| No | 174 (67.4) |
| Yes | 84 (32.6) |
| Total | 258 (100) |
| **Fall Mechanism** | |
| Legs giving way | 2 (0.8) |
| Collapsing | 9 (3.5) |
| Dizziness | 13 (5.0) |
| Loss of balance | 27 (10.5) |
| Slipping/Tripping | 40 (15.5) |
| Total | 91 (100) |

### 4.3 Physical Characteristics of the Participants

Table 4.2 indicates the physical characteristics of the participants with age, body mass and stature as the relevant variables. The Mann- Whitney U test indicated that all variables were statistically significant between groups. The participants mean age was 78.2 ± 7.3 years, with females (79.0 ± 6.8 years) being significantly older than the males (76.2 ± 8.3 years) [$U$ (1) = 5.08, p= 0.024]. Mean body mass for the total group was 70.5±14.8 kg. Total means for females and males were 66.3±13.6 and 81.0 ± 12.4respectively. Results indicated that males were significantly heavier [$U$ (1) = 58.27, $p$ = 0.001] than females. Total mean stature was 164.3±10.8 cm with a mean of 160.1± 7.65 cm for females and mean of 175.0±10.3 cm for males. Results indicated that males were significantly taller [$U$ (1) = 85.15, $p$ = 0.001] than females.

Table 4.2: Physical characteristics of the participants**.**

| **Variable** | **Total (n = 258)** | **Females (n = 184)** | **Males (n =74)** | **Mann-Whitney U** | **p-value** |
|---|---|---|---|---|---|
| | **$\bar{X}$ ± SD** | | | | |
| Age (years) | 78.2 ± 7.3 | 78.9 ± 6.84 | 76.2 ± 8.3 | 5.088 | 0.024* |
| Body mass (kg) | 70.5 ± 14.8 | 66.3 ± 13.6 | 81.0 ± 12.4 | 85.150 | 0.001* |
| Stature (m) | 164.3 ± 10.8 | 160.1 ± 7.6 | 175.0 ± 10.3 | 58.272 | 0.001** |

***Note:*** **indicates statistically significant difference $p < 0.05$.*
***indicates statistically significant difference $p < 0.01$.*

### 4.4 Types of Residential Facilities Used by the Participants

The results on the types of residential facilities used by participants revealed that 43.0% (n = 111) resided in private facilities, while most of them (57.0%; n = 147) resided in non-profit organisation (NPO) facilities, (Figure 4.1).


Figure 4.1: Type of LTC facilities in the study.

**4.5 Medications Currently Used by the Participants**

The results in Figure 4.2 illustrate that a total of 461 medications were currently used by the 258 participants of which anti-Parkinsons (2.3%; n = 6), anti-epileptics (2.7%; n = 7) and anti-psychotics (3.5%; n = 9) made up the smallest percentage of medications used by the participants. Sedatives (6.2%; n = 16), anti-diuretics (11.6%; n = 30), anti-diabetics (14.0%; n = 36) and anti-depressants (17.4%; n = 45) was often used by the participants. Most of the participants were medicated with anti-hypertensives (58.9%; n = 152) and other (60.5%; n = 156) medications.

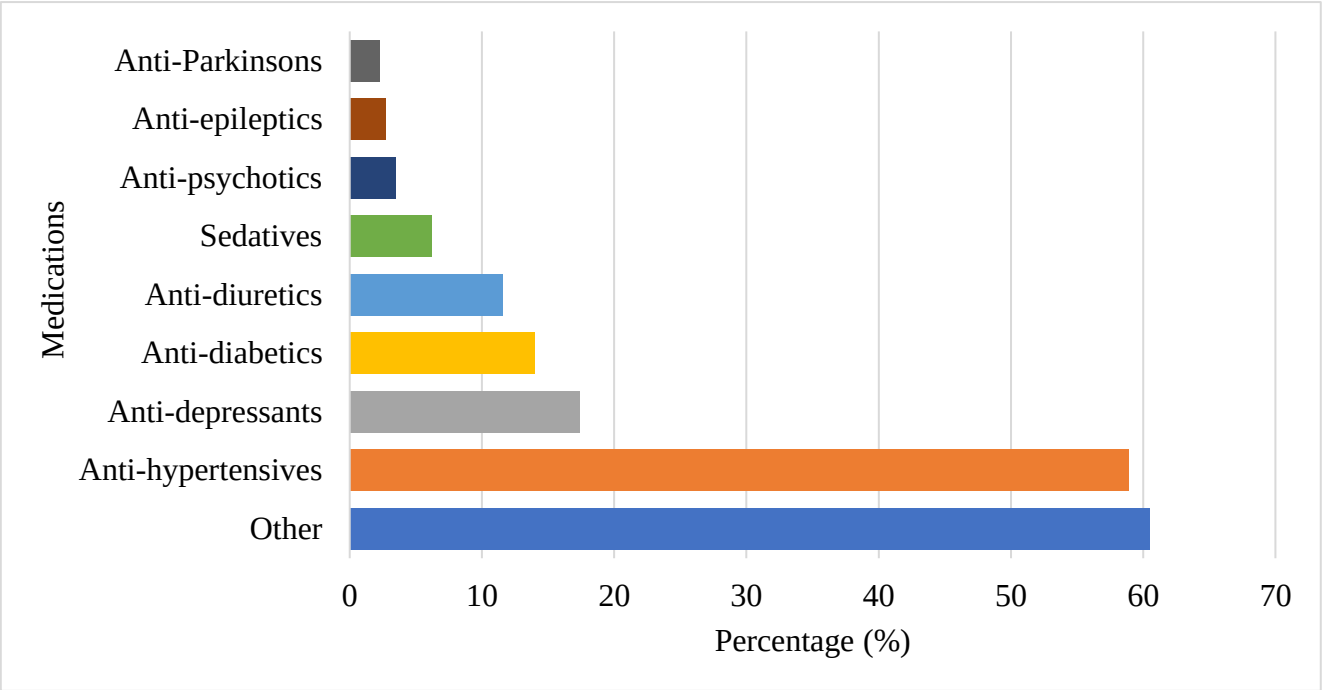



Figure 4.2: Medications used by the participants.

### 4.6 History of Falls Experienced by the Participants

#### 4.6.1 Mechanisms of Falls in the Past Three Months

In the previous three months, a total of 35.3% (n = 91) falls were sustained by the 258 participants. A small proportion of falls were related to either the legs giving way (0.8%; n = 2) or collapsing (3.5%; n = 9) (Figure 4.2). More often, falls were related to dizziness (5.0%; n = 13), loss of balance (10.5%; n = 27) and slipping/tripping (15.5%; n = 40) (Figure 4.3).

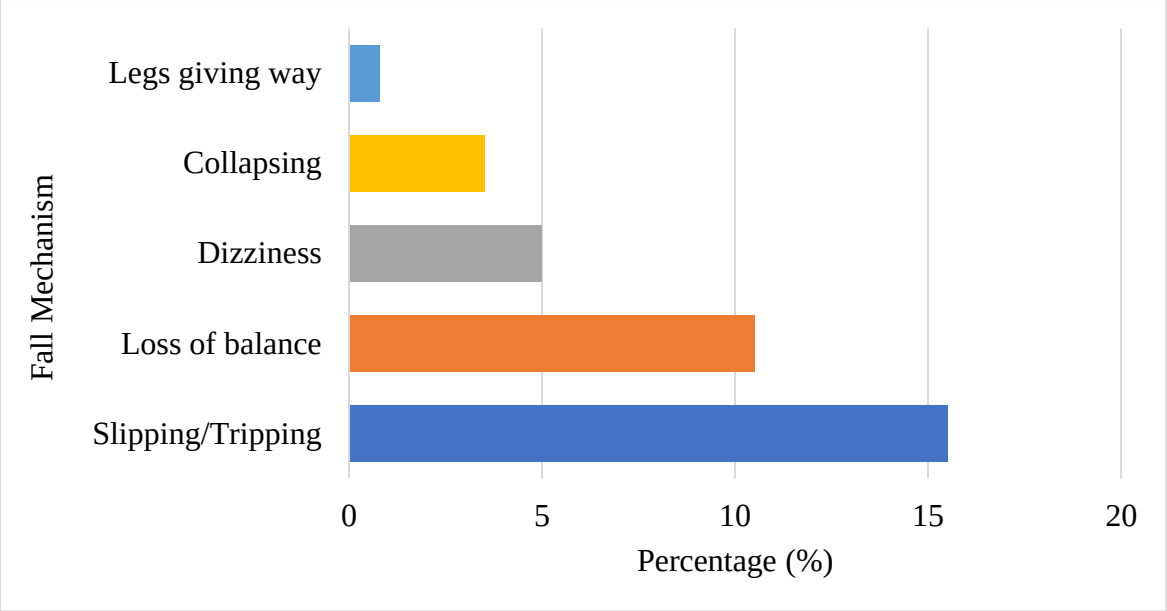



Figure: 4.3: Mechanisms of falls among the participants in the past three months.

### 4.6.2 Fall Mechanisms based on Sociodemographic Characteristics

Table 4.3 indicates that females (77.5%; n = 31) sustained a higher prevalence of falls compared to males (22.5%; n = 9), due to slipping/tripping. The males 53.8%; n = 8) were higher for dizziness. Loss of balance showed a similar prevalence among both males (10.8%; n = 8) and females (10.3%; n = 19). The results were similar for loss of balance, legs giving way and collapsing.

Regarding collapsing, 55.6% (n = 5) and 33.3% (n = 3) of the participants were in the age groups 70 - 79 and 80 - 89 years, respectively. Based on dizziness, 38.5% (n = 5) and 46.2% (n = 6) were in the age groups 70-79 and 80-89 years, respectively. From the 40 participants who experienced tripping/slipping, 30.0% (n = 12) and 45.0% (n = 18) were in the age groups 70-79 and 80-89 years, respectively. Similarly, from the 27 participants who experienced a loss balance, 40.7% (n = 11) and 48.1% (n = 13) were in the age groups 70-79 and 80-89 years, respectively. Therefore, the prevalence of falls was higher in the age groups 70-79 and 80-89

years compared to 60-69, years and 90 years and older, with the main fall mechanism being slipping/tripping.

From the 40 participants who reported slipping/tripping in the past three months, 45.0% (n = 18) had normal weight, while 47.5% (n = 19) were either overweight or obese. For the 27 participants who reported a loss of balance, 40.7% (n = 11) had normal weight, while 55.5% (n = 15) were either overweight or obese. Regarding the 13 participants who experienced dizziness, 38.4% (n = 5) had normal weight, while 61.6% (n = 8) were either overweight or obese. Regarding the 9 participants who collapsed in the last three months, 22.2% (n = 2) had normal weight, while 77.8% (n = 7) were either overweight or obese. The results indicated a low prevalence of falls among underweight individuals compared to those who were normal weight or overweight/obese. Most importantly, the results showed that the participants who were overweight or obese were the most prone to falls.

Regarding the participants' level of education, among the 40 participants who fell due to slipping/tripping, this mechanism was highest among those who had grade 7 or lower (20.0%; n = 8). Falling, due to loss of balance, was also more prevalent among those who had a grade 7 or lower (22.2%; n = 6) education and those who matriculated (29.6%; n = 8). A large proportion of falls, due to dizziness, were found among those who had matriculated from mainstream school and lower (53.9%; n = 7) compared to those who graduated with masters or doctorate degrees (30.8%; n = 5).

Slipping/tripping was the main mechanism of falls among single (25.0%; n = 10), divorced (20.0%; n = 8), and widowed (42.5%; n = 17) participants, whereas loss of balance was the main mechanism of falls in married participants (37.0%; n = 10).

Table 4.3: Fall Mechanisms in the past 3 months based on sociodemographic characteristics.

| Category | Legs giving way | Collapsing | Dizziness | Loss of balance | Slipping/Tripping |
|---|---|---|---|---|---|
| **Gender** | | | **n (%)** | | |
| Male (n = 23) | 0 (0.0%) | 3 (33.3%) | 7 (53.8%) | 8 (29.6%) | 9 (22.5%) |
| Female (n = 61) | 2 (100.0%) | 6 (66.7%) | 6 (46.2%) | 19 (70.4%) | 31 (77.5%) |
| Total (n = 84) | 2 (100%) | 9 (100%) | 13 (100%) | 27 (100%) | 40 (100%) |
| **Age (years)** | | | | | |
| 60 – 69 (n = 12) | 0 (0.0%) | 1 (11.1%) | 2 (15.4%) | 3 (11.1%) | 8 (20.0%) |
| 70- 79 (n = 35) | 2 (100.0%) | 5 (55.6%) | 5 (38.5%) | 11 (40.7%) | 12 (30.0%) |
| 80 – 89 (n = 35) | 0 (0.0%) | 3 (33.3%) | 6 (42.6%) | 13 (48.1%) | 18 (45.0%) |
| ≥ 90 (n = 2) | 0 (0.0%) | 0 (0.0%) | 0 (0.0%) | 0 (0.0%) | 2 (5.0%) |
| Total (n = 84) | 2 (100%) | 8 (100%) | 13 (100%) | 27 (100%) | 40 (100%) |
| **Body mass index (kg•min-2)** | | | | | |
| Underweight (n = 4) | 0 (0.0%) | 0 (0.0%) | 0 (0.0%) | 1 (3.7%) | 3 (7.5%) |
| Normal weight (n = 36) | 2 (100.0%) | 2 (22.2%) | 5 (38.5%) | 11 (40.7%) | 18 (45.0%) |
| Overweight (n = 32) | 0 (0.0%) | 6 (66.7%) | 4 (30.8%) | 11 (40.7%) | 14 (35.0%) |
| Obese (n = 12) | 0 (0.0%) | 1 (11.1%) | 4 (30.8%) | 4 (14.8%) | 5 (12.5%) |
| Total (n = 84) | 2 (100%) | 9 (100%) | 13 (100%) | 27 (100%) | 40 (100%) |
| **Educational level** | | | | | |
| Grade 7 or lower (n =19) | 1 (50.0%) | 1 (11.1%) | 3 (23.1%) | 6 (22.2%) | 8 (20.0%) |
| Grades 8 – 11 (n = 12) | 0 (0.0%) | 2 (22.2%) | 1 (7.7%) | 4 (14.8%) | 5 (12.5%) |
| Matriculated from a mainstream school (n = 25) | 0 (0.0%) | 2 (22.2%) | 3 (23.1%) | 8 (29.6%) | 12 (30.0%) |
| Matriculated from a technical school (n = 13) | 0 (0.0%) | 1 (11.1%) | 1 (7.7%) | 5 (18.5%) | 6 (15.0%) |
| Graduated with a bachelor's degree (n = 19) | 1 (50.0%) | 3 (33.3%) | 3 (23.1%) | 4 (14.8%) | 8 (20.0%) |
| Graduated with a master's and doctoral degree (n = 3) | 0 (0.0%) | 0 (0.0%) | 2 (15.4%) | 0 (0.0%) | 1 (2.5%) |
| Total (n = 91) | 2(100%) | 9 (100%) | 13 (100%) | 27 (100%) | 40 (100%) |
| | | | | | |

| | | | | | |
|---|---|---|---|---|---|
| **Marital Status** | | | | | |
| Married (n =20) | 0 (0.0%) | 2 (22.2%) | 3 (23.1%) | 10 (37.0%) | 5 (12.5%) |
| Single (n = 20) | 1 (50.0%) | 3 (33.3%) | 2 (15.4%) | 4 (14.8%) | 10 (25.0%) |
| Divorced (n = 22) | 1 (50.0%) | 3 (33.3%) | 5 (38.5%) | 5 (18.5%) | 8 (20.0%) |
| Widowed (n = 29) | 0 (0.0%) | 1 (11.1%) | 3 (23.1%) | 8 (29.6%) | 17 (42.5%) |
| Total (n = 91) | 2 (100%) | 9 (100%) | 13 (100%) | 27 (100%) | 40 (100%) |

***Note:*** *BMI indicates body mass index.*

### 4.7 Prevalence of Fall Risk Factors Among the Participants

Among all participants, 33.7% (n = 87) presented with no risk factors for falls that was more so for males (41.9%; n = 56) than females (30.4%; n = 31), while 31.4 % (n = 81) had one risk factor that was about even across gender, 18.2% (n = 47) had two risk factors that was higher in females (20.1%; n = 37), 11.6% (n = 30) had three that was also higher in females (13.0%; n = 24), 3.5% (n = 9) had four that was about even across gender, and 1.6% (n = 4) had five that was also about even in both genders (Figure 4.4). Specifically, among female participants, 30.4% (n = 56) had zero risk factors, 32.1% (n = 59) had one, 20.1% (n = 37) had two, 13.0% (n = 24) had three, 3.3% (n = 6) had four and 1.1% (n = 2) had five risk factors. Among the male participants, 41.9% (n = 31) had zero risk factors, 29.7% (n = 22) had one, 13.5% (n = 10) had two, 8.1% (n = 6) had three, 4.1% (n = 3) had four, and 2.7% (n = 2) had five.

