

**The Association between Polypharmacy and Falls in an Older
Chronic Disease Population in East Trinidad. A Community based
Cohort study.**

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ABSTRACT

AIM:

To determine if there is an association between polypharmacy and falls in the older population age 60 years and above in the Chronic disease clinic at the Sangre Grande Enhanced Health Centre under the Eastern Regional Health Authority.

METHODOLOGY:

This research was a prospective cohort study and used a quantitative design. Participant selection was done via non-probability convenience sampling. All individuals aged 60 years and older that attended the Chronic Disease Clinic at the Sangre Grande Enhanced Health Centre between September 1st 2023 and November 30th 2023 was selected to participate in the research. The data collection was done via the use of a questionnaire tool done in person at the Chronic Disease Clinic. Patients who participated also had four different physical examinations done. These examinations included assessing visual acuity, lying and standing blood pressures, sensory exam of the lower limbs and timed get up and go test. After 3 months a follow up was done via phone to assess if they had a fall within that time.

RESULTS:

Out of the 338 participants, The study primarily involved older adults (mean age 70.23), predominantly female (66%), with the largest ethnic group being Afro Trinidadian (45.9%). The 3 month incident rate of falls in this study was 7.4% with a lifetime prevalence of at least 1 fall of 48%. There were 138 (40.8%) participants on polypharmacy, 5 or more drugs and 200

(59.2%) participants were non polypharmacy taking less than 5 drugs. No significant associations were found between most demographic factors, comorbid conditions (except anaemia), and falls. High FRAT (Falls risk assessment tool) scores were linked to increased fall risk OR 12.084 (4.931-29.615), and impaired visual acuity ($P=0.035$), while other clinical predictors showed no significant associations. There was no association between polypharmacy and falls nor the type of medication.

CONCLUSION:

There was no significant association between polypharmacy and falls. The positive associations with anaemia, impaired visual acuity, self-reported dizziness and high Falls risk assessment score, should be looked into further detail at Chronic disease clinics to aid in fall prevention as some of these factors are modifiable.

INTRODUCTION

Injuries related to falls are prevalent among older individuals and can lead to significant pain, decreased functionality, loss of independence, and premature mortality. Each year, around 28-35% of individuals aged 65 and above experience falls, with this percentage rising to 32-42% for those over 70 years old.¹ A fall is defined as “An event which results in a person coming to rest inadvertently on the ground or floor or other lower level”. Fall-related injuries may be fatal or non-fatal though most are non-fatal.¹

Over the past five decades, Trinidad and Tobago has witnessed a substantial rise in its elderly demographic, both in numerical terms and relative to the overall population. Currently, 177,767 individuals, constituting 13.4% of the total population, are aged 60 years and above.²

There is a rising prevalence of multimorbidity in the older population, which leads to various treatment options and goals towards these targeted diseases. Various medications are used when trying to achieve the best results for patients. This consequently leads to a high treatment burden and polypharmacy.³

Polypharmacy lacks a clear universal definition, but a recent systematic review of the definitions of polypharmacy showed that it was most commonly applied to patients who took five or more medications.⁴ Establishing the link between falls and polypharmacy is crucial as this can help inform whether the threshold for a detailed medication review should be lowered and in turn reduce the risk of falls.³

This field is important, as the older population is increasing, there will also be an increased risk and demand for health services and hospitalizations.³ With the increase in fall related injuries, there can be serious consequences such as; fractures which in turn leads to functional impairment and an increase in dependency towards relatives and caretakers and even longer hospital stays.

When older adults lose their independence and functionality, this can also have a negative impact on their mental health and wellbeing and can lead to depression and anger.⁵ There is also an increase in disability, reduced social activities, lowered quality of life and an increased risk of mortality.⁵

In geriatric medicine, some of the common topics discussed as they are termed the giants of geriatrics as these are dangerous conditions that can imperil the older population. These include; immobility, instability (falls), incontinence, intellectual impairment, and iatrogenic complications, e.g., resulting from inappropriate medication.⁶

This research would be focusing on the association between polypharmacy and falls in the older population age 60 years and above in the Chronic disease clinic at the Sangre Grande Enhanced Health Centre under the Eastern Regional Health Authority. Information gathered via this research, can aid health care professionals in better understanding if there is a link between polypharmacy and falls in this vulnerable population, and in turn make adjustments to decrease the risk of fatal fall related injuries amongst the older adults.

PROBLEM STATEMENT

Having previously worked at the Accident and Emergency Department under the South West Regional Health Authority, it was noted that there was a significant issue concerning a high number of elderly patients presenting with falls and subsequent complications. Falls among the elderly are recognized as a major challenge, often resulting in a diminished quality of life for these individuals. Many of these patients are concurrently managing multiple health conditions and thus are prescribed numerous medications. Similarly, in my experience in a private primary care setting, I have observed that patients with a history of conditions such as strokes, diabetes mellitus, hypertension, and hypercholesterolemia often require multiple medications for their management.

Several studies have been conducted researching the link between polypharmacy and falls in the UK and in Sweden. In one study it showed that, the risk of injurious falls increases by 2% for each additional drug, in a remarkably linear fashion.⁷ Prior studies showed that particular drug classes such as antihypertensives, sedatives, analgesics and even anticholinergics can increase the risk of having a fall and fall related injuries.⁷

However, when searching for articles online that included using key search words such as; polypharmacy, falls, older population age 60 years and above and Primary care setting , from Trinidad and Tobago to justify this, only one study was found looking at trauma in the elderly, as a cross sectional study. The study looked at trauma admissions to a tertiary hospital in Trinidad, comparing injury characteristics and patient outcomes in older versus younger adults. Falls were the most common mechanism of injury in the elderly, accounting for 71% of injuries.⁸ The older patients who fell sustained fractures and were more likely to injure their limbs and head.⁸ This study was conducted in 2014, and no other new research studies were conducted in

approximately eight years. No studies in Trinidad and Tobago assessed the association on polypharmacy and falls in the older population, which highlights the lack of data availability as compared to the UK and Sweden.