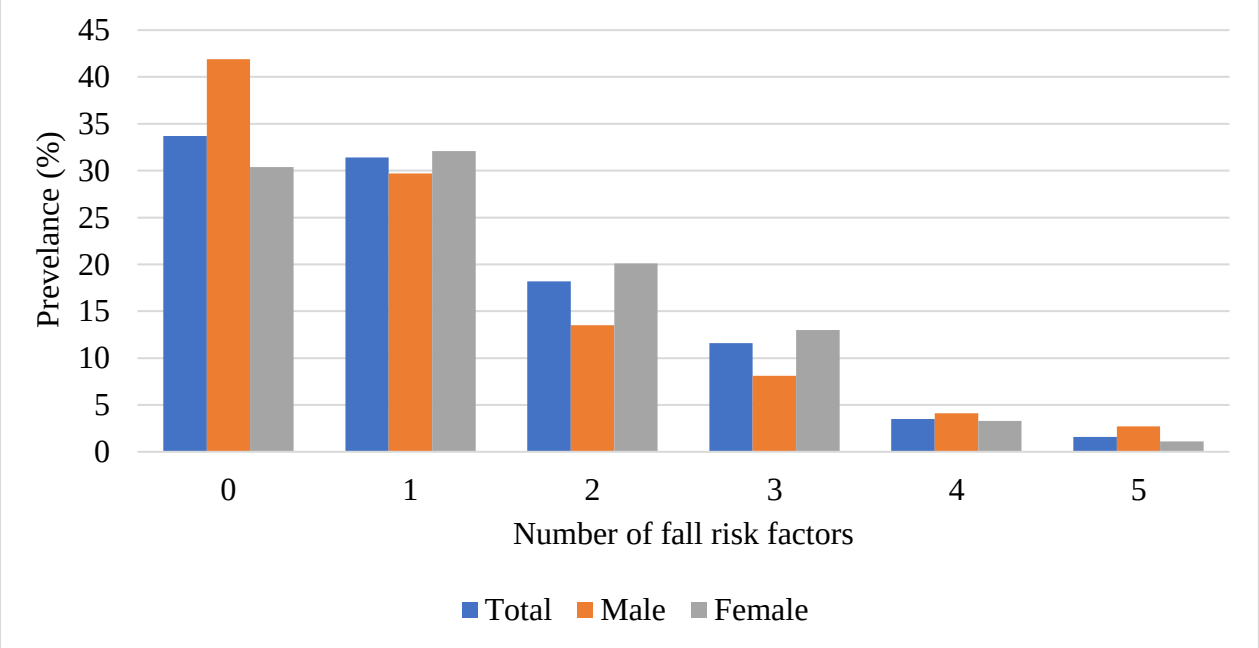



Figure 4.4: Prevalence of fall risk factors among the participants based on gender.

Figure 4.5 illustrates the prevalence of fall risk factors based on age-group. The number of risk factors generally increased with advancing age. The prevalence of zero risk across the various age-groups was 60-69 years with 35.3% (n = 12), 70–79 years with 35.0% (n = 36), 80-89 years with 33.3% (n = 37) and ≥90 years with 20.0% (n = 2). The prevalence of one risk factor across the age groups was 60–69 years with 23.5% (n = 8), 70–79 years with 35.0% (n = 36), 80–89 years with 27.9% (n = 31) and ≥90 years with 60.0% (n = 6). The prevalence of two risk factors across the age groups was 60–69 years with 20.6% (n = 7), 70–79 years with 13.6% (n = 14), 80–89 years with (22.5% (n = 25) and ≥90 years with 10% (n = 1). The prevalence of participants with three risk factors across the age groups was 60–69 years with 14.7% (n = 5), 70–79 years with 10.7% (n = 11), 80–89 years with 11.7% (n = 13) and ≥90 years with 10.0% (n = 1). Most of the risk factors were higher in the age groups 70–79 and 80–89 years.

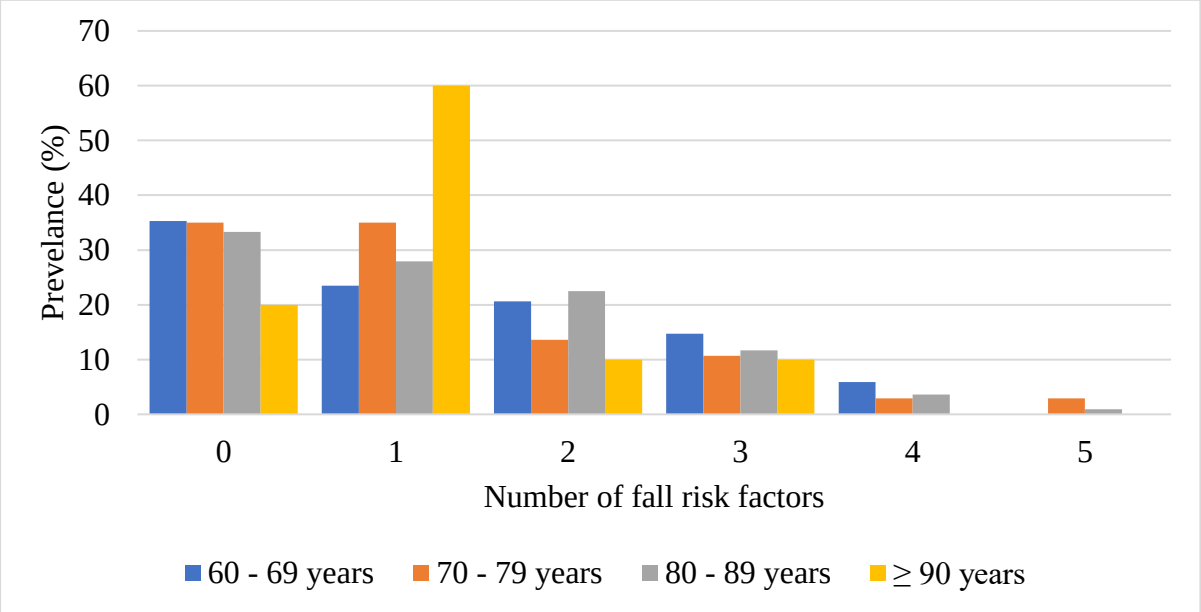



Figure 4.5: Prevalence of fall risk factors among the participants based on age-group.

## 4.7 Fall Risk Status Among the Participants

### 4.8.1 Fall Risk Status Based on the Recent Falls Sustained by the Participants

The recent fall sustained by the participants was 31.8% (n = 82). The number of falls between three and twelve months was almost double in females (20.7%; n = 38) compared to males (10.8%; n = 8). However, males (16.2%; n = 24) showed a slightly higher fall prevalence in the last three months compared to females (13.0%; n = 12).

### 4.8.2 Fall Risk Status Based on the Number of Medications used by the Participants

A total of 87.6% (n = 226) participants were on medication, with 25.6% (n = 66) males and 62.0% (n = 160) females. A total of 10.3% (n = 19) females reported taking one tablet, 14.7% (n = 27) reported taking two tablets and 62.0% (n = 114) reported taking more than two tablets. In males, 16.2% (n = 12) took one tablet, 10.8% (n = 8) took two, and 62.2% (n = 46) took more than two. In females 10.3% (n = 24) and 10.8% (n = 8) of males reported not being on any medication.

### 4.8.3 Fall Risk Status Based on the Psychological Issues of the Participants

Psychological issues refer to having anxiety, depression or being uncooperative. A total of 27.9% (n = 72) of participants were affected by psychological issues. Males had none of these issues, whereas 7.6% (n = 14) of females were moderately affected, and 4.9% (n = 9) were severely affected by one or more psychological issues. Females showed a slightly higher prevalence of mild psychological issues (19.6%; n = 36) compared to males (17.6%; n = 13). A total of 32.1% (n = 59) of females appeared to have psychological issues compared to 17.6% (n = 13) males.

### 4.8.4 Fall Risk Status Based on the Cognitive Status of the Participants

Cognitive status refers to the participants risk for developing dementia. A score between 0 –3 is suggestive of severe cognitive impairment, between 4–7 is indicative of moderate impairment and a score of 8 and above is suggestive of normal/intact cognitive function. Participants with normal or intact cognitive status was similar for males and females, with 67.6% (n = 123) and 66.8% (n = 50), respectively (Figure 4.6). The prevalence of mild (21.2%; n = 39) and moderate (5.2%; n = 10) cognitive status in females was higher than males (mild: 17.6%; n = 13, moderate: 4.1%; n = 3). However, severe cognitive impairment was higher among males (10.8%; n = 12) compared to females (6.5%; n = 8). A total of 33% (n = 65) of participants were at risk of mild-to-moderate impaired cognitive function.

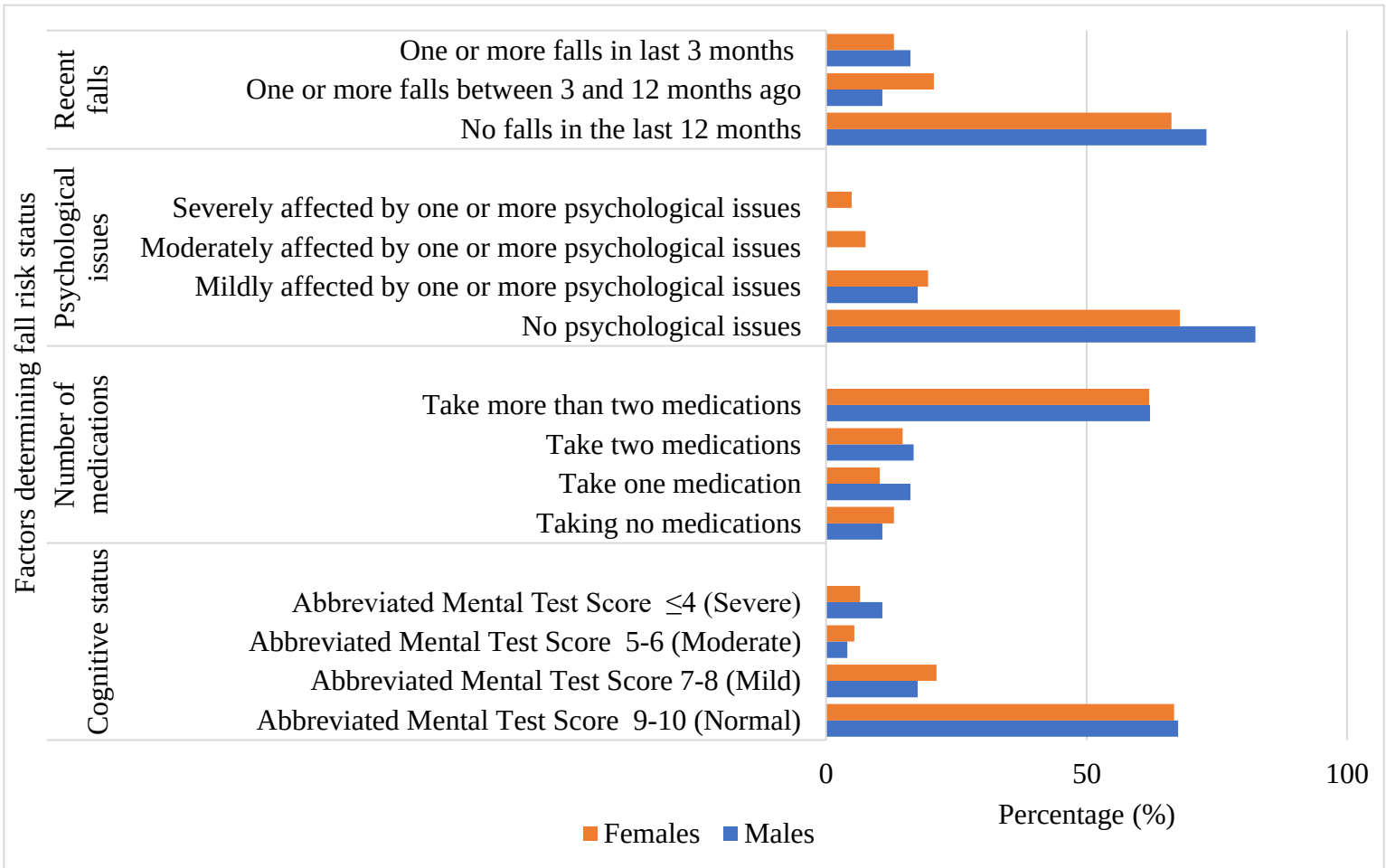



Figure: 4.6: Fall risk status among the participants based on gender.

### 4.9 Prevalence of Fall Risk Factors Based on Gender and Age-Group

The major risk factors for falls among the participants are illustrated in Figure 4.7 and Figure 4.8. According to the fall risk factors, poor vision was the most prevalent in both males (44.6%; n = 33) and females (51.6%; n = 95). When reported according to age-group, poor vision was prevalent in 42.2% (n = 54) of participants aged 70–79 years and in 45.3% (n = 58) of participants aged 80–89 years. In participants aged 60–69 years, poor vision was only prevalent in 9.4% (n = 12), with an even lower prevalence of 3.1% (n = 4) in the elderly aged 90-years and older.

Concerning behaviours refer to observed or reported agitation, confusion, disorientation, difficulty following instructions or being non-compliant (observed or known). Males (20.3%; n = 15) and females (20.7%; n = 38) reported a similar prevalence of concerning behaviours. A total of 45.3% (n = 24) of concerning behaviours was found in the 80–89 year age-group, with a lower prevalence of 35.8% (n = 19) in those aged 70–79 years. There was a prevalence of 17.0% (n = 9) of concerning behaviours in the 60–69 year age-group, and an even lower prevalence of 1.9% (n = 1) in the elderly aged 90-years and older.

Appearing physically unstable or being impulsive was the third most prevalent fall risk factor among the elderly. The prevalence of unstable mobility in males (15.2%; n = 12) and females (16.2%; n = 28) was quite similar. The prevalence was also similar in the age group 70–79 years (35.0%; n = 14) and 80–89 years (37.5%; n = 15), but much lower (22.5%; n = 9) in the 60–69 year age group, and even lower prevalence in the 90-years and older age-group (1.9%; n = 2).

Unsafe transfers, as a risk factor, refer to a participant reaching too far forward and, thereby, making their base of support unstable and unsafe or being impulsive in terms of moving from one point to another by making use of unstable objects. The prevalence of unsafe transfers was found in 12.2% (n = 8) of males but was slightly lower in females (10.9%; n = 20). The 80–89-year age-group presented with the highest prevalence (48.3%; n = 13) of unsafe transfers compared to the 70–79 year age-group with 27.6% (n = 8), the 60–69 year age-group with 20.7% (n = 6), and a much lower prevalence of 3.4% (n = 1) in the 90-years and older age-group.

The reported or known urgency and accidental actions regarding incontinence as a risk factor was slightly higher in elderly females (10.3%; n = 19) than elderly males (8.1%; n = 5). The 70–79 and 80–89 year age groups presented with the same prevalence of 44.0% (n = 21), with a much lower prevalence of 12.0% (n = 3) in the 60-69 year age group, and this risk factor was completely absent in those aged 90-years and older.

Males (5.4%; n = 4) and females (6.0%; n= 11) presented with a similar prevalence for unsafe footwear as a fall-risk factor. In the age-group 70–79 years, the prevalence of unsafe footwear was 66.7% (n = 10) but was much lower at 20.0% (n = 3) in the age-group 80–89 years, while the 60-69 years and 90-years and older age groups had the same prevalence of 6.7% (n = 2).

The environment as a risk factor presented challenges or difficulties with orientation to the individual's residential environment, such as knowing where the location of the bathroom was within their own room or flat or where the dining hall was located within the facility. The prevalence of environmental challenges was 2.7% (n = 2) in elderly males compared to 4.3% (n = 8) in elderly females. The prevalence of environmental challenges was the same in the 60–

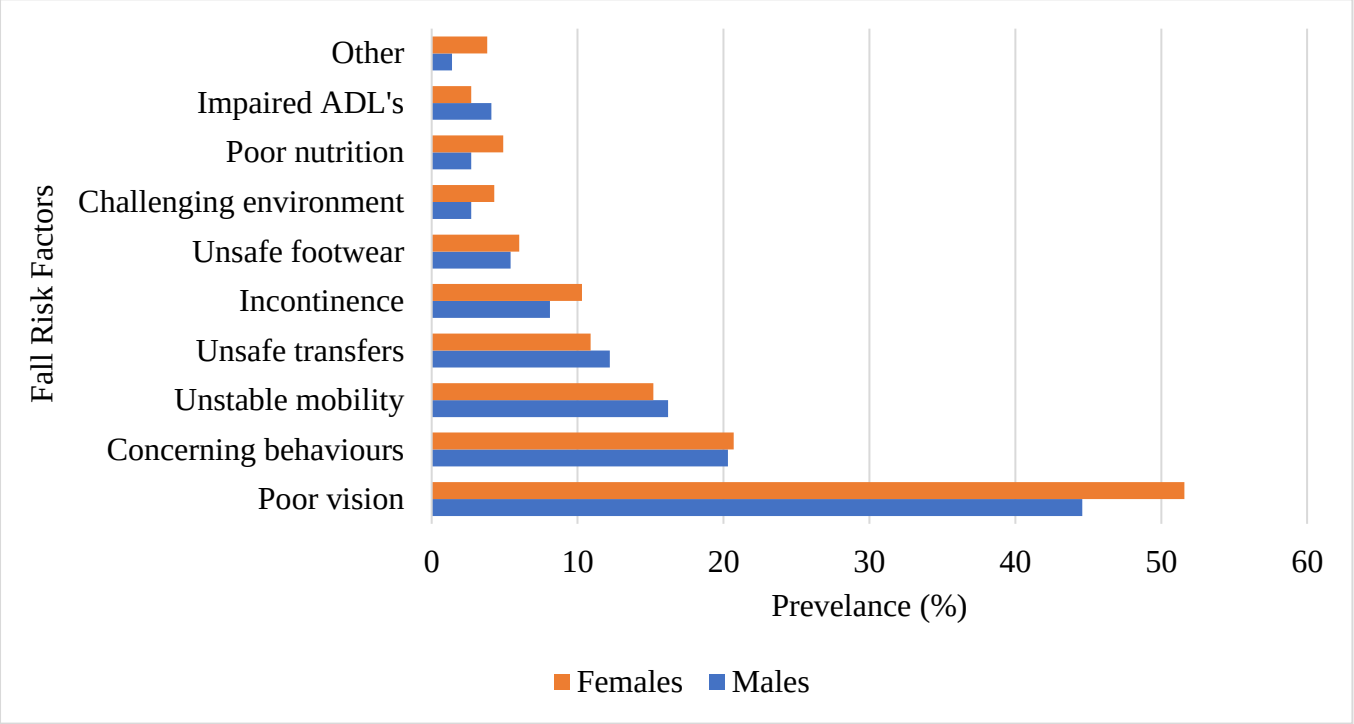
69 and 70–79 year age groups with 30.0% (n = 3), while the age-group 80–89 years was higher (40.0%; n = 4), and it was completely absent in the age-group 90-years and older.

Poor nutrition refers to individuals' being either underweight or having a poor appetite. Males presented with a lower prevalence of poor nutrition at 2.70% (n = 1), whereas females were slightly higher at 4.89% (n = 9). A high prevalence (27.3%; n = 3) of poor nutrition was shown in the age-group 70–79 years, and an even higher prevalence (72.7%; n = 7) in the age-group 80–89 years.

Activities of daily living compromised six activities which were fundamental to maintaining independence, such as bathing, walking, grooming, dressing, eating and personal hygiene. Impaired ADLs, as a fall risk factor, was prevalent among 4.1% (n = 2) of males and 2.71% (n = 5) of females. Impaired ADLs were also very high among the age- group 80–89 years (62.5%; n = 4), with a much lower prevalence (25.0%; n = 2) among the age-group 90-years and older, and an even lower prevalence of 12.5% (n = 1) among the age-group 60–69 years. The risk factor was absent among the age-group 70–79 years.

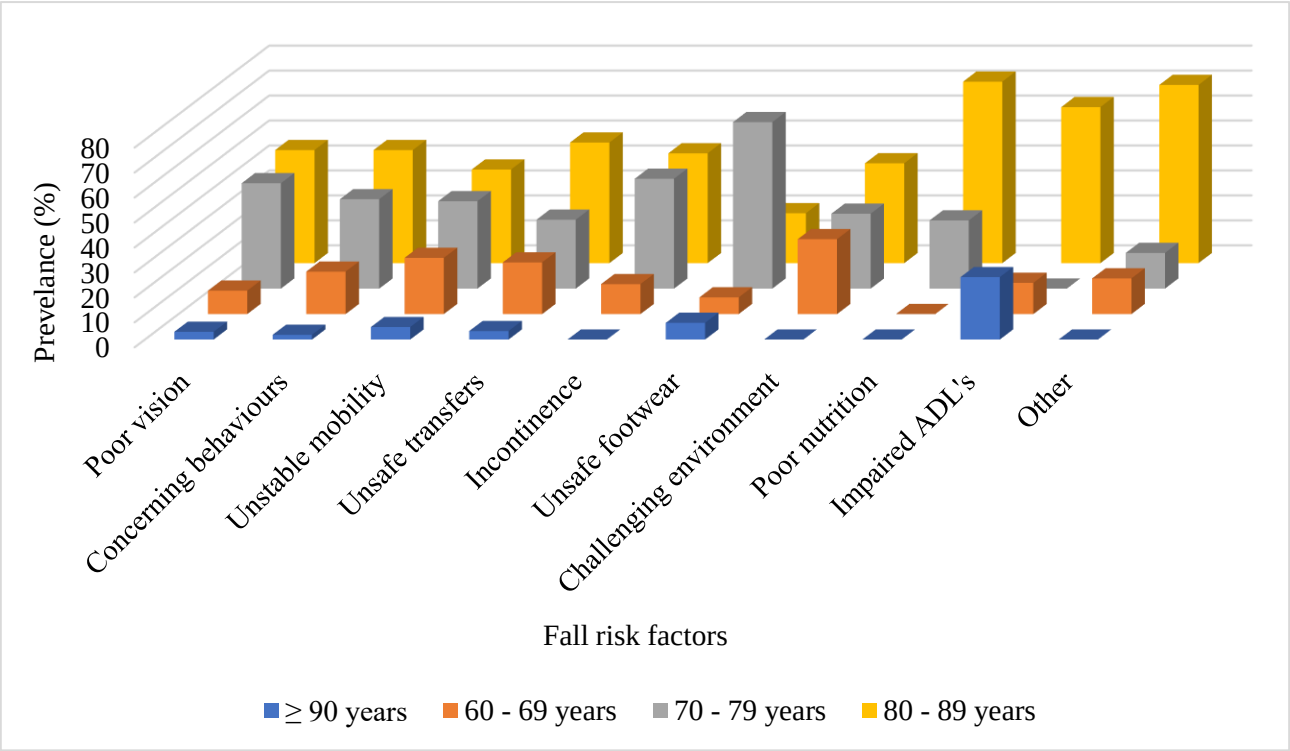
Based on the prevalence of all the risk factors for falls in the elderly, poor vision was the highest (49.6%; n = 128), which entailed experiencing difficulties in seeing signs or objects. In addition, 20.5% (n = 53) of falls were linked to concerning or stressful behaviours (e.g., agitation, confusion, disorientation, and difficulty following instructions/non-compliant), whereas 15.5% (n = 40) was attributed to poor mobility, 11.2% (n = 28) to unstable transfers, 9.7% (n = 24) to incontinence and 2.7% (n = 7) to other risk factors not mentioned in the study.

The age-group 60–69 years had a high prevalence of risk related to challenging environments (30. 0%; n= 3), poor mobility (22.5%; n = 9) and unsafe transfers (20.7%; n = 6). In the age-group 70–79 years, the risk factors such as unsafe footwear (66.7%; n = 1), incontinence (44.0%; n = 11) and poor vision (42. 2%; n = 54) were the highest. Poor nutrition (72.7%; n = 7), other (71.4%; n = 4) (which refers to other risk factors not listed in the study), and impaired ADLs (62.5%; n = 4) were high among the age-group 80–89 years, whereas impaired ADLs (25.0%; n = 2), unsafe footwear (6.7%; n = 1) and unstable mobility (5.0%; n = 2) were the highest among the age-group 90-years and older.




*Note: ADLs indicates Activities of Daily Living.*

Figure 4.7: Fall risk factors among the participants based on gender.

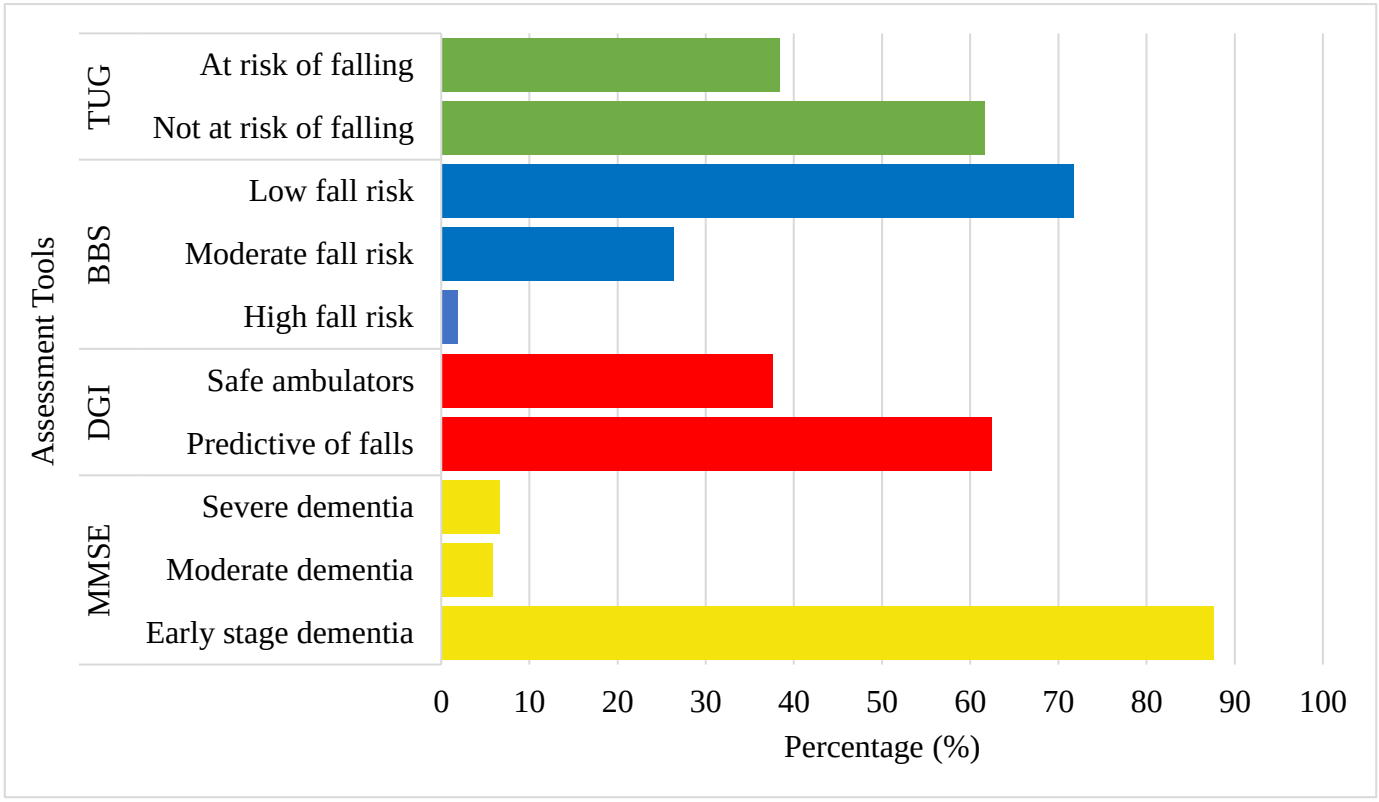



*Note: ADLs indicates Activities of Daily Living.*
*Other indicates other risk factors not mentioned above.*

Figure 4.8: Fall risk factors among the participants based on age-group.