JUSTIFICATION

The connection between polypharmacy and falls among individuals aged 60 and above has been highlighted in research conducted in Trinidad, where a notable percentage of injuries in this demographic result from falls. Despite this, there is a lack of data investigating the specific reasons for these falls in older adults. Identifying the risk factors for falls is crucial for effective fall prevention, particularly if these factors are modifiable. Previous studies have demonstrated that polypharmacy significantly influences the occurrence of falls. Therefore, if polypharmacy is identified as a significant modifiable risk factor, healthcare professionals can implement measures to carefully review patients' medications. This proactive approach aims to prevent the harmful consequences and potentially fatal injuries associated with falls, ultimately enhancing the quality of life for older patients.

PRIMARY RESEARCH QUESTION

1. Is there an association between polypharmacy and falls in the older population age 60 years and above in the Chronic disease clinic at the Sangre Grande Enhanced Health Centre under the Eastern Regional Health Authority ?

SECONDARY RESEARCH QUESTIONS

- 1 Is it the type of medications rather than polypharmacy that older patients use that are associated with falls under the Eastern Regional Health Authority?
- 2 What proportion of patients in the chronic disease clinic experience falls?
- 3 Is visual acuity, orthostatic hypotension, abnormal sensory lower limb exam and timed up an go test predictors of falls?
- 4 Is the FRAT (Falls risk assessment tool) a good predictor for falls?

AIM

1. To determine if there is an association between polypharmacy and falls in the older population age 60 years and above in the Chronic disease clinic at the Sangre Grande Enhanced Health Centre under the Eastern Regional Health.

RESEARCH OBJECTIVES

- 1 To identify what proportion of chronic disease patients experience falls when followed up prospectively.
- 2 To identify if it is the type of medications rather the number of medications that older patients use resulting in an increase in falls under the Eastern Regional Health Authority.
- 3 To identify if visual acuity, orthostatic hypotension, abnormal sensory lower limb exam and timed up and go test are predictors of falls.
- 4 To identify if the FRAT (Falls risk assessment tool) is a good predictor of falls.

LITERATURE REVIEW

A literature search was performed by using PubMed database for online journal abstracts and articles, as well as Google scholar and UWI Online database system. Key search terms were used; older adults, polypharmacy, falls, Primary care setting, Chronic Disease Clinic, Local Health centre, Trinidad and Tobago. Additional studies were identified by searching the reference lists of some of these studies obtained via UWI online databases.

Numerous articles have been published relating polypharmacy and falls in older adults globally. A fall is defined as “An event which results in a person coming to rest inadvertently on the ground or floor or other lower level”. Fall-related injuries may be fatal or non-fatal though most are non-fatal.¹ Falls can be due to multiple factors such as muscle weakness as patients age, medication, impaired balance and gait, dizziness ,osteoarthritis, impaired visual acuity, postural hypotension and even certain chronic diseases.

Various types of studies were conducted, including nested case-control studies, longitudinal studies, population-based cross-sectional studies, and retrospective cohort studies. Additionally, there were differences in the age criteria for defining the elderly across these studies. Some articles utilized an age threshold of 60 and above, while others used 65 years and above, and even 70 years and above.

Another variation, was the fact that there is no universally approved definition for polypharmacy⁴, and so some of the articles had different categories for polypharmacy use , ranging from greater than or equal to 4 drugs to even greater than ten drugs being used by the older population.

However, throughout some of the studies, there was a term used as FRID’s which stands for fall risk increasing drugs. This classification of medication are drugs that can increase the risk of

falls in the older population. Some of the studies neglected to include these types of drugs as this can contribute to falls rather than the number of medications patients are using.

One study from the Gerontological society of America showed that the presence of multiple FRIDs in a prescription is an independent risk factor for falls, even in older adults with few medications.⁹ Further investigation for deprescribing fall risk increasing drugs should be focused on to determine if they effectively prevent falls in the older population.

A study conducted by Hammond and Wilson explored the relationship between polypharmacy and falls in the elderly through a literature review published in Nursing and Midwifery Studies. The findings suggest that while polypharmacy is associated with falls in older individuals, the type of medications taken may have a greater impact on fall risk than polypharmacy alone.¹⁰

In a nationwide nested case-control study spanning from January 1st to December 31st, 2013, conducted in Sweden by Morin, Calderon Larrañaga, Welmer, Rizzuto, Wastesson, and Johnell, researchers examined the relationship between polypharmacy and injurious falls in older adults. The study focused on thirteen fall risk-increasing drugs and categorized them accordingly. To align the timeframe of exposure with Fall Risk-Increasing Drugs (FRIDs), the study assessed the number of FRIDs taken during the 7-day period leading up to the fall event. This approach aimed to establish a correlation between FRID use and falls. Notably, variations in study methodologies were observed, with some studies lacking a specific time frame linking FRID exposure to falls, potentially impacting result accuracy. Furthermore, discrepancies were noted in data collection methods regarding medication use, with some studies relying on self-reported information while others utilized prescription or dispensing databases. Self-reported data could introduce recall bias

and lead to missing information, whereas prescription or dispensing databases might not capture over-the-counter or non-prescription medications, potentially resulting in incomplete or inaccurate data collection.⁷

Several studies have examined factors that may contribute to an increased risk of falls in individuals using multiple medications. A longitudinal study conducted in England focused on walking speed and found a notable interaction between walking speed and the relationship between polypharmacy and falls. Interestingly, participants with both fast and slow walking speeds did not show a significant link between polypharmacy and falls. This suggests that the risk of falls may not be heightened by the number of medications taken when individuals have good physical function. Consequently, walking speed could serve as a useful indicator for identifying patients who may require personalized management of polypharmacy.³

Another study on Polypharmacy and falls in the middle age and elderly population conducted from 1990 to 1993 done by (Ziere G et al). This study, conducted as part of the Rotterdam study, highlighted the presence of recall bias. The findings were based on structured interviews, relying on participants' memory of events, which could introduce bias in retrospective studies. It was observed that over a third of individuals did not accurately recall the number of falls. To address potential underreporting, the study focused on excluding individuals with cognitive disorders, particularly dementia, to enhance the accuracy of data and results.¹¹

Another study on Trauma in the elderly in Trinidad and Tobago: a cross-sectional study that was conducted between May 1st 2009 to May 31st 2009 by (Naraynsingh R et al). This study was conducted at the Accident and Emergency department at San Fernando General Hospital, on

trauma occurring in the older population. This study showed that falls were the most common injury in the elderly and accounted for 71% of injuries.⁸ However, the study was conducted over a restricted time frame of only one month, which may have contributed to bias results. The study demonstrates the need for public health measures and public education in developing countries at fall prevention in older persons to reduce the burden of falls, as the older population is increasing globally. The study stated that by 2050, 20% of the population in Trinidad and Tobago will be 65 years or older.⁸

A study conducted in 2005 by Reyes-Ortiz CA et al ,examined falls among elderly individuals in Latin America, the Caribbean, and Mexican-Americans. The research revealed that the prevalence of falls varied across different cities, ranging from 21.6% in Bridgetown Barbados, to 34.0% in Santiago, Chile. Through multiple logistic regression analyses, it was found that female gender, advanced age, high levels of depressive symptoms, and the presence of functional limitations were significant independent risk factors for falls in most cities and among elderly Mexican-Americans. Additionally, factors such as diabetes, urinary incontinence, and arthritis were identified as significant risk factors in several cities.¹²

A study conducted locally in Trinidad and Tobago titled "Polypharmacy and the Risk of Malnutrition among Independently-living Elderly Persons" by Ramgoolie P and Nichols S in 2015 revealed that among the participants, both polypharmacy and the presence of multiple ailments were linked to a higher risk of malnutrition. However, the specific mechanisms driving these associations are not yet fully understood. In this study, polypharmacy was defined as the use of six or more medications.¹³

A study conducted locally focused on polypharmacy and potential drug-drug interactions among emergency department patients in the Caribbean by researchers Dookeeram D et al. This four-month cross-sectional study compared the occurrence of potential drug-drug interactions in older and younger patients discharged from the emergency department. Polypharmacy, defined as the use of five or more drugs, was a key aspect of the study. The primary objective was to evaluate the prevalence of polypharmacy and potential drug-drug interactions in adult patients discharged from the emergency department of a tertiary teaching hospital in Trinidad and Tobago, comparing those aged 18-64 years with those aged 65 years and older. The study highlighted a notable percentage of patients with potential drug-drug interactions, many of whom had multiple interactions. Older patients (aged 65 years and above) were more likely to experience both polypharmacy and potential drug-drug interactions. The study also found a correlation between polypharmacy and the use of herbal and over-the-counter medications. Furthermore, potential drug-drug interactions were significantly linked to polypharmacy and several common chronic conditions, such as hypertension, ischemic heart disease, and psychiatric disorders.¹⁴

A local study conducted by Yogi RR et al focused on falls in older individuals, comparing older and younger fallers in a developing country. This prospective observational study examined older trauma patients in Trinidad, comparing characteristics between older and younger patients who experienced falls. The study included 1432 adult trauma patients, with 1141 aged 18-64 years and 291 aged 65 years and older. It was observed that older fallers were more likely to be female. The findings suggest that older individuals who experience falls represent a unique patient group in Trinidad, with distinct characteristics compared to older fallers in developed

countries. The study also emphasized the development of a trauma registry across all hospitals in Trinidad and Tobago, which aims to provide continuous data on trauma in Trinidad and monitor trends in the epidemiology, treatment, and outcomes of this global issue.¹⁵

Falls risk assessment tools (FRATs) have been used in various healthcare settings, including acute, subacute, and aged care, to identify individuals at a heightened risk of falling.¹⁶ FRATs offer fall risk profiles to anticipate the probability of future falls, making them essential for tailored fall prevention initiatives.¹⁷ In a study utilizing the Fall risk assessment tool, it was found that the most predictive factors were recent falls (0.82), psychological status (0.55), medications (0.46), and cognition (0.41). The FRAT (Falls risk assessment tool) demonstrates 80% accuracy, with a sensitivity of 70.2%, specificity of 68.8%, and high reliability.¹⁸

However, many confounding factors for falls varied from each article, such as age, walking speed, comorbidities, alcohol and smoking use, and even body mass index. Also, different articles had different subgroups of the number of drugs being investigated. Majority of the articles that looked at polypharmacy and falls in the older population, showed that there was some association with either the number of medications or the type of medications being used. Throughout my research and review of different studies, it influences my intended research, as there are gaps in the literature reviews for some of these studies. The articles that were critiqued, established that there is an association between falls in the older population and the number of drugs these patients take on a daily basis. However, new research questions came out of these studies such as if it's the type of medications being used that are associated with falls, as certain drug classes known as FRID's as mentioned above can increase the risk of falls. My intended

research would also include the types of medications the older patients are on along with the number of medications, in order to determine an association between the falls and polypharmacy.

RESEARCH DESIGN

This study was a prospective cohort design, with data collection conducted through a questionnaire, which is provided in the appendix. Data collection took place in person at the Chronic Disease Clinic, chosen for its expediency, focus, and objectivity in gathering relevant information for the study. Following questionnaire completion, patients underwent four distinct examinations. These included assessments of visual acuity, lying and standing blood pressures, sensory examinations of the lower limbs, and the timed "get up and go" test. These examinations were integral to patient assessment, aiding in the identification of deficits in leg strength, balance, vestibular function, and gait. Postural vital signs were assessed to eliminate orthostatic hypotension as a potential factor, while visual acuity testing aimed to identify any impairment, given its association with fall risk.

SETTING

This Community-based cohort study was conducted at the Sangre Grande Enhanced Health Centre, part of the Eastern Regional Health Authority (ERHA), operating within the primary care setting. The health centre primarily serves residents of the Sangre Grande region, located in County St. Andrew/St. David. The total catchment population for this facility is 47,859, with an estimated adult population of 33,501, as documented in the updated HEARTS database of the Sangre Grande Enhanced Health Centre, ERHA. Participants for this study were drawn from the Chronic Disease Clinic, which caters to 8,150 registered patients. This clinic specializes in the management of chronic conditions such as diabetes mellitus, hypertension, heart disease, strokes, and hyperlipidaemia.

The Primary care setting specifically the Chronic disease clinic was considered to conduct this study as majority of patients who present have multiple comorbidities and would be placed on medication in this setting. Some patients may not be on multiple drugs and may still have a history of falls. If there is an association between falls and polypharmacy, physicians in the primary care setting can take a closer detailed look at these patient's drug history and make adjustments.

PARTICIPANTS

The participants selected for this study were patients age 60 years and older who attended the Chronic Disease Clinic at the Sangre Grande Enhanced Health Centre , between September 1st 2023 to November 30th 2023.

The inclusion and exclusion criteria are as follows:

INCLUSION CRITERIA

- 1 Males and females age 60 years and older who attend the Chronic Disease Clinic at the Sangre Grande Enhanced Health Centre.