**4.10 Outcomes Among the Participants for the Physical and Cognitive Performance Tests**

According to the TUG assessment, the majority (61.6%; n = 159) of participants were not at risk of falls, while 38.4% (n = 99) were at risk of falls. Based on the BBS assessment, results indicated that most participants (71.7%; n = 185) had a low risk of falling, while 26.4% (n = 68) had a moderate risk of falling, and 1.9% (n = 5) had a high risk of falling. Based on the DGI assessment, most participants (62.4%; n = 161) were predictive of falling, while only 37.6% (n = 97) had safe ambulation. Furthermore, according to the MMSE, most participants (87.6%; n = 226) were in the early-stage dementia, while 5.8% (n = 15) had moderate dementia, and 6.6% (n = 17) had severe dementia (Figure 4.9).




*Note: TUG = Timed Up-and-Go; BBS = Berg Balance Scale; DGI = Dynamic Gait Index; MMSE = Mini Mental State Examination.*

Figure 4.9: Outcomes among the participants for the physical and cognitive performance tests.

### 4.11 Classification of Fall Risk Status Among the Participants

If the total fall risk assessment tool score was from 5 to 11 out of 20 points, then participants were classified as low-risk for falls, from 12 to 15 points was moderate-risk, and 16 points or more was high-risk. Within the past three months, there was a total of 81.8% (n = 211) falls in the low-risk category, 15.1% (n = 39) in the moderate-risk, and 3.1% (n = 8) in the high-risk (Figure 4.10).

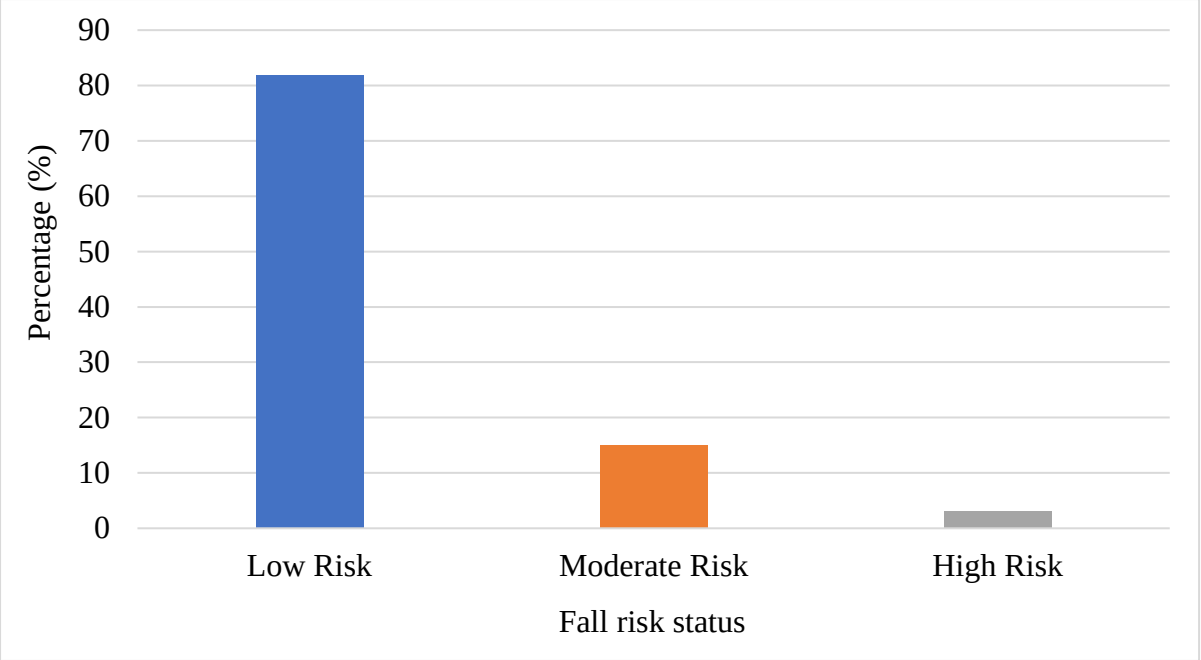



Figure 4.10: Fall risk status of participants in the past three months.

### 4.12 Association Between Falls and the Sociodemographic Characteristics of the Participants

Table 4.4 indicates the relationship between the sociodemographic characteristics of the participants and falls, wich indicated that falls were significantly associated with facility type ($p = 0.007$), educational level ($p = 0.029$) and marital status ($p = 0.001$). For facility type, the results indicated that most participants from NPO residential facilities (69.0%; $n = 58$) were more at risk for falls compared to those from private facilities (31.0%; $n = 26$). The findings suggest that the participants' level of education and marital status were significantly associated with falls, with both genders having an equal prevalence of falls.

Table 4.4: Association between falls and the sociodemographic characteristics of the participants.

| Variable | Category | Falls n (%) | | p-value | $\chi^2$ |
|---|---|---|---|---|---|
| | | Yes | No | | |
| Facility type | NPO | 58 (69.0) | 89 (51.1) | 0.007* | 7.403 |
| | Private | 26 (31.0) | 85 (48.9) | | |
| Gender | Male | 23 (27.4) | 51 (29.3) | 0.748 | 0.103 |
| | Female | 61 (72.6) | 123 (70.7) | | |
| Age (years) | 60 - 69 | 12 (14.3) | 22 (12.6) | 0.806 | 0.982 |
| | 70 - 79 | 35 (41.7) | 68 (39.1) | | |
| | 80 - 89 | 35 (41.7) | 76 (43.7) | | |
| | ≥ 90 | 2 (2.4) | 8 (4.6) | | |
| Educational level | Junior school or lower | 19 (22.6) | 13 (7.5) | 0.029* | 14.05 |
| | Some high school, did not graduate | 11 (13.1) | 32 (18.4) | | |
| | Highschool graduate or GED | 24 (28.6) | 55 (31.6) | | |
| | Technical school | 12 (14.3) | 39 (22.4) | | |
| | Bachelor's degree | 15 (17.9) | 27 (15.5) | | |
| | Master's degree | 2 (2.4) | 4 (2.3) | | |
| | Doctoral degree | 1 (1.2) | 4 (2.3) | | |
| Marital status | Married | 16 (19.0) | 47 (27.0) | 0.001* | 16.49 |
| | Single | 20 (23.8) | 24 (13.8) | | |
| | Divorced | 21 (25.0) | 18 (10.3) | | |
| | Widowed | 27 (32.1) | 85 (48.9) | | |

***Note:*** ** indicates statistically significant association p < 0.05.*
*** indicates statistically significant association p < 0.01.*
*GED indicates General Educational Development.*

### 4.13 Association Between Falls and Fall Risk Factors

Table 4.5 shows the observed risk factors for falls and indicated that falls were significantly associated with concerning behaviours ($X^2$ = 6.486; p = 0.011) and other risk factors ($X^2$ = 4.951; p = 0.026). Poor vision ($X^2$ = 0.198; p = 0.656), unstable mobility ($X^2$ = 2.131; p = 0.144), unsafe transfers ($X^2$ = 0.002; p = 0.96), impaired ADL's ($X^2$ = 0.052; p = 0.819), unsafe footwear ($X^2$ = 2.681; p = 0.102), challenging environment ($X^2$ = 1.441; p = 0.23), poor nutrition ($X^2$ = 3.568; p = 0.059), and incontinence ($X^2$ = 0.007; p = 0.932) showed no significant associations with falls.

Table 4.5: Association between falls and fall risk factors among the participants.

| Risk factors | $\chi 2$ | p-value | OR (CI 95%) |
|---|---|---|---|
| Poor vision | 0.198 | 0.656 | 1.126 (0.668 - 1.896) |
| Unstable mobility | 2.131 | 0.144 | 0.600 (0.301 - 1.197) |
| Unsafe transfers | 0.002 | 0.961 | 1.022 (0.441 - 2.365) |
| Concerning behaviours | 6.486 | 0.011* | 0.453 (0.244 - 0.840) |
| Impaired activities of daily living | 0.052 | 0.819 | 1.213 (0.230 - 6.385) |
| Unsafe footwear | 2.681 | 0.102 | 3.311 (0.730 - 15.020) |
| Challenging environment | 1.441 | 0.232 | 0.467 (0.132 - 1.661) |
| Poor nutrition | 3.568 | 0.059 | 0.306 (0.084 - 1.115) |
| Incontinence | 0.007 | 0.932 | 0.962 (0.394 - 2.347) |
| Other | 4.951 | 0.026* | 0.184 (0.035 - 0.968) |

***Note:*** **indicates statistically significant association $p < 0.05$.*
*OR (95% CI) indicates odds ratio (95% confidence interval).*
*$\chi 2$ indicates Chi-square statistic.*

### 4.14 Association Between Falls and Medication Use

In Table 4.6, the results indicated statistically significant relationships between types of medication and falls, where anti-depressants [$\chi 2(1) = 4.941$; $p = 0.026$, OR = 2.083 (95% CI: 0.611, 1.763)] and anti-diabetics [$\chi 2(1) = 4.097$; $p = 0.043$, OR = 2.070 (95% CI: 1.013, 4.228)] were strongly associated with falling. These results indicated that with anti-depressant and anti-diabetic medication use, participants were four times more likely to sustain a fall. Furthermore, anti-hypertensives [$\chi 2(1) = 0.019$, $p = 0.890$, OR = 1.038 (95% CI: 0.611, 1.763)], anti-epileptics [$\chi 2(1) = 0.052$, $p = 0.819$, OR = 0.824 (95% CI: 0.157, 4.340 )], anti-psychotics [$\chi 2(1) = 2.246$, $p = 0.134$, OR = 2.690 (95% CI: 0.703, 10.289)], anti-diuretics [$\chi 2(1) = 0.537$, $p = 0.464$, OR = 0.727 (95% CI: 0.309, 1.710)], anti-Parkinson's [$\chi 2(1) = 0.002$, $p = 0.967$, OR = 1.037 (95% CI: 0.186, 5.776)], sedatives [$\chi 2(1) = 0.190$, $p = 0.663$, OR = 1.262 (95% CI: 0.443, 3.596 )], and other [$\chi 2(1) = 0.003$, $p = 0.955$, OR = 1.016 (95% CI: 0.596 - 1.730)] medications, were not significantly associated with falls.

Table 4.6: Association between falls and medication use among the participants.

| Medications | $\chi 2$ | p- value | Odds Ratio | 95% CI |
|---|---|---|---|---|
| Anti-hypertensives | 0.019 | 0.890 | 1.038 | 0.611 - 1.763 |
| Anti-epileptics | 0.052 | 0.819 | 0.824 | 0.157 - 4.340 |
| Anti-Psychotics | 2.246 | 0.134 | 2.690 | 0.703 - 10.289 |
| Anti-diuretics | 0.537 | 0.464 | 0.727 | 0.309 - 1.710 |
| Anti-Parkinsons | 0.002 | 0.967 | 1.037 | 0.186 - 5.776 |
| Anti-depressants | 4.941 | 0.026* | 2.083 | 1.082 - 4.012 |
| Sedatives | 0.190 | 0.663 | 1.262 | 0.443 - 3.596 |
| Anti-diabetics | 4.097 | 0.043* | 2.070 | 1.013 - 4.228 |
| Other | 0.003 | 0.955 | 1.016 | 0.596 - 1.730 |

***Note:*** **indicates statistically significant association $p < 0.05$.*
*OR (95% CI) indicates odds ratio (95% confidence interval).*
*$\chi 2$ indicates Chi-square statistic.*

### 4.15 Association Between Falls and the Physical and Cognitive Performance Tests

Table 4.7 indicates the relationship between the physical assessment tools and falling. The results indicated that the TUG ($X^2$= 8.654, p = 0.003), and BBS ($X^2$ = 17.335, p = 0.001) were statistically significant with falling. The DGI ($X^2$ = 2.344, p = 0.126) and MMSE ($X^2$= 3.265, p = 0.195) showed no significance with falling.

Table 4.7: Association between falls and the physical and cognitive performance tests.

| Assessment Tool | Category | No falls | Falls | $\chi 2$ | p-value |
|---|---|---|---|---|---|
| Timed Up-and-Go | Not at risk of falling | 118 (74.2) | 41 (25.8) | 8.654 | 0.003* |
| | At risk of falling | 56 (56.6) | 43 (43.4) | | |
| Berg Balance Scale | Low fall risk | 138 (74.6) | 47 (25.4) | 17.335 | 0.001** |
| | Moderate fall risk | 35 (51.5) | 33 (48.5) | | |
| | High fall risk | 1 (20.0) | 4 (80.0) | | |
| Dynamic Gait Index | Predictive of falls | 103 (64.0) | 58 (36.0) | 2.344 | 0.126 |
| | Safe ambulators | 71 (73.2) | 26 (26.8) | | |
| Mini Mental State Examination | Early-stage dementia | 156 (69.0) | 70 (31.0) | 3.265 | 0.195 |
| | Moderate dementia | 7 (46.7) | 8 (53.3) | | |
| | Severe dementia | 11 (64.7) | 6 (35.3) | | |

***Note:*** **indicates statistically significant association $p < 0.05$.*
***indicates statistically significant association $p < 0.01$.*
*$\chi 2$ indicates Chi-square statistic.*

**4.16 Summary**

In the present study the prevalence of falls was 32.6% (n = 84). Majority of participants were at low risk (81.8%; n = 211), 15.1% (n = 39) at moderate risk and 3.1% (n = 8) at high risk for falling. Age (p = 0.024), stature (p = 0.001) and body mass (p = 0.001) indicated statistical significance. Poor vision (males: 44.6%; females: 51.6%), concerning behaviours (males: 20.3%; females: 20.7%) and unsafe mobility (males: 15.2%; females: 16.2%) showed the highest prevalence amongst gender. Risk factors pertaining to challenging environment (30.0% n = 3), and unsafe mobility (22.5%; n = 9) had a high prevalence among the age-group 60-69 year, poor vision (42.2%; n = 54) and incontinence (44.0%; n = 11) in the 70 – 79 year age-group, poor nutrition (72.7%; n = 7), and other risk factors (71.4%; n = 4) not mentioned in the study in the 80 – 89 year age-group. Impaired ADLs (25.0%; n = 2) and unsafe footwear (6.7%; n = 1) in the >90 year age-group. Determinants of falls were strongly associated with facility type (X2 = 7.403; p = 0.007), level of education (X2 = 14.05; p =

0.029), marital status (X2 = 16.49; p = 0.001). Anti-depressant [$\chi 2$ (1) = 4.941; p = 0.026; OR = 2.083 (95% CI: 1.082, 4.012)] and anti-diabetic [$\chi$ 2 (1) = 4.097, p = 0.043, OR = 2.070 (95% CI: 1.013, 4.228)] medications were the only drugs significantly associated with falling. The TUG (p = 0.003) and BBS (p = 0.001) assessment tool were statistically significant with determining a participant at risk of falling.