EXCLUSION CRITERIA

- 1 Patients who have Dementia or an altered mental status
- 2 Patients with a comorbid psychiatric illness
- 3 Patients who are unable to verbalize their responses due to an illness
- 4 Patients who are hearing impaired
- 5 Patients who cannot ambulate

SAMPLING SIZE

Comparing two proportions sample size

$$n = (Z_{\alpha/2} + Z_{\beta})^2 * (p_1(1-p_1) + p_2(1-p_2)) / (p_1 - p_2)^2$$

$Z_{\alpha/2}$ is the critical value of the Normal distribution at $\alpha/2$ for a confidence level of 95%

α is = 0.05 and the critical value is 1.96

$$Z_{\alpha/2} = 1.96$$

Z_{β} is the critical value of the Normal distribution at β for a power of 80%, β is 0.2 and the critical value is 0.84

$$Z_{\beta} = 0.84$$

P1 is the population group who had polypharmacy use and had a fall

P2 is the population group who had no polypharmacy use and had a fall

P1 = 22.7 % taken from a prior study ¹⁹

P2 = 11.35% taken from a prior study ²⁰

Using the formula

$$n = (1.96 + 0.84)^2 * (0.227(1-0.227) + 0.1135(1-0.1135)) / (0.227 - 0.1135)^2$$

n = 169 persons in each group

A sample size of 338 would allow me to detect a difference in fall prevalence of 22.7% in the polypharmacy use group versus 11.35% in the non-polypharmacy use group

SAMPLING METHOD

Participant selection was done via non-probability convenience sampling. All individuals aged 60 years and older that attended the Chronic Disease Clinic at the Sangre Grande Enhanced Health Centre between September 1st 2023 and November 30th 2023 were selected to participate in the research.

DATA COLLECTION

The primary form of data collection was done via a questionnaire with both closed ended and open ended questions. The questionnaire was done on the day of the patients chronic disease clinic appointment. Patients who met the inclusion criteria were also asked to have four different examinations performed on them, which included testing visual acuity, lying and standing blood pressures, sensory exam of the lower limbs and timed get up and go test. The questionnaire was filled out by the researcher and the participant, in case there were any clarifications to the questions being asked.

The first part of the questionnaire entailed patient's demographics, which included age, gender and ethnicity. The second part of the questionnaire included medical questions both relating to medication and falls, along with comorbidities, such as (Osteoarthritis, stroke, anaemia, diabetes, hypertension). Alcohol use, smoking and exercise status were also assessed. The third part of the questionnaire included the use of a validated fall risk assessment tool known as FRAT (Falls risk assessment tool). ¹⁸The FRAT classified patients who were at low, medium and high risk of falling relating to a scoring system. Scores between 5-11 were at a low risk, 12-15 were at medium risk and scores 16-20 were at a high risk of falling. A copy of the questionnaire is shown in Appendix B. Patients who met the inclusion criteria and agreed to participate in the study were also asked to have four main examinations done, shown in Appendix C. Any patients who had abnormal examinations were referred to the relevant specialist if they were not being followed up with one already. Patients were also informed, that three months after the date of seeing them in clinic , they would be followed up via a phone call to assess if they had a fall. A fall was defined as "An event which resulted in a person coming to rest inadvertently on the

ground or floor or other lower level”.¹This data was recorded in an excel sheet and was used for further analysis.

However, before the data was collected , each patient was read a consent form, and once they agreed to participate in the study it was documented .A copy of the consent form is attached in Appendix A.

PILOT TESTING

This questionnaire and four physical exams had a pilot testing done, to identify the time for completion and to receive feedback on questions that required clarification or that may be worded inappropriately or should have been excluded. The pilot testing included 10 participants, in which it took 15 to 20 minutes per patient to perform both physical exams and the questionnaire. Consent was obtained prior to conducting the pilot testing. There were no changes made from the pilot testing and these 10 participants were included in the final data collection and analysis.

DATA ANALYSIS

Statistical analysis was done with SPSS version 25.0. Frequencies and percentages were reported for categorical data. Means and medians (interquartile ranges) were reported for scale variables. Fisher's exact tests and Chi square tests were used for dichotomous categorical variable associations. Binary logistic regression models were used for identifying predictors of falls with demographic, clinical and functional tests as covariates. The threshold for statistical significance was set at P of 0.05.

RESULTS

The sociodemographic and selected clinical characteristics of the sample are shown in Table 1.

Characteristics	Description n(%)
Gender	
Male	115 (34%)
Female	223 (66%)
Age Groups: Mean 70.23 ± 7.13	
60-64	82 (24.3%)
65-69	100 (29.6%)
70-74	70 (20.7%)
75-79	42 (12.4%)
80 and older	44 (13%)
Ethnicity	
Afro Trinidadian	155 (45.9%)
Indo Trinidadian	114 (33.7%)
Mixed Afro/Indo Trinidadian	30 (8.9%)
Mixed	39 (11.5%)
BMI kg/m²	
Underweight	13 (3.9%)
Normal weight	110 (32.6%)
Overweight	104 (30.9%)
Obesity	110 (32.6%)

Table 1- Sociodemographic and clinical characteristics

Demographics

Out of the 338 eligible persons approached in the research, all consented to participate. The response rate was 100%. The study predominantly involved female participants (66%) and individuals aged 65- 69 years (29.6%). The largest ethnic group was Afro Trinidadian (45.9%). Majority of the participants were of normal BMI (32.6%) and almost two thirds of the participants were either obese or overweight.

The characteristics of those who had a fall are shown in Table 2.

Characteristics	Descriptives n(%)
Number of people having a fall within the last year	
Yes	79 (23.4%)
No	259 (76.6%)
Number of people who had a fall over one year	
13 months ago	1 (1.9%)
18 months ago	2 (3.7%)
2 years ago	25 (46.3%)
3 years ago	11 (20.4%)
4 years ago	4 (7.4%)
5 years ago	6 (11.1%)
7 years ago	1 (1.9%)
9 years ago	1 (1.9%)
10 years ago	2 (3.7%)
12 years ago	1 (1.9%)
People who had a history of falls	
1 Fall	120 (35.5%)
2 Falls	8 (2.4%)
3 Falls	1 (0.3%)
Number of people admitted to the hospital who had a fall	
Yes	28 (21.7%)
No	101 (78.3%)
Number of people who sustained fractures from a fall	

Yes	14 (10.9%)
No	115 (89.1%)
Number of people able to function as normal and perform daily activities of living after their fall	
Yes	107 (82.9%)
No	22 (17.1%)
People who had a fall in the past, number of drugs taken at time of fall	
No drugs	15 (11.6%)
1 drug	7 (5.4%)
2 drugs	19 (14.7%)
3 drugs	30 (23.3%)
4 drugs	13 (10.1%)
5 drugs	23 (17.8%)
6 drugs	13 (10.1%)
7 drugs	6 (4.7%)
8 drugs	3 (2.3%)

Table 2 - Characteristics of those with a fall history.