# CHAPTER FIVE: DISCUSSION

## 5.1. Introduction

This section discusses the determinants of falls among the elderly participants in the study. It highlights the findings according to the three research questions, strengths, limitations and concludes with future research.

The aim of this study was to identify the determinants of falls in the elderly living in various LTC facilities in the City of Cape Town (CoCT). Thus, the objectives of the study focused on determining the prevalence of falls among the elderly in the CoCT, and the sociodemographic factors and determinants associated with falls among the elderly. In this study, 258 participants from 15 various LTC facilities in the CoCT aged ≥ 60 years and older participated in the study. In this chapter. The results of the present study were compared to the results of various related studies.

## 5.2 Prevalence of Falls in the Elderly

The present study reported that the prevalence of falls was 32.6% for the elderly participants in the study, in which similar results were noted in Saudi Arabia (34%), China (31.7%), Brazil (38.9%) and Malaysia (32.8%) (Almegbel et al., 2018a; Firpo et al., 2013; Kioh & Rashid, 2018b; Zhang et al., 2019). These findings differ from studies among the elderly in the United Arab Emirates (UAE) indicating a much higher prevalence of 50.8% (S. I. Sharif et al., 2018) and 60.3% in Egypt (Orces, 2013). Another study also indicated similar results from this study, where fall prevalence among women were higher than in men (Gale et al., 2016). A much lower prevalence was indicated in a systematic review study on prevalence of

falls globally (26.5%) (Salari et al., 2022). The results from these studies could be attributed to many factors including the research study conducted, culture and family structures as well as health care conditions in higher and lower income countries.

According to age, the majority of participants who fell were in the 70-79 year (39.9%) and 80 – 89 year (43.0%) age groups. These findings were consistent with a study by Jiang et al. (2020), where the majority of participants who fell were in the 80 – 89 year age-group and accounted for 63.1% of falls, especially in LTC facilities (Dhargave & Sendhilkumar, 2016; Jiang et al., 2020) that was consistent with several previous studies (Peng et al., 2019; Rapp et al., 2012). The reason for the low fall rates in the present study among those aged 60-69 years could be attributed to them being more physically stronger (Ghazi et al., 2017). While those aged 90 years and older were often bedridden that accounted for the low fall prevalence (Dhargave & Sendhilkumar, 2016). This contradicts the results by Ghazi et al. (2017) and Data et al. (2019) who reported that age was not a significant determinant of falling in the elderly.

The results in the present study indicated that most of the elderly (52.3%) who fell were either overweight or obese, of which the majority were female. The prevalence of obesity among elderly Americans showed that aged 60 years and older was 37.4%, while 25.0% of Australians aged 65–74 years and 14.4% over 75 years were obese (Astrup, 2001; Cois & Day, 2015; Himes & Reynolds, 2012). In the United Kingdom, nearly 25.0% of women and 18.0% of men aged 65–75 years and 22.0% of women and 12.0% of men aged 75 years or older suffering from overweight or obesity (Constante Dutra et al., 2013; Stewart Williams et al., 2015). In LTC facilities, 30.0% of elderly aged 65 years and older within the LTC facilities were obese while 15– 20% of residents aged 65– 74 years are obese (Pitchai et al., 2019; Shebl et al., 2015).

Results of the present study indicated that about a third (32.6%) of participants had a fall in the previous twelve months, related to slipping/tripping was the main fall mechanism. Falls related to slipping/tripping, showed a much higher prevalence of 68.5% (Imaginário et al., 2021). Factors such as poor mobility, incorrect footwear, decreased strength, and balance problems could explain why more participants sustained a fall due to slipping/tripping (Gustavsson et al., 2018; Jiang et al., 2020).

### 5.3 Risk Factors for Falls in the Elderly

The results from the present study indicated that the risk factors responsible for falls among the elderly were related to facility type, concerning behaviours, medication use such as anti-depressants and anti-diabetics, other risk factors not mentioned in the present study and specific physical performance tests, namely, TUG and BBS.

Based on facility type, the participants in the present study who often fell were from NPO facilities compared to those from private facilities. This could be attributed to the fact that NPO facilities were often understaffed, had minimal safety resources, such as assisted devices, and implemented cost-cutting measures related to environmental infrastructure, such as poor stair design, inadequate lighting, lack of handrails and ramps, and excluding fall prevention programmes (Mohamed et al., 2020; Rapp et al., 2012; Shao et al., 2023). In contrast, however, private LTC facilities frequently had a multidisciplinary team of healthcare professionals, such as occupational therapists, physiotherapists and biokineticists, who specialised in these working with the elderly and implemented fall prevention procedures, as well as continuously educated the administrative and support staff on safety measures (King et al., 2018; Rizka et al., 2021). These health professionals have the means to

incorporate individual sessions with residents, conduct private exercise sessions and continuously monitoring each of their residents (King et al., 2018; Rizka et al., 2021). Unfortunately, public health care facilities for the elderly are not well-funded and, in turn, must deal with the large burden of disease, meagre support or 'caretaker' staff and overcrowded facilities compared to private facilities (Jacobs et al., 2020).

The results in the present study indicated a statistically significant association between concerning behaviours and falling. Almost half (47.2%) of the participants were observed to have problem behaviours. Concerning behaviours can increase the risk of falls among older adults dramatically and can be directly influenced by the roles that the elderly associate with their independence in making decisions, their experience with their history of falls, their level of understanding of fall risks, and their ability and willingness to receive support from staff and health care professionals (Dhargave & Sendhilkumar, 2016) Within LTC facilities, safety regulations are usually dominated by the staff before the elderly admission to the care facilities, and adapting to these institutional rules and regulations, regarding how to go navigate independent living, tends to lead to risk-taking behaviours that ultimately lead to falling (Castaldo et al., 2020; Living et al., 2000; Tolson & Morley, 2011).

A total of 62.0% of participants were taking more than two medications, the majority of whom were female (71.3%) within the age categories of 70 – 79 years (42.5%) and 80 – 89 years (39.4%). The results indicated that anti-depressants and anti-diabetics were the only medications significantly associated with falling. According to two retrospective studies, anti-diabetic and anti-psychotic medication were found to be significant determinants of falls, which was comparable to the present study (Costa-Dias et al., 2014; Obayashi et al., 2013). Dhargave and Sendhilkumar (2016), showed multiple medication use that is comparable to

the present study (Dhargave & Sendhilkumar, 2016). Similar to this study, Kalula et al. (2016) reported that the number of medications were also significantly associated with falls. Almegbel et al. (2018) found that falling among the elderly was higher with multiple medication use (Almegbel et al., 2018). A systematic review concluded that the likelihood of falls increased dramatically with the use of four or more medications. According to two retrospective studies, anti-diabetic and anti-psychotic medication was found to be a significant determinant of falls which was comparable to the present study (Costa-Dias et al., 2014; Obayashi et al., 2013). A prospective study suggested that the reduced use of psychotropic medications resulted in a decreased fall rate, which strongly supported the relationship between psychotropic drug use and falling (Hill & Wee, 2012). These results were also consistent with a study among community-dwelling adults in Germany (Du et al., 2017). Even though medication can treat depression, the use of medication, such as anti-depressants, sedatives, and hypnotics, was associated with falls among the elderly (Fraix, 2012; Woolcott, 2010).

In the present study, ‘other risk factors’ referred to those not listed as major factors. The results in the present study indicated that the ‘other risk factors’ were significantly associated with falling. Many studies have collectively identified more than 400 risk factors for falling, with no reliable classification of these risk factors into categories for ease of understanding (Callis, 2016; Deandrea et al., 2013; Rubenstein, 2006). According to Williams et al. (2015), there are numerous risk factors for falls among the elderly, which included older age, female gender, physical frailty, muscle weakness, poor gait and balance, impaired cognition, and depressive symptoms (Williams et al., 2015). The risk of falling increased with age, and escalated even further with comorbidities, such as cardiovascular disease, arthritis, and diabetes (Williams et al., 2015).

Environmental risk factors, such as unusable handrails, uneven walking surfaces, poor lighting in bedrooms and bathrooms accounted for 20.0% of the falls in various LTC facilities in Shanghai, China (Jiang et al., 2021). Findings from the present study indicated that eliminating fall-related environmental hazards may be effective in reducing the burden of falls, therefore, safety in LTC facilities should be considered paramount during policy development for fall management (Jiang et al., 2021). Various studies (C. L. Chu et al., 2011; Kumar et al., 2014; Stamenkovic et al., 2020; Tuerk et al., 2015) have argued that risk factors such as impaired cognition and fear of falling were common among the elderly, especially women, and were associated with a history of falling, gait and balance impairments, depression, and poor health outcomes (Stamenkovic et al., 2020; Tuerk et al., 2015). Therefore, physical assessments, disease, and medications use should be important factors in the assessment of fall risk among the elderly in LTC facilities (Shao et al., 2023). A major concern is that the causes of falls were complex and multifaceted, which could be either external or internal to the individual and, invariably, led to an elevated fall prevelance (Rashid et al., 2019).

According to the physical performance assessments, the results in the present study indicated that the TUG and BBS were significantly associated with falls. In a systematic review by Park (2018), the TUG and BBS were used to assess daily activities, such as walking and climbing stairs, The BBS can help healthcare staff to assess the risk of falling and in preventing or predicting falls, especially among the elderly (Neuls et al., 2011). Simarlarly, the TUG assessment has been shown to be a good predictor of fall risk as a fall predictor (Barry et al., 2014; Cruz et al., 2022; Oliveira et al., 2018).

The dynamics of falls are such a concerning matter that screening alone for fall risk does not only identify residents at risk of falling but also enables the identification areas of concern such as the risk factors listed in the FRAT (Levec & Jakovljević, 2020).

### 5.4 The Relationship Between Sociodemographic Characteristics and Falls

In the present study, education level and marital status indicated were significantly related to falls among the elderly.

The results in the present study indicated that the participants' level of education significantly associated with falling. Elderly participants with lower levels of education sustained a higher number of falls. These results were consistent with another study which also found that participants, mostly females with fall incidents, had lower education levels (Wen et al., 2021). They concluded that the elderly with lower education levels could possibly have difficulty understanding fall prevention information and that a fall prevention programme was necessary among this population (Wen et al., 2021). Educational level influenced the perception of the elderly so that, when performing visual search tasks, the elderly with lower educational levels required more time, made more mistakes, and reached fewer targets compared to the elderly with higher educational levels (Abreu et al., 2015).

According to this study, a strong relationship was reported between marital status and falling which indicated that participants who were married were more likely to have a lower risk of falling compared to their single/unmarried counterparts. In addition, the results indicated that being widowed was related to an increased risk of falling which indicated that having a partner contributed to a higher level of social support and decreased risk of falling. These

results were consistent with a systematic review by (Bloch et al., 2010) who indicated that marriage had a positive effect on falling. They concluded that being married provided various forms of support which was absent for single or divorced individuals that had unfavourable health effects, especially among the elderly. These findings are echoed in various studies, including South African census, which concluded that marriage, compared to being single or divorced, offered health advantages (Carr & Springer, 2010; Jennings et al., 2022; Statistics South Africa, 2014).

A study conducted in Cape Town among community dwelling elderly by kalula et al., 2016, in 3 different suburbs showed similar results to the present study, with significant risk factors associated with falls such as number of medications, history of previous falls, dizziness, marital status and the TUG and MMSE assessment tool (Kalula et al., 2016). Interestingly, differences in cognitive tests were used as well as elderly outside of the LTC facilities, yet results yielded similar results. This could be attributed to reasons such as geographical area, contrary to similar results found among high female prevalence irrespective of country (Dhargave & Sendhilkumar, 2016; Nordell et al., 2000) however, additional studies need to be done to confirm this speculation. Along with many other studies, Kalula et al., 2016 echoes similar conclusions from the present study in that medical history and performance tests should be used in combination to identify the determinants of falls among the elderly.

### 5.5 Strengths and Limitations of the Study

To the best of my knowledge, this was the first cross sectional study among the elderly in LTC institutions focusing on the determinants of falls in the CoCT, South Africa. The use of

a variety of assessments rather than one to determine falls among the elderly was a study strength.

A limitation to this study was that it was based on cross-sectional data which limited the possibility of determining causal relationships. Recall bias among the participants of their fall history may also limit the validity of these findings. The COVID – 19 pandemic during the period of data collection resulted in restricted access to facilities to protect the elderly, which negatively impacted the participant response rate and sample size, and overall statistical power of the study so the results may reflect a gender bias.

### 5.6 Conclusion

In the present study, determinants of falls were strongly associated with facility type, level of education, marital status, concerning behaviours, anti-depressant and ant-diabetic medication and the TUG and BBS assessment tools used to assess fall risk.

History taking remains an important part of determining the risk of falls among the elderly, indicated as a limitation too. By understanding the risk factors that increase the likelihood of falls in the elderly, health care professionals can dramatically assist in reducing the number of falls (King et al., 2018; Reuben et al., 2017; WHO, 2020). Therefore, particular attention should be given to medical history in combination with the risk factors and physical assessments to determine fall-risk. Therefore, particular attention should be given to medical history in combination with the risk factors and physical assessments to determine fall-risk. This study emphasised the importance of the determinants of falls which increased the risk of

falling and the associated functional decline that often had a negative impact on maintaining independence and quality of life among the elderly.

### 5.7 Recommendations

The results from this study can be used for future research in planning effective strategies to prevent falls among the elderly, especially living in LTC facilities. The assessments used in this study all had high reliability and validity outcomes. The fall risk assessments should be used upon entry into the residential facilities. Residents should undergo regular follow up assessments to indicate whether there were any decrements in function related to falling. Risk classification is essential, as there were differences in risk factors that affected the prevalence of falls among the elderly. In this regard multiple assessments should be conducted to establish correct diagnosis, so that effective strategies could be implemented to mitigate the risk of falling. The use of fall detection devices, such as night lights, panic buttons, wearable sensors and rehabilitation devices, help prevent the risk of falling among the elderly and the devastating consequences.

The awareness of how important the preparation of data collection is essential. Additional data could have been collected from the participants such as detailed medical history, place of fall and physical activity level, to enable finer results and produce better comparisons to similar studies conducted.

The amount of pressure and workload that nurses undergo, placed a huge burden on them, especially when working in LTC facilities that were often understaffed. Thus, there demand

for biokineticists in the public sector, especially in elderly care institutions, where there is an absence of physical activity programmes in the prevention of falls.

### 5.8 Summary

Falls among the elderly have become a global concern, especially for those living in LTC facilities in low middle-income countries. The majority of risk factors for falls are modifiable, thus conducting regular assessments and follow-ups could lead to the early detection and preventions of falls. There is a need to raise awareness and educate health care professionals on the determinants of falls within LTC facilities. Furthermore, regular assessments to determine fall-risk among residents and the implementation of exercise programmes, specifically targeted for the elderly, are required to decrease the number of falls. The findings from this study could be useful in a clinical setting within various LTC facilities to provide evidence on the determinants of falls and raise awareness on falls among the elderly.

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## APPENDIX A: INFORMATION LETTER


**UNIVERSITY OF THE WESTERN CAPE**
**Private Bag X 17, Bellville, 7535, South Africa**
***Tel: +27 21-959 2409 Fax: 27 21-959 3688***
**E-mail: 3522614@myuwc.ac.za**

| ASSESSMENT DATE | TIME |
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### INFORMATION SHEET

**Project Title:** The determinants of falls among the elderly living in long term care facilities in the City of Cape Town.

**Dear Participant,**

**Introduction**

This is an invitation for you to participate in a valuable scientific study. This information sheet will help you to decide whether you would like to participate in this study or not. Before you decide to participate, it is required for you to fully understand what is involved in this study. If there are any questions regarding this study that this sheet does not explain to you, then please do not hesitate to ask questions.

**What is this study about?**

This is a research project being conducted by Nabilah Ebrahim from the University of the Western Cape. I am inviting you to participate in this study in order to establish the risk factors associated with causing falls in the elderly who are living in retirement facilities in Cape Town. This study will only include individuals who are currently not making use of any walking aids.

**What will I be asked to do if I agree to participate?**

You will be asked to complete a consent form before any information or data is recorded. Participation may range from filling in a questionnaire to participating in risk assessments of a physical nature in order to gather relevant research information. This will be done in a private area within the various care facilities. The duration of each assessment may be varied depending on each participant's functioning; however, this will be established and communicated to you. A researcher-generated self-administered sociodemographic questionnaire on age, gender, height, weight, educational qualifications, marital status, and medical history and risk factors for falls will be completed by each participant. Five physical tests will also be conducted, namely, a) the Fall Risk Assessment Tool (FRAT) that provides data on the fall status of participants, b) the Berg Balance Scale (BBS) that provides data on balance, c) the Dynamic Gait Index (DGI) that provides data on walking gait, d) the Timed Up-and-Go (TUG) test that provides data on the participants balance during a series of structured tasks, and e) the Mini Mental State Examination (MMSE) provides data on the participants' cognitive status.

**Would my participation be kept confidential?**

All your personal information will be kept strictly confidential. To help protect your confidentiality, we will have all assessments done in a secure, private location within the comfort of the care facility. All recorded data will be kept confidential by replacing your name with numeric codes and saving the information within a private folder which will be reviewed only by the researcher, supervisor, and co-supervisor of the study. Your identity will be always protected. Hard copies will be stored in locked filing cabinets, and electronic data will be stored in password protected computer files in the office of the supervisor. All information regarding this research will be stored securely in the SRES department, with access available to the researcher and supervisors only. All participants' information will be destroyed after a period of five years.

**What are the risks of this research?**

There may be some risks from participating in this research study. Much like any activity or assessment, there are risks which can be described as both expected and unexpected. Possible expected risks of an emotional and psychological nature may include feeling self-conscious, embarrassed, or anxious, due to being unable to complete the physical tests, such as the Berg Balance Scale, Dynamic Gait Index, Timed Up-and-Go test, and the Mini Mental State

Examination. A health care practitioner will be available for any participant with any undue emotional and/or psychological stress. When doing the physical tests, there is minimal risk of injury, such as a fall. It is, nevertheless, a relatively safe assessment, without any high-intensity or fast movements, which reduces the chance of you losing balance or injuring yourself. When performing the physical tests, my research assistant and I will always be available to help you, as well as a staff member will be present to assist to make sure that when the tests are being conducted, that you are safe and secure.

**What are the benefits of this research?**

This research is not designed to help you personally, but the results may help the researcher learn more about the risk factors associated with causing falls in the elderly who are living in retirement facilities in Cape Town. In future, other people might benefit from this study through improved understanding of the risk factors associated with falls in the elderly to develop appropriate preventative and safety measures.

**Do I have to be in this research, and may I stop participating at any time?**

Your participation in this research is completely voluntary. You may choose not to take part at all. If you decide to participate in this research, you may stop participating at any time. If you decide not to participate in this study or if you stop participating at any time, you will not be held accountable or face any negative consequences.

**Is any assistance available if I am negatively affected by participating in this study?**

When doing physical assessments such as the Berg Balance Scale, the Dynamic Gait Index and the Timed Up- and -Go test, there is minimal risk to injury. However, the standard operating procedure (SOP) for fall prevention and management will be always followed to ensure your safety.

**What if I have questions?**

This research is being conducted by **Nabilah Ebrahim** from the University of the Western Cape. If you have any questions about the research study itself or would like to make a booking, please contact me on:

Email: 3522614@myuwc.ac.za

Cell: 082 353 4204

Should you have any questions regarding this study and your rights as a research participant or if you wish to report any problems you have experienced related to the study, please contact:

Head of Department: Prof. Andre Travill
University of the Western Cape
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Email: atravill@uwc.ac.za

Dean CHS: Prof Anthea Rhoda
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This research has been approved by the University of the Western Cape's Senate Research Committee and Ethics Committee.

(REFERENCE NUMBER: BM21/6/18)

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| NAVORSINGS DATUM | TYD |
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**INLIGTINGSBLAD**

**Projek Titel:** Die algemene risikofaktore vir valle onder bejaardes, in aftree fasiliteite in Kaapstad.

**Geagte deelnemer,**

**Inleiding**

Dit is 'n uitnodiging om aan 'n wetenskaplike studie deel te neem. Hierdie inligtingstuk sal u help om te besluit of u aan hierdie studie wil deelneem. Voordat u besluit om deel te neem, is dit nodig dat u ten volle moet verstaan wat hierby betrokke is. Indien daar enige navrae rondom hierdie studie is, is u welkom om te vra.

**Waaroor gaan die studie?**

Dit is 'n navorsingsprojek wat deur Nabilah Ebrahim van die Universiteit van Wes-Kaapland gedoen word. Ek nooi u uit om deel te neem aan hierdie navorsingsprojek om die risikofaktore vir val onder diegene wat in aftree fasiliteite woon, vas te stel. Dit sal voordelig wees vir professionele persone wat toekomstige val met betrekking tot faktore soos omgewingsfaktore en intrinsieke faktore kan voorspel en u onafhanklikheid en lewensgehalte vir die langste tyd kan handhaaf. Hierdie studie sal slegs individue insluit wat tans geen loophulpmiddels gebruik nie. Hierdie studie sal ook bydra tot verdere navorsing deur verskillende assesseringsinstrumente om valrisikofaktore te voorspel vooraf geïdentifiseer kan word.

**Wat sal ek gevra word as ek instem om deel te neem?**

U sal gevra word om 'n toestemmingsvorm in te vul voordat enige inligting of data aangeteken word. Deelname kan wissel van die invul van 'n vraelys tot deelname aan risikobeoordelings tot die versameling van relevante inligting. Dit sal in 'n privaat area binne die verskillende versorgingsfasiliteite gedoen word. Die tydsduur van elke assessering kan wissel, maar u sal dit vasstel en aan u meedeel. Vrae wat u sal invul, bevat inligting soos sosiodemografiese gegewens (ouderdom, geslag, lengte, gewig, inkomste, opvoedkundige kwalifikasies, huwelikstatus, en mediese geskiedenis. Fisiese toetse soos die Berg Balansskaal, Dynamic Gait Index, Timed Up and Go-toets en Mini Mental State Examination sal deel vorm van die studie.

**Sal my deelname vertroulik gehou word?**

Al u persoonlike inligting sal streng vertroulik gehou word. Om u vertroulikheid te help beskerm, sal ons alle assesserings op 'n veilige, privaat plek laat doen binne die gemak van die sorgfasiliteit. Alle aangetekende data sal vertroulik gehou word deur u naam deur numeriese kodes te vervang en die inligting in 'n privaatmap op te slaan wat slegs deur die navorser, studieleier en medestudieleier van hierdie projek hersien sal word. U identiteit sal te alle tye beskerm word. Harde kopieë word in geslote liasseerkaste gestoor, en elektroniese data word in wagwoordbeskermde rekenaarlêers in die kantoor van die toesighouer gestoor. Alle inligting rakende hierdie navorsing sal veilig in die SRES -afdeling gestoor word, met slegs toegang tot die navorser en toesighouers. Alle deelnemers se inligting sal na 'n tydperk van vyf jaar vernietig word.

**Wat is die risiko's van hierdie navorsing?**

Daar kan 'n paar risiko's verbonde wees aan die deelname aan hierdie navorsingstudie. Net soos enige aktiwiteit of assessering, is daar ook risiko's wat as verwag en onverwags beskryf kan word. Moontlike verwagte risiko's van emosionele en sielkundige aard kan insluit dat u selfbewus, verleë of angstig voel omdat u nie die fisieke toetse kan voltooi soos die Berg-balansskaal, die dinamiese gangindeks, Timed Up-and-Go en die Mini-geestesondersoek.

**Moet ek aan hierdie navorsing deelneem, en mag ek enige tyd ophou deelneem?**

U deelname aan hierdie navorsing is heeltemal vrywillig. U kan kies om glad nie deel te neem nie. As u besluit om aan hierdie navorsing deel te neem, kan u enige tyd ophou

deelneem. As u besluit om nie aan hierdie studie deel te neem nie, of as u op enige tydstip ophou deelneem, sal u nie verantwoordelik gehou word of negatiewe gevolge hê nie.

**Is daar hulp beskikbaar indien ek negatief geraak word deur aan hierdie studie deel te neem?**

Indien enige negatiewe gevolge van ernstige aard voorkom, sal mediese ondersteuning gekontak word. Noodsorg sal geneem word deur die navorser wat 'n gekwalifiseerde noodhulp is (vlak 3) om u te ondersteun totdat mediese ondersteuning opdaag.

**Wat as ek vrae het?**

Hierdie navorsing word gedoen deur **Nabilah Ebrahim** van die Universiteit van Wes-Kaapland. As u enige vrae het oor die navorsing self, kontak my gerus op:

**E-pos: 3522614@myuwc.ac.za.**

**Cell: 082 353 4204**

As u enige vrae het rakende hierdie studie en u regte as navorsingsdeelnemer, of as u enige probleme wat u ondervind het met betrekking tot die studie, wil kontak, kontak:

Hoof van die Departement: Prof. Andre Travill
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Private Bag X17
Bellville 7535
Email: atravill@uwc.ac.za

Dean CHS: Prof Anthea Rhoda
Address: Faculty of Community and Health Sciences, University of the Western Cape, Private Bag X17, Bellville, 7535
Email: chs-deansoffice@uwc.ac.za

Hierdie navorsing is goedgekeur deur die Universiteit van Wes -Kaapland se Senaatnavorsingskomitee en Etiekkomitee.

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**IPHEPHA LOLWAZI**

**Isihloko seProjekthi:** Ukuchonga kokuwa phakathi kwabantu abadala abahlala kumaziko omhlala phantsi kwiSixeko saseKapa.

Mthathi-nxaxheba othandekayo,

**Intshayelelo**

Esi sisimemo sokuba uthathe inxaxheba kuphononongo lwenzululwazi. Olu xwebhu lolwazi luza kukunceda uthathe isigqibo sokuba uyafuna na ukuthatha inxaxheba kolu phononongo. Phambi kokuba uthathe isigqibo sokuthatha inxaxheba kuyafuneka ukuba ukuqonde ngokupheleleyo ukuba yintoni ebandakanyekileyo kolu phando. Ukuba kukho nayiphi na imibuzo malunga nolu phando ongenakuyichaza kweli phepha, nceda ungathandabuzi ukubuza imibuzo.

**Singantoni esi sifundo?**

Le yiprojekthi yophando eqhutywa nguNabilah Ebrahim kwiDyunivesithi yaseNtshona Koloni. Sikumema ukuba uthathe inxaxheba kule projekthi yophando ukuseka umngcipheko wokuwa phakathi kwabo bahlala kumaziko ononophelo lwexesha elide. Oku kuyakuba luncedo kuba iingcali zayo zinokuqikelela ukuwa kwexesha elizayo ngokubhekisele kwizinto ezinje ngemeko yendalo esingqongileyo, izinto zangaphakathi njl njl, kwaye ugcine ukuzimela kwakho kunye nomgangatho wobomi elona xesha lide. Olu phononongo luza kuncedisa kuphando olwenziweyo lokuba izixhobo zovavanyo ezahlukeneyo zokuxela kwangaphambili umngcipheko wokuwa kunokuchongwa kwangaphambili.

**Yintoni endiza kucelwa ukuba ndiyenze ukuba ndiyavuma ukuthatha inxaxheba?**
Uya kucelwa ukuba ugcwalise ifom yokuvuma ngaphambi kokuba naluphi na ulwazi okanye idatha ibhalwe. Ukuthatha inxaxheba kungahluka ukusuka ekugcwaliseni iphepha lemibuzo ukuya ekuthatheni inxaxheba kuvavanyo lomngcipheko ukuqokelela ulwazi olufanelekileyo. Oku kuyakwenziwa kwindawo yabucala ngaphakathi kumaziko ononophelo ahlukeneyo. Ubude bovavanyo ngalunye bunokwahluka; Nangona kunjalo, oku kuyakwenziwa kwaye kwaziswe wena. Ikhweshine eyenzelwe ukuba iphandwe ngabantu ngokwabo iminyaka, isini, ukuphakama, ubunzima, iziqinisekiso zemfundo, imeko yomtshato, kunye nembali yezonyango kunye nemingcipheko yokuwa iya kusetyenziswa. Kuya kuqhutywa iimvavanyo zomzimba ezinje ngeBerg Balance Scale, Dynamic Gait Index, Timed Up and Go Test kunye Uviwo lweMini yengqondo yeNgqondo.