Characteristics of fall history

Out of the 338 participants, 76.6% stated that they had no history of a fall within the last year. However, just under half the sample (46.7%) indicated having experienced a fall two years ago. For those who had a history of falls, 35.5% had one incident and close to 3% indicated that they had either 2 or 3 falls. Most people who had a fall were not admitted to the hospital (78.3%), suffered no fractures (89.1%) and were able to perform normal daily activities after a fall (82.9%). The number of drugs taken by the participants at the time of fall varied with the majority taking three drugs (23.3%). Those taking five drugs accounted for 17.8% of the sample. The maximum number of drugs taken was 8 but this figure only accounted for 2.3% of the sample.

The comorbidities of the participants are shown in Table 3

Comorbidity	n (%)
Hypertension	296 (87.6%)
Diabetes Mellitus	175 (51.8%)
Dyslipidemia	173 (51.2%)
Osteoarthritis	38 (11.2%)
Ischemic Heart Disease	25 (7.4%)
Stroke	22 (6.5%)
BPH	22 (6.5%)
Thyroid Disease	17 (5.0%)
Asthmatic	14 (4.1%)
Venous Insufficiency	13 (3.8%)
Anemia	9 (2.7%)
Acid Reflux	8 (2.4%)
Cataract	6 (1.8%)
Chronic Kidney Disease	5 (1.5%)
Glaucoma	4 (1.2%)
Epilepsy	2 (0.6%)
Breast Cancer	2 (0.6%)
Peripheral Vascular Disease	2 (0.6%)
Heart Failure	1 (0.3%)
Rheumatoid Arthritis	1 (0.3%)
Hernia	1 (0.3%)
Thyroid Cancer	1 (0.3%)
Prostate Cancer	1 (0.3%)
Angina	1 (0.3%)
COPD	1 (0.3%)
Parkinson's Disease	1 (0.3%)

Table 3 - Comorbidities

Comorbidities

Participants were asked to list the comorbidities they have. The top three most common were hypertension (87.6%), diabetes mellitus (51.8%) and Dyslipidaemia (51.2%).

The number of drugs currently being taken by the participants are shown in Table 4.

Number of Drugs Taken	Median (Range)	n (%)
Overall	4 (10)	
1		21 (6.2%)
2		58 (17.2%)
3		74 (21.9%)
4		47 (13.9%)
5		61 (18.0%)
6		37 (10.9%)
7		28 (8.3%)
8		7 (2.1%)
9		4 (1.2%)
11		1 (0.3%)

Table 4 - Current medication.

Number of current drugs

Out of 338 participants, the majority of participants took their medications daily (82.2%).

Participants were asked to state the number of drugs they were currently taking. Overall, participants took a median value of 4 drugs. Out of the 338 participants 138 (40.8%) were on polypharmacy, 5 or more drugs and 200 (59.2%) participants were non polypharmacy taking less than 5 drugs. Furthermore, polypharmacy was not significantly associated with age or gender, however, ethnicity was significantly associated with Indo Trinidadians having the highest rate of polypharmacy 61 (53.5%) compared to other ethnicities. The majority of participants took 3 drugs (21.9%), followed by those who took 5 drugs (18%) and those who took 2 drugs (17.2%). The maximum number of drugs taken was 11 as indicated by 1 (0.3%) participant and the least number of drugs taken by 21 (6.2%) participants was 1 drug.

The current number and class of drugs are shown in Table 5.

Number of Antihypertensives	Median (Range)	n (%)
Overall	2 (4)	
0		40 (11.8%)
1		121 (35.8%)
2		139 (41.1%)
3		35 (10.4%)
4		3 (0.9%)
Number of Antidiabetic medication	Median (Range)	n (%)
Overall	1 (2)	
0		167 (49.4%)
1		103 (30.5%)
2		68 (20.1%)
Number of Sedatives	Median (Range)	n (%)
Overall	0 (1)	
0		333 (98.5%)
1		5 (1.5%)
Number of Anticonvulsants	Median (Range)	n (%)
Overall	0 (1)	
0		315 (93.2%)
1		23 (6.8%)
Number of Antiplatelet Medications	Median (Range)	n (%)
Overall	0 (2)	
0		204 (60.4%)
1		125 (37.0%)
2		9 (2.7%)

Table 5 - Current number and class of drugs

Current drug characteristics

Participants were asked to state the number of drugs they were currently taking. Similar to the questions that asked what drugs they were taken at the time of fall, five classifications of drugs were used: antihypertensives, antidiabetic medication, sedatives, anticonvulsants, and antiplatelet medications. The median values for each were 2, 1, 0, 0 and 0 drugs respectively. Regarding antihypertensive medications, the data suggests 2 drugs is the most frequent number taken by 41.1% of the participants and 121 participants (35.8%) stated that they took 1 types of antihypertensive medication while 35 participants or 10.4% of the sample took 3. Even fewer participants (0.9%) were prescribed 4 of these medications. It should also be noted that 40 participants (11.8%) did not take these medications. The majority of the participants (49.4%) did not take any antidiabetic medication, however 30.5% indicated that they took 1 and 20.1% took 2. Almost all participants (98.5%) did not take any sedatives and a similar majority (93.2%) also did not take any anticonvulsant medications. While 60.4% of the participants did not take antiplatelet medication, 37% and 2.7% took 1 and 2 antiplatelet medications respectively. The total daily pill count was also determined for all oral medications. The median daily pills taken was 4 with a range of 0.5 – 20 pills.

Exercise and smoking characteristics are shown in Table 6.