**Ngaba ukuthatha inxaxheba kwam kungagcinwa kuyimfihlo?**
Zonke iinkcukacha zakho ziya kugcinwa ziyimfihlo ngokungqongqo. Ukunceda ukukhusela ukugcinwa kwemfihlo kwakho, siya kuthi sonke sivavanywe kwindawo ekhuselekileyo, eyimfihlo kwindawo ekhuselekileyo yoncedo. Yonke idatha erekhodiweyo iya kugcinwa iyimfihlo ngokufaka igama lakho endaweni yeekhowudi zamanani kunye nokugcina ulwazi ngaphakathi kwifolda yabucala eya kuthi ivavanywe kuphela ngumphandi, umphathi kunye nomphathi we-projekthi. Ngamaxesha onke isazisi sakho siya kukhuselwa.

**Buphi ubungozi kolu phando?**
Kunokubakho umngcipheko ekuthatheni inxaxheba kolu phando. Njengawo nawuphi na umsebenzi okanye uvavanyo, kukho umngcipheko onokuthi uchazwe njengoko kulindelwe kwaye kungalindelekanga. Imingcipheko enokulindeleka yohlobo lweemvakalelo nezengqondo inokubandakanya ukuziva ungazithembi, uneentloni, okanye unxunguphalo, ngenxa yokungakwazi ukugqiba iimvavanyo zomzimba ezinjenge Berg Balance Scale, iDynamic Gait Index, iTimed Up-and-Go, kunye Uviwo lweMini yengqondo yeNgqondo.

**Ngaba kufuneka ndibekho kolu phando, kwaye ndingayeka ukuthatha inxaxheba nangaliphi na ixesha?**
Ukuthatha kwakho inxaxheba kolu phando ngokuzithandela. Unokukhetha ukungathathi nxaxheba kwaphela. Ukuba uthatha isigqibo sokuthatha inxaxheba kolu phando, unokuyeka ukuthatha inxaxheba nangaliphi na ixesha. Ukuba uthatha isigqibo sokungathathi nxaxheba

kolu phononongo okanye uyeke ukuthatha inxaxheba nangaliphi na ixesha, awuzukubekwa uxanduva okanye ujongane neziphumo ezibi.

**Kuthekani ukuba ndinemibuzo?**

Olu phando luqhutywa nguNabilah Ebrahim osuka kwiDyunivesithi yaseNtshona Koloni. Ukuba unayo nayiphi na imibuzo malunga nophando ngokwalo, nceda unxibelelane nam kule nombolo 3522614@myuwc.ac.za.

Ukuba unayo nayiphi na imibuzo malunga nolu phononongo kunye namalungelo akho njengomthathi-nxaxheba wophando okanye ukuba unqwenela ukuxela naziphi na iingxaki ohlangabezana nazo ezinxulumene nophando, nceda unxibelelane:

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This research has been approved by the University of the Western Cape's Senate Research Committee and Ethics Committee.

(REFERENCE NUMBER: _____)
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**APPENDIX B: CONSENT FORM**


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## CONSENT FORM

**Project Title:** The determinants of falls among the elderly living in long term care facilities in the City of Cape Town.

The study has been described to me in language that I understand, and I freely and voluntarily agree to participate. My questions about the study have been answered. I understand that my identity will not be disclosed and that I may withdraw from the study without giving a reason at any time and this will not have any negative consequences.

**Participant's name:** **…….……**

**Participant's signature:** **.....……**

**Date:** **.....……**

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## VRYWARINGS VORM

**Projek titel:** Die determinante van val val onder bejaardes wat in aftree -fasiliteite in die Stad Kaapstad woon.

Die studie is vir my beskryf in 'n taal wat ek verstaan, en stem vrywillig in om deel te neem. My vrae oor die studie is beantwoord. Ek verstaan dat my identiteit nie bekend gemaak sal word nie en dat ek myself enigetyd vandie studie mag onttrek, sonder om 'n rede te verskaf.

**Deelnemer naam:** **…….**

**Deelnemer handtekening:** **.....**

**Datum:** **.....**

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## IFOMU YEMVUME

Isihloko seProjekthi: Imimiselo yokuwa kwabantu abadala abahlala kumaziko ononophelo lwexesha elide kwiSixeko saseKapa.

Uphononongo luchazwe kum ngolwimi endiluqondayo, kwaye ndivuma ngokukhululekileyo nangokuvumayo ukuthatha inxaxheba. Imibuzo yam malunga nesifundo iphenduliwe. Ndiyaqonda ukuba isazisi sam asizukuchazwa kwaye ndingarhoxa kuphononongo ngaphandle kokunika isizathu nangaliphi na ixesha kwaye oku akuyi kuba naziphumo zibi.

**Igama labathathi-nxaxheba:** **…….……**

**Utyikityo lomthathi-nxaxheba:** **.....……**

**Umhla:** **.....……**

## APPENDIX C: DATA RECORDING SHEET

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## RESEARCH QUESTIONNAIRE & INSTRUMENTS

Patient Name _____

Date _____

Age _____

*Tick appropriate box below:*

| | |
|---|---|
| **Name of Retirement Facility** | |
| **Gender** | 1. Male □<br>2. Female □ |
| **Height (cm)** _____ cm | |
| **Weight (kg)** _____ kg | |
| **Educational Qualifications** | 1.Grade 7 or lower □<br>2. Not matriculated □<br>3. Matriculated or General Educational Development (GED) □<br>4. Technical school □<br>5. Graduated with Bachelor's degree □<br>6. Graduated with Master's degree □<br>7. Graduated with Doctoral degree □ |
| **Marital Status** | 1. Married □<br>2. Unmarried □<br>3. Divorced □<br>4. Widowed □<br>5. Single □ |

| **Medical History:** | |
|---|---|
| **Falls**<br>**(In the past 3 months)** | 1.Slip/ Trip □<br>2.Loss of Balance □<br>3.Collapse □<br>4.Legs gave way □<br>5.Dizziness □ |
| **Medication** | 1.Anti-hypertensives □<br>2.Anti-epileptics □<br>3.Anti-psychotics □<br>4.Anti-diuretics □<br>5.Anti-Parkinsons □<br>6.Anti-depressants □<br>7.Sedatives □<br>8.Anti-diabetics □<br>9.Other (all medication not included in the previously described groups). □ |

## FALL RISK ASSESSMENT TOOL (FRAT)

### PART 1: FALL RISK STATUS

| RISK FACTOR | LEVEL | RISK SCORE |
|---|---|---|
| **RECENT FALLS** | None in the last 12 months | 2 |
| | One/ more between 3 & 12 months ago | 4 |
| | One/ more in last 3 months whilst a resident | 8 |
| **NUMBER OF MEDICATIONS** (Sedatives, Anti-depressants, Anti-Parkinson's, Diuretics Anti-hypertensives, hypnotics etc.) | Not taking any | 1 |
| | Taking one | 2 |
| | Taking two | 3 |
| | Taking more than two | 4 |
| **PSYCHOLOGICAL ISSUES** (Anxiety, Depression, ↓Cooperation, ↓Insight or ↓Judgement especially in re mobility) | Does not appear to have any. | 1 |
| | Mildly affected by one/ more | 2 |
| | Moderately affected by one/more | 3 |
| | Severely affected by one/ more | 4 |
| **COGNITIVE STATUS** (see AMTS below) | AMTS 9 or 10/10 **OR** Intact | 1 |
| | 7-8 Mild | 2 |
| | 5-6 Moderate | 3 |
| | 4 or less Severe | 4 |
| Low Risk: 5–11<br>Moderate Risk: 12-15<br>High Risk: 16-20 | **RISK SCORE** | **/ 20** |

**FALL RISK STATUS (Circle): LOW / MODERATE / HIGH**

## ABBREVIATED MENTAL TEST SCORE (AMTS)

| | **1 Point for each correct answer** |
|---|---|
| 1.What is your age | |
| 2. What is the time to the nearest hour? | |
| 3.Give the patient an address, and ask them to repeat it at the end of the test<br>e.g. 42 West Street | |
| 4. What is the year? | |
| 5. What is the name of this facility? | |
| 6. Can the resident recognise two persons (doctor, nurse, carer etc.)? | |
| 7. What is your date of birth?<br>(Day & Month sufficient) | |
| 8. In what year did World War I begin? | |
| 9.Name the current president | |
| 10. Count backwards from 20 down to 1. | |
| **SCORE** | **/10** |

## PART 2: RISK FACTOR CHECKLIST

| | | **YES / NO** |
|---|---|---|
| **POOR VISION** | Reports/ observed difficulty seeing – signs/objects etc. | |
| **POOR MOBILITY** | Unknown/ appear unsafe/impulsive/forgets walking aid | |
| **UNSAFE TRANSFERS** | Status unknown/ appears unsafe | |
| **CONCERNING BEHAVIOUR** | Observed/ reported agitation, confusion, disorientation.<br>Difficulty following instructions/ non-compliant (observed/know) | |
| **ACTIVITIES OF DAILY LIVING (ADL's)** | Observed risk taking behaviour/ reported | |
| | Observed unsafe use of equipment | |
| | Unsafe footwear/ inappropriate clothing | |
| **ENVIRONMENT** | Difficulty with orientation (bed/bathroom/dining room) | |
| **POOR NUTRITION** | Underweight/ Low appetite | |
| **INCONTINENCE** | Reported/ known urgency/ nocturia/ accidents | |
| **OTHER** | (any risk factor not included in the previously described list). | |

## TIMED UP-AND-GO TEST (TUG)

Purpose: To assess mobility

Equipment: Stopwatch

Directions: Patients wear their regular footwear and can use a walking aid, if needed. Begin by having the patient sit back in a standard armchair and identify a line 3 meters on the floor.

- **Instruct the patient:**

When I say "Go," I want you to:

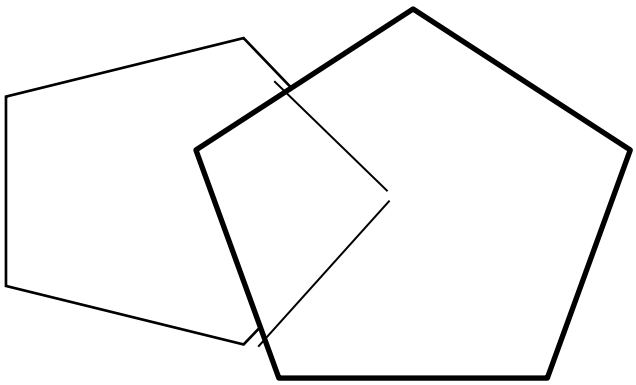
1. Stand up from the chair.
2. Walk to the line on the floor at your normal pace.
3. Turn.
4. Walk back to the chair at your normal pace.
5. Sit down again.

- **On the word "Go," begin timing.**
- **Stop timing after patient sits back down.**
- **Record time.**

**Time in seconds: _____**

An older adult who takes ≥12 seconds to complete the TUG is at risk for falling.

## MINI MENTAL STATE EXAMINATION (MMSE)

| | Residents Score | Maximum Score |
|---|---|---|
| **ORIENTATION**<br>Year? Month? Day? Date? Time? | | **5** |
| Country? Town? District? Facility? Unit? | | **5** |
| **REGISTRATION**<br>Examiner names 3 objects (e.g., apple, table, penny)<br>Patient asked to repeat (1 point for each correct).<br>THEN patient to learn the 3 names repeating until correct. | | **3** |
| **ATTENTION AND CALCULATION**<br>Subtract 7 from 100, and then repeat from result.<br>Continue 5 times: 100 93 86 79 65.<br>Alternative: spell "WORLD" backwards - dlrow.' | | **5** |
| **RECALL**<br>Ask for names of 3 objects learned earlier | | **3** |
| **LANGUAGE**<br>Name a pencil and watch | | **2** |
| Repeat "No ifs, ands, or buts" | | **1** |
| Give a 3-stage command.<br>Score 1 for each stage.<br>E.g., "Place index finger of right hand on your nose and then on your left ear". | | **3** |
| Ask patient to read and obey a written command on a piece of paper stating, "Close your eyes". | | **1** |
| Ask the patient to write a sentence. Score if it is sensible and has a subject and a verb | | **1** |
| **COPYING**<br>Ask the patient to copy a pair of intersecting pentagons:<br>  | | **1** |
| | **TOTAL SCORE:** | **/30** |

## BERG BALANCE SCALE (BBS)

| | | SCORE |
|---|---|---|
| **1.Sitting to Standing**<br><br>Please stand up. Try not to use your hands for support. | Able to stand without using hands and stabilize independently.<br>Able to stand independently using hands.<br>Able to stand using hands after several tries.<br>Needs minimal aid to stand or to stabilize.<br>Needs moderate or maximal assist to stand. | 4<br>3<br>2<br>1<br>0 |
| **2.Standing Unsupported**<br><br>Please stand for two minutes without holding. | Able to stand safely 2 minutes.<br>Able to stand 2 minutes with supervision.<br>Able to stand 30 seconds unsupported.<br>Needs several tries to stand 30 seconds unsupported.<br>Unable to stand 30 seconds unassisted.<br>**If a subject can stand 2 minutes unsupported, score full points for sitting unsupported.**<br>**Proceed to item #4.** | 4<br>3<br>2<br>1<br>0 |
| **3. Sitting with back unsupported but feet supported on floor/stool**<br><br>Please sit with arms folded for 2 minutes. | Able to sit safely and securely 2 minutes.<br>Able to sit 2 minutes under supervision.<br>Able to sit 30 seconds.<br>Able to sit 10 seconds.<br>Unable to sit without support 10 seconds | 4<br>3<br>2<br>1<br>0 |
| **4. Standing to Sitting**<br><br>Please sit down | Sits safely with minimal use of hands.<br>Controls descent by using hands.<br>Uses back of legs against chair to control descent.<br>Sits independently but has uncontrolled descent.<br>Needs assistance to sit. | 4<br>3<br>2<br>1<br>0 |

| | | |
|---|---|---|
| **5. Transfers**<br><br>Arrange chairs(s) for a pivot transfer. Ask subject to transfer one way toward a seat with armrests and one way toward a seat without armrests. You may use two chairs (one with and one without armrests) or a bed and a chair. | Able to transfer safely with minor use of hands.<br>Able to transfer safely definite need of hands.<br>Able to transfer with verbal cueing and/or supervision.<br>Needs one person to assist.<br>Cannot transfer themselves at all. | 4<br>3<br>2<br>1<br>0 |
| **6. Standing unsupported with eyes closed**<br><br>Please close your eyes and stand still for 10 seconds. | Able to stand 10 seconds safely.<br>Able to stand 10 seconds with supervision.<br>Able to stand 3 seconds.<br>Unable to keep eyes closed 3 seconds but stays steady.<br>Needs help to keep from falling. | 4<br>3<br>2<br>1<br>0 |
| **7. Standing unsupported with feet together**<br><br>Place your feet together and stand without holding. | Able to place feet together independently and stand 1 minute safely.<br>Able to place feet together independently and stand for 1 minute with supervision.<br>Able to place feet together independently but unable to hold for 30 seconds.<br>Needs help to attain position but able to stand 15 seconds with feet together.<br>Needs help to attain position and unable to hold for 15 seconds. | 4<br>3<br>2<br>1<br>0 |
| **8. Reaching forward with outstretched**<br><br>Lift arm to 90 degrees. Stretch out your fingers and reach forward as far as you can. | Can reach forward confidently >25 cm.<br>Can reach forward >12 cm safely.<br>Can reach forward >5 cm safely.<br>Reaches forward but needs supervision.<br>Loses balance while trying/requires external support | 4<br>3<br>2<br>1<br>0 |
| | | |