Question	Response		
	Yes	No	Median (IQR)
	n (%)	n (%)	
Do you take medication daily?	278 (82.2%)	60 (17.8%)	
Do you exercise?	196 (58.0%)	142 (42.0%)	
Time spent on exercise			60 mins (150 mins)
Do you smoke?	26 (7.7%)	312 (92.3%)	
Do you smoke cigarettes?	25 (7.4%)	313 (92.6%)	
Do you smoke marijuana?	4 (1.2%)	334 (98.8%)	

Table 6- Exercise and Smoking characteristics.

Exercise and smoking status.

Out of 338 participants, exercised (58%), did not smoke (92.3%), did not smoke cigarettes (92.6%) or marijuana (98.8%). The median value (IQR) of 60 minutes (150 minutes) was indicative of the time spent on exercise per week by the participants.

EXAMINATION RESULTS

The visual acuity of participants including the best and worst visual acuity is shown in

Table 7.

Visual Acuity	With glasses (n = 143)		Without glasses (n = 338)		Visual Acuity	
	Left eye	Right-Eye	Left eye	Right-eye	Best	Worst
	n (%)	n (%)	n (%)	n (%)	n (%)	n (%)
20/20	22 (6.5%)	20 (5.9%)	17 (5.0%)	9 (2.7%)	50 (14.8%)	6 (1.8%)
20/25	26 (7.7%)	30 (8.9%)	17 (5.0%)	16 (4.7%)	51 (15.1%)	13 (3.8%)
20/30	31 (9.2%)	33 (9.8%)	28 (8.3%)	26 (7.7%)	66 (19.5%)	16 (4.7%)
20/40	27 (8.0%)	25 (7.4%)	51 (15.1%)	49 (14.5%)	66 (19.5%)	40 (11.8%)
20/50	23 (6.8%)	17 (5.0%)	59 (17.5%)	70 (20.7%)	56 (16.6%)	61 (18.0%)
20/70	10 (3.0%)	11 (3.3%)	86 (25.4%)	80 (20.3%)	35 (10.4%)	89 (26.3%)
20/100	2 (0.6%)	3 (0.9%)	38 (11.2%)	40 (11.8%)	8 (2.4%)	48 (14.2%)

Light Perception	-	1 (0.3%)	-	4 (1.2%)	-	4 (1.2%)
Hand Movement	1 (0.3%)	2 (0.6%)	40 (11.8%)	42 (12.4%)	6 (1.8%)	57 (16.9%)
Blind	1 (0.3%)	1 (0.3%)	2 (0.6%)	2 (0.6%)	-	4 (1.2%)

Table 7- Visual Acuity

Visual Acuity

Visual acuity was tested for participants who wore glasses and for all participants without. Of the 338 participants, 143 wore glasses. For those who wore glasses, 6.5% had 20/20 vision in their left-eye while 5.9% had 20/20 vision in their right eye. Figures for all participants who did not wear glasses were comparably lower at 5% in the right eye and 9% in their left eye. Participants' visual acuity was categorized as 'best' and 'worst' and overall, those in the former category had substantially more participants with 20/20 vision (14.8%) than those in the latter (1.8%). These trends hold for all visual acuity categories. Generally, those who wore glasses tend to have better visual acuity which got progressively worse when the test was conducted without glasses. More specifically, those under the 'worst' visual acuity category, had a greater number of participants with poor vision. Also of considerable note is the small number of participants with extremely poor vision with 2 persons classified as blind on both the left and right eye.

Orthostatic hypotension, Timed up and go test, Sensory exam of lower limbs

Of the 338 participants, majority of patients (87.6%) did not have orthostatic hypotension.

Regarding the timed up and go test, the median value (IQR) of 10.53 seconds (4.08 seconds) represents the typical time it takes for the study's participants to perform this test. The shortest time taken was 5.72 seconds and the longest time taken was 45 seconds. Out of 338 participants, 65.1% were categorized as normal and not at risk of falling. On the other hand, 34.9% were categorized as abnormal and at risk of falling.

Out of 338 participants, 96.4% were classified as normal under the crude touch sensory examination. Three participants, or 0.9% were categorized as abnormal bilaterally up to the medial malleolus. With respect to the fine touch test, 96.2% were categorized as normal while 4 participants or 1.2% were categorized as abnormal bilaterally up to tibial tuberosity.

Furthermore, 80.2% were categorized as normal for the vibration test. The next frequent category for vibration was the abnormal bilaterally up to tibial tuberosity which accounted for 5.6% of the sample. The categories abnormal unilaterally up to medial malleolus and abnormal bilaterally up to medial malleolus accounted for 5.3% of the sample each. Ten participants or 3% were categorized as abnormal unilaterally up to tibial tuberosity and just 2 participants or 0.6% of the sample were abnormal up to medial malleolus and abnormal unilaterally up to tibial tuberosity.

Out of 338 participants, 99.1% were categorized as normal for the proprioception test and three participants were classified as abnormal. More specifically, two participants or 0.6% of the sample were considered to be abnormal bilaterally up to the ankle and one participant or 0.3% of the sample were categorized as abnormal unilaterally up to the ankle. Regarding the power test, 98.8% were categorized as normal. However, three participants or 0.9% of the sample had 4/5

power bilaterally and 1 participant or 0.3% demonstrated 4/5 power unilaterally. Finally, for the coordination test, 99.4% were considered to be normal. However, only 2 participants were considered to be abnormal unilaterally or abnormal bilaterally.

FALLS AT 3 MONTHS FOLLOW UP

The rate of falls at 3 months follow up was 7.4% (25). Of all participants 41% (129) had at least 1 past fall. Of the 209 subjects with no history of falls, 9.5% (20) had a fall at 3 months of follow up. This translates to a lifetime prevalence of at least one fall of 47.6% (149) in this study.

The association between demographics and incident falls are shown in Table 8

Variable	No Fall (n, %)	Fall (n, %)	P-Value
Age Groups			0.304
- 60-64	77 (93.9%)	5 (6.1%)	
- 65-69	93 (93.0%)	7 (7.0%)	
- 70-74	61 (87.1%)	9 (12.9%)	
- 75-79	41 (97.6%)	1 (2.4%)	
Gender			0.131
- Male	103 (89.6%)	12 (10.4%)	
- Female	210 (94.2%)	13 (5.8%)	
Ethnicity			0.080
- Afro Trinidadian	140 (90.3%)	15 (9.7%)	
- Indo Trinidadian	109 (95.6%)	5 (4.4%)	
- Mixed Afro/Indo Trinidadian	30 (100.0%)	0 (0.0%)	
- Mixed	34 (87.2%)	5 (12.8%)	
BMI Categories			0.325
- Underweight	12 (92.3%)	1 (7.7%)	
- Normal weight	106 (96.4%)	4 (3.6%)	
- Overweight	94 (90.4%)	10 (9.6%)	
- Obesity	100 (90.9%)	10 (9.1%)	

Table 8 - The association between demographics and incident falls.

Associations between demographics and falls.

There were no significant associations between falls and any demographic factor above. With regards to comorbidities there were no significant associations between the 5 most common chronic diseases of hypertension ($P=0.217$), dyslipidaemia ($P=0.999$), diabetes ($P=0.100$), arthritis ($P=0.335$) and ischemic heart disease ($P=0.101$) and falls at 3 months. The only chronic disease associated with falls was anaemia ($P=0.022$). Those who were anaemic had a fall incidence of 33% compared to 6.7% of those with a normal haemoglobin (OR=7.0; 95% CI 1.63-29.80). With regards to substance use there were no associations between smoking cigarette, smoking marijuana or alcohol and incident falls ($P=0.999$ for all)

The predictors of drug number and class for incident falls are shown in Table 9.

Predictor	Odds Ratio for fall at 3-months (95%CI)	P value
Polypharmacy use (5 or more drugs)		
<i>No</i> [#]	1	
<i>Yes</i>	1.370 (0.605 - 3.100)	0.450
Total daily pill count	1.078 (0.937-1.240)	0.296
Antihypertensive drug class		
<i>0</i> [#]	1	
<i>1</i>	1.527 (0.316-7.381)	0.599
<i>2</i>	1.633 (0.347-7.689)	0.535
<i>3</i>	1.781 (0.280-11.328)	0.541
Antihypertensives pill count (total number of pills in drug class)	1.036 (0.678-1.583)	0.869
Antidiabetic drug class		
<i>0</i> [#]	1	
<i>1</i>	1.322 (0.504-3.467)	0.570
<i>2</i>	1.802 (0.656-4.947)	0.253
Antiplatelet drug class		
<i>0</i> [#]	1	
<i>1</i>	0.653 (0.263-1.621)	0.358
<i>2</i>	1.375 (0.162-11.655)	0.770
Anticonvulsant drug class		
<i>0</i> [#]	1	
<i>1</i>	0.551 (0.071-4.27)	0.568
Sedative drug class		
<i>0</i> [#]	1	
<i>1</i>	*	

[#]Referent category. *- Odds ratio incalculable due to 0 frequencies

Table 9 - Predictors of incident falls based on drug use.

Drug related predictors of 3-month falls.

Polypharmacy use was not significantly associated with 3-month falls. Similarly, the total daily pill count was not predictive of falls. In a subset analysis 60(17%) participants who admitted to not taking medications daily were excluded. Of the remaining 278 (83%) of those who took their medications daily, 116 (41.7%) were polypharmacy users. Within this subgroup, polypharmacy was not associated with 3-month falls ($P=0.972$). As seen in Table 10, no drug class or pill count was associated with incident falls. Sedative use was also not predictive of falls ($P=0.999$).

The Clinical Predictors of falls are shown in Table 10.

Predictor	Odds Ratio for fall at 3-months (95%CI)	P value
Fall within past year No [#] Yes	1 0.267 (0.061 - 1.156)	0.077
Fall ever No [#] Yes	1 0.381 (0.139 - 1.042)	0.060
FRAT score (Fall Risk Assessment score) 5-11 [#] 12-15 16-20	1 * 12.084 (4.931-29.615)	<0.001
Best Corrected Visual Acuity 20/20 [#] Any impairment	1 *	
Sensory Exam Crude touch Normal [#] Any abnormality	1 1.144 (0.142-9.238)	0.900
Sensory Exam fine touch Normal [#] Any abnormality	1 1.045 (0.130-8.382)	0.967
Sensory Exam vibration Normal [#] Any abnormality	1 1.640 (0.655-4.104)	0.900
Sensory Exam proprioception Normal [#] Any abnormality	1 *	
Sensory Exam Power Normal [#] Any abnormality	1 *	
Sensory Exam Coordination Normal [#] Any abnormality	1 *	
Timed up and go test (seconds)	0.956 (0.859-1.063)	0.403
Timed up and go test <12 secs [#] ≥12 sec	1 1.053 (0.450-2.461)	0.906
Orthostatic Hypotension No [#] Yes	1 2.430 (0.911-6.483)	0.076

*#Referent category. *Odds ratio in calculable due to 0 frequencies*

Table 10 - Predictors of incident falls based on fall history and other key physiologic factors.

Clinical predictors of a fall within a 3-month period.

As shown in Table 14 only the 16-20 FRAT risk category was associated with falls when compared to the lowest risk group. With regards to visual acuity no participant with a best acuity of 20/20 had a fall compared to 8.7% of those with some visual impairment ($P=0.035$) In additional analyses those with self-reported dizziness had a 3-month fall rate of 34% vs. 4% of those without dizziness ($P<0.001$) Self-reported vision, mobility, environmental orientation, nutrition and continence were not predictive of falls ($P>0.99$ for all) None of the other clinical examination findings were predictive of falls. The fall rate was 7.5% in those with normal proprioception vs 0% in those with some proprioceptive abnormality but there was no trend towards statistical significance. ($P=0.999$) Similarly motor examination power and coordination were not predictive of falls ($P=0.999$ for both).

SUMMARY OF RESULTS

Polypharmacy and falls: The 3 month incident rate of falls in this study was 7.5% with a lifetime prevalence of at least 1 fall of 48%. Out of the 338 participants 138 (40.8%) were on polypharmacy, 5 or more drugs and 200 (59.2%) participants were non polypharmacy taking less than 5 drugs. Polypharmacy was not significantly associated with a 3 month fall.

Fall History and Impact: While 23.4% reported falls in the past year, most did not require hospitalization or suffered fractures and retained their ability to perform daily activities. Drug use at the time of the fall varied, with a significant number taking three medications.

Health Conditions and Medications: High prevalence of hypertension, diabetes, and dyslipidaemia were noted. Polypharmacy was common, (59.2%) with a median of 4 medications taken per participant.

Lifestyle Factors: The majority adhered to medication schedules, engaged in moderate exercise, and abstained from smoking.