| | | |
|---|---|---|
| **9. Pick up object from the floor from a standing position**<br><br>Pick up the shoe/slipper which is placed in front of your feet. | Able to pick up slipper safely and easily.<br>Able to pick up slipper but needs supervision.<br>Unable to pick up but reaches 2-5cm from slipper and keeps balance independently.<br>Unable to pick up and needs supervision while trying.<br>Unable to try/needs assist to keep from losing balance or falling. | 4<br>3<br>2<br><br>1<br>0 |
| **10. Turning to look behind over left and right shoulders while standing**<br>Turn to look directly behind you over toward left shoulder. Repeat to the right. Examiner may pick an object to look at directly behind the subject to encourage a better twist turn. | Looks behind from both sides and weight shifts well.<br>Looks behind one side only other side shows less weight shift.<br>Turns sideways only but maintains balance.<br>Needs supervision when turning.<br>Needs assist to keep from losing balance or falling. | 4<br>3<br>2<br>1<br>0 |
| **11. Turn 360 degrees**<br><br>Turn completely around in a full circle. Pause. Then turn a full circle in the other direction. | Able to turn 360 degrees safely in 4 seconds or less.<br>Able to turn 360 degrees safely one side only in 4 seconds or less.<br>Able to turn 360 degrees safely but slowly.<br>Needs close supervision or verbal cueing.<br>Needs assistance while turning. | 4<br>3<br>2<br>1<br>0 |
| **12. Placing alternate foot on step or stool while standing unsupported**<br><br>Place each foot alternately on the step/stool. Continue until each foot has touched the step/stool four times. | Able to stand independently and safely and complete 8 steps in 20 seconds.<br>Able to stand independently and complete 8 steps in >20 seconds.<br>Able to complete 4 steps without aid with supervision.<br>Able to complete >2 steps need minimal assist.<br>Needs assistance to keep from falling/unable to try. | 4<br>3<br>2<br>1<br>0 |

| | | |
|---|---|---|
| **13. Standing unsupported one foot in front**<br>(Demonstrate)<br>Place one foot directly in front of the other. If you feel that you cannot place your foot directly in front, try to step far enough ahead that the heel of your forward foot is ahead of the toes of the other foot. | Able to place foot tandem independently and hold 30 seconds.<br>Able to place foot ahead of other independently and hold 30 seconds.<br>Able to take small step independently and hold 30 seconds.<br>Needs help to step but can hold 15 seconds.<br>Loses balance while stepping or standing. | 4<br>3<br>2<br>1<br>0 |
| **14. Standing on one leg**<br><br>Stand on one leg if you can without holding. | Able to lift leg independently and hold >10 seconds.<br>Able to lift leg independently and hold 5-10 seconds.<br>Able to lift leg independently and hold = or >3 seconds.<br>Tries to lift leg unable to hold 3 seconds but remains standing independently.<br>Unable to try or needs assist to prevent fall. | 4<br>3<br>2<br>1<br>0 |
| | **TOTAL SCORE:** | **/56** |

## DYNAMIC GAIT INDEX (DGI)

| | | SCORE |
|---|---|---|
| **1.Gait level surface**<br><br>Walk at your normal speed from here to the next mark 6m | Normal: Walks (6m), no assistive devices, good sped, no evidence for imbalance, normal gait pattern<br><br>Mild Impairment: Walks (6m), uses assistive devices, slower speed, mild gait deviations.<br>Moderate Impairment: Walks (6m) slow speed, abnormal gait pattern, evidence for imbalance.<br>Severe Impairment: Cannot walk (6m) without assistance, severe gait deviations or imbalance. | 3<br><br>2<br><br>1<br><br>0 |
| **2. Change in gait speed**<br><br>Begin walking at your normal pace (1m), when I tell you "Go," walk as fast as you can (1m). When I tell you "Slow," walk as slowly as you can (1m). | Normal: Able to smoothly change walking speed without loss of balance or gait deviation. Shows a significant difference in walking speeds between normal, fast, and slow speeds. Mild: Can change speed but demonstrates mild gait deviations, or not gait deviations but unable to achieve a significant change in velocity or uses an assistive device. Moderate: Makes only minor adjustments to walking speed or accomplishes a change in speed with significant gait deviations, or changes speed but have significant gait deviations, or changes speed but loses balance but can recover and continue walking. Severe: Cannot change speeds or loses balance and must reach for wall or be caught. | 3<br><br>2<br><br>1<br><br>0 |
| **3. Gait with horizontal head turns** | Normal: Performs head turns smoothly with no change in gait.<br>Mild Impairment: Performs head turns smoothly with slight change in gait velocity, i.e., minor disruption to smooth gait path or uses walking aid.<br>Moderate Impairment: Performs head turns with moderate change in gait velocity, slows down, staggers but recovers, can continue to walk.<br>Severe Impairment: Performs task with severe disruption of gait, i.e., staggers outside 5m path, loses balance, stops, and reaches for wall. | 3<br><br>2<br><br>1<br><br>0 |
| **4. Gait with vertical head turns**<br><br>Tip your head up. Keep looking up until I tell you, "Look down," then keep walking straight and tip your head down. Keep your head | Normal: Performs head turns smoothly with no change in gait.<br>Mild Impairment: Performs head turns smoothly with slight change in gait velocity, i.e., minor disruption to smooth gait path or uses walking aid. | 3<br><br>2 |

| | | |
|---|---|---|
| down until I tell you "Look straight, "then keep walking straight, but return your head to the centre. | Moderate Impairment: Performs head turns with moderate change in gait velocity, slows down, staggers but recovers, can continue to walk.<br>Severe Impairment: Performs task with severe disruption of gait, i.e., staggers outside 5m path, loses balance, stops, and reaches for wall. | 1<br>0 |
| **5. Gait and pivot turn**<br><br>Begin walking at your normal pace. When I tell you, "Turn and stop," turn as quickly as you can to face the opposite direction and stop. | Normal: Pivot turns safely within 3 seconds and stops quickly with no loss of balance.<br>Mild Impairment: Pivot turns safely in > 3 seconds and stops with no loss of balance.<br>Moderate Impairment: Turns slowly, requires verbal cueing, requires several small steps to catch balance following turn and stop.<br>Severe Impairment: Cannot turn safely, require assistance to turn and stop. | 3<br>2<br>1<br>0 |
| **6. Step over obstacle**<br><br>Begin walking at your normal speed. When you come to the shoebox, step over it, not around it, and keep walking | Normal: Can step over the box without changing gait speed, no evidence of imbalance.<br>Mild Impairment: Can step over box but must slow down and adjust steps to clear box safely.<br>Moderate Impairment: Can step over box but must stop, then step over. May require verbal cueing.<br>Severe Impairment: Cannot perform without assistance. | 3<br>2<br>1<br>0 |
| **7. Step around obstacles** | Normal: Can walk around cones safely without changing gait speed; no evidence of imbalance.<br>Mild: Can step around both cones but must slow down and adjust steps to clear cones.<br>Moderate: Can clear cones but must significantly slow, speed to accomplish task, or requires verbal cueing.<br>Severe: Unable to clear cones, walks into one or both cones, and requires physical assistance. | 3<br>2<br>1<br>0 |
| **8. Steps**<br><br>Walk up these stairs as you would at home, i.e., use the railing if necessary. At the top, turn around and walk down | Normal: Alternating feet, no rail.<br>Mild Impairment: Alternating feet, must use rail.<br>Moderate Impairment: Two feet to a stair, must use rail.<br>Severe Impairment: Cannot do safely. | 3<br>2<br>1<br>0 |
| **SCORE:** | **TOTAL** | **/24** |

## APPENDIX D: LETTER OF PERMISSION FROM THE CITY OF CAPE TOWN

CITY OF CAPE TOWN
ISIXEKO SASEKAPA
STAD KAAPSTAD

CORPORATE SERVICES
POLICY & STRATEGY DEPARTMENT
RESEARCH BRANCH
ORGANISATIONAL RESEARCH

Jameyah Armien-Ally
Senior Professional Officer
E: jameyah.armien@capetown.gov.za
M: 083 686 3530

13 September 2021

| | |
|---|---|
| ATT | : Nabilah Ebrahim |
| To | : University of the Western Cape |
| REFERENCE | : PSRR-0387 |

**Request for approval to undertake research in the City.**

Ms Nabilah Ebrahim requested permission from the City of Cape Town to undertake research in 7 old age facilities spread around Cape Town.

The selected facilities documented below, are not co/owned nor managed by the City of Cape Town.

1. Huis Nuweland
2. Ladies Christian Home
3. Ria Abel Home for the Aged
4. Helderberg Society for the Aged
5. Strand Sorg
6. Huis Zonnekus
7. Beitul Aman Home for the Aged

The listed facilities are privately owned and Ms Ebrahim should engage with the relevant facility management to obtain approval to access and engage with the residents and staff.

City approvals do not extend to privately owned facilities and Ms Ebrahim therefore does not require permission from the City to proceed with research in these facilities

Should you require additional information, please contact Jameyah Armien-Ally.

Jally 14 Sept 2021

Jameyah Armien-Ally
**SPO: Organisation Research**

## APPENDIX E: ETHICS CLEARANCE LETTER

UNIVERSITY of the WESTERN CAPE

60 YEARS of hope, action & knowledge

17 August 2021

Ms N Ebrahim and Prof L Leach
SRES
**Faculty of Community and Health Sciences**

**Ethics Reference Number:** BM21/6/18

**Project Title:** The determinants for falls among the elderly in retirement facilities in the City of Cape Town.

**Approval Period:** 17 August 2021 – 17 August 2024

I hereby certify that the Biomedical Science Research Ethics Committee of the University of the Western Cape approved the scientific methodology and ethics of the above mentioned research project.

Any amendments, extension or other modifications to the protocol must be submitted to the Ethics Committee for approval.

**Please remember to submit a progress report annually by 30 November for the duration of the project.**

*Permission to conduct the study must be submitted to BMREC for record-keeping.*

The Committee must be informed of any serious adverse event and/or termination of the study.

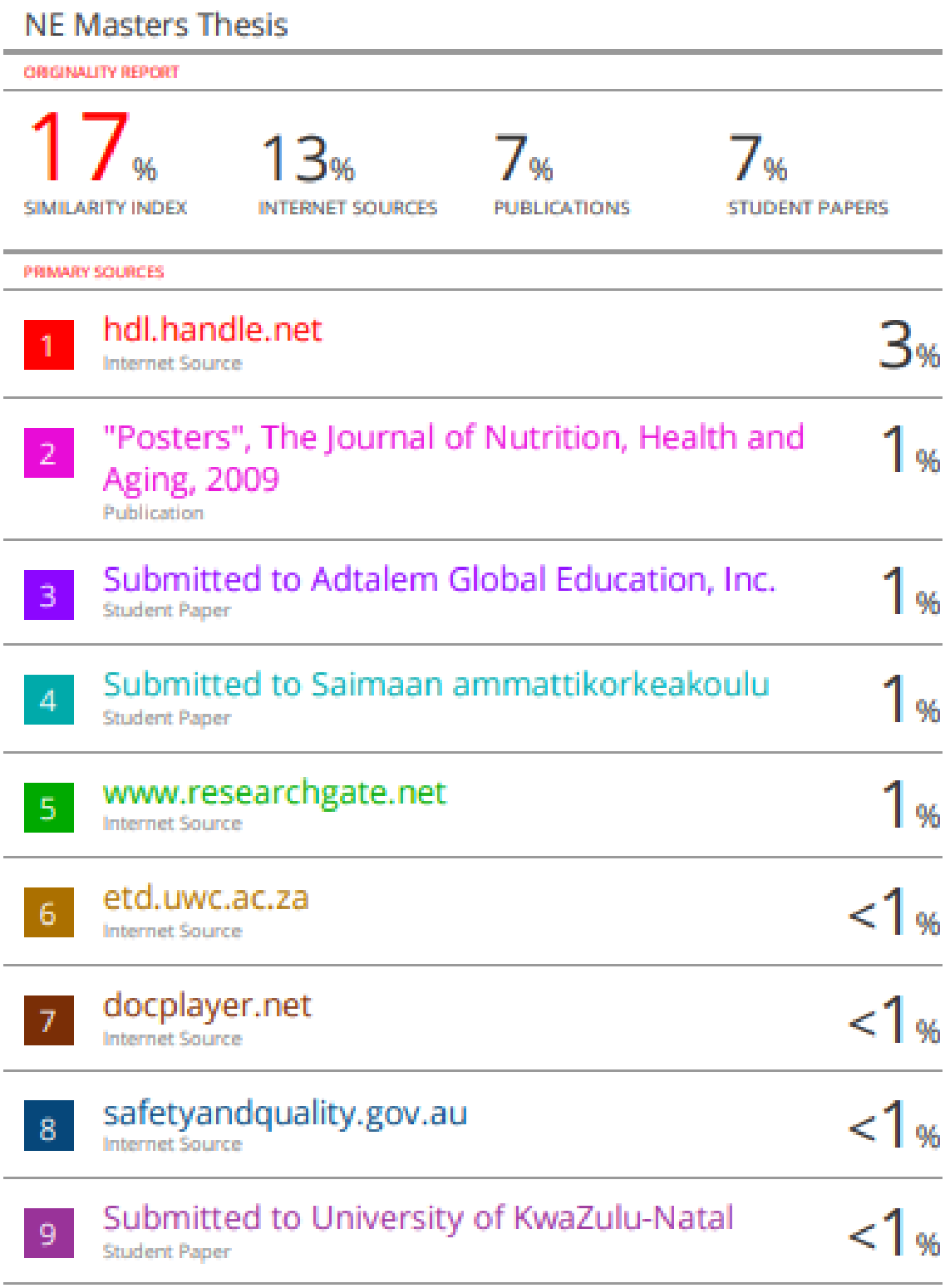
*Ms Patricia Josias*
*Research Ethics Committee Officer*
*University of the Western Cape*

Director: Research Development
University of the Western Cape
Private Bag X 17
Bellville 7535
Republic of South Africa
Tel: +27 21 959 4111
Email: research-ethics@uwc.ac.za

*NHREC Registration Number: BMREC-130416-050*

FROM HOPE TO ACTION THROUGH KNOWLEDGE.

**APPENDIX F: TURN-IT-IN**



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