Sensory and Functional Assessments: Most participants had normal results in sensory and motor function tests. The Timed Get Up and Go Test indicated that 34.9% were at risk of falling. Orthostatic hypotension was present in 12.4%.

Predictors of Falls: No significant associations were found between most demographic factors, comorbid conditions (except anaemia), and falls. High FRAT (Falls risk assessment tool) scores were linked to increased fall risk, self-reported dizziness and impaired visual acuity, while other clinical predictors showed no significant associations.

DISCUSSION

This prospective cohort study with 338 participants, showed that polypharmacy use of five or more drugs was not associated with a 3-month fall nor the type of drugs used. Similarly, the total daily pill count was not predictive of falls. No drug class or pill count was associated with incident falls. The rate of falls at 3 months follow up was 7.4% (25). This differed from a prior study by (Dhalwani NN et al), which showed that almost one-third of the total population using five or more drugs, which was significantly associated with 21% increased rate of falls over a 2-year period.³ Another study by (Ziere G et al), showed that despite polypharmacy, the use of at least one drug known to increase fall risk (notably Central nervous system drugs and diuretics) showed an association with falls.¹¹ The difference is likely due to the fact that this cohort follow up was done for a short period of three months, whereas most studies looked at follow ups between 6 months to two years. The population sample size for the studies were also much larger than this study conducted in the Chronic disease clinic.

From this study, there was a high prevalence of hypertension, diabetes, and dyslipidaemia. Polypharmacy was common, with a median of 4 medications taken per participant.

Hypertension was the most common chronic disease in this sample population. However, there was no statistical significance between these chronic diseases and falls. Prior literature showed there was a high prevalence of falls 32.2% amongst older adults with hypertension in the primary care centers, which was substantially higher when compared to community-dwelling older adults and specific populations with comorbidities such as diabetes.^{21,22}

Another study showed there was a positive association between chronic obstructive pulmonary disease (COPD) and the risk of falls.^{23,24} Studies also reported an increased risk

of falling among patients with a medical history of stroke.^{25,26} The observed variations from this research could potentially be attributed to variances in sample sizes.

Anaemia however, was found to be associated with falls. This is different compared to previous literature. A study conducted on the association between anaemia and falls in community-dwelling older individuals, as part of the KORA-Age study, revealed that there was no direct link between haemoglobin levels or anaemia and falls in older adults from the general population. However, it was found that the combination of anaemia and disability had an additional impact on the likelihood of falls occurring. Therefore, it is recommended that blood counts be routinely conducted in disabled older men and women to pinpoint individuals who are at a heightened risk for falls.²⁷ The findings also differed from this research as patients were excluded with disabilities and those unable to walk, as they would be unable to perform the physical examinations, such as the timed up and go test. There was another study on “Anaemia Increases Risk for Falls in Hospitalized Older Adults: An Evaluation of Falls in 362 Hospitalized, Ambulatory, Long-Term Care, and Community Patients.” This study findings suggested a potentially important link between anaemia and the risk of falls during hospitalization in ambulatory older patients.²⁸

In additional analyses those with self-reported dizziness had a 3-month fall rate of 34% vs. 4% of those without dizziness. This is in keeping with prior studies, which showed Dizziness was a predictor of risk of falls and that it was associated with a greater number of comorbidities and previous history of falls.²⁹ In another study by (De Moraes, S.A. et al), it showed that individuals, including both adults and the elderly, who experienced vestibular dysfunction faced an elevated risk of falls. Over a two-year period of observation among elderly individuals living in the community, those who reported dizziness were

approximately three times more likely to experience falls compared to their counterparts who did not report such symptoms.³⁰

The use of the validated FRAT tool the 16-20 FRAT risk category was associated with falls when compared to the lowest risk group. This is in keeping with a prior study, which showed the tool is moderately predictive, reliable and brief method of screening fall risk in subacute and residential aged care.¹⁸

Impaired Visual acuity was a predictor of falls. This is in keeping with prior literature, which showed falls were 16% higher among individuals with low vision and 40% higher among individuals with blindness than with normal vision.³¹ The timed up and go test however was not a predictor of falls in this study. In a prior study it showed that The Timed Up and Go test has limited ability to predict falls in community dwelling elderly and should not be used in isolation to identify individuals at high risk of falls in this setting.³² The limited predictive value of the Timed Up and Go test may be due to its singular focus on assessing balance, strength, and mobility. However, the risk of falling is influenced by a range of internal and external factors that are not adequately captured by this test.³³ Abnormal sensory exam was not a predictor for falls in this study. However, prior literature showed a longitudinal study which indicated that a progressive decline in peripheral touch sensation is a risk factor for mobility impairment and falls in older adults.³⁴ This difference can be due to short follow up time and smaller sample size in this study. Orthostatic hypotension also was not found to be a predictor of falls in this study. However, from prior studies specifically a systematic review and metaanalysis showed that Orthostatic hypotension is significantly positively associated with falls in older adults. This difference can also be attributed to the smaller sample size and short follow up time.³⁵

It should be noted that despite polypharmacy not being associated with falls in the older population, this study had numerous strengths which included the use of a validated tool to test for fall risk assessment. Performing physical exams rather than relying on patient's self-reported symptoms such as vision impairment, dizziness, numbness to lower limbs or impaired balance, these tests helped in gaining more accurate data. Another strength included the use of a cohort study with a three month follow up to measure incidence. Another strength of this study is the inclusion of data on lifestyle, medication, and multiple metabolic risk factors.

This study is one of the first in Trinidad and Tobago to look at the association between polypharmacy and falls in the older population in a Chronic disease clinic. Despite this study not showing an association with polypharmacy, there were positive associations with impaired vision and anaemia, along with the Fall risk assessment tool showing those at high risk of having a fall. This validated tool can be incorporated as part of routine Chronic disease clinic assessment for older patients. This study is a starting point for further studies to be conducted and allocation of resources in fall prevention should be targeted towards our high risk groups.

CONCLUSION

There was an association with falls with participants who had anaemia , impaired visual acuity, self-reported dizziness and those who had a high score using the Falls risk assessment tool. These positive associations should be looked into more detail in the Chronic disease clinics. All older patients should have Complete blood counts to assess their haemoglobin levels to rule out anaemia and have their eyes tested. The Falls risk assessment tool can be implemented into Chronic disease clinics and those with a high score would be at an increased risk of falling and so the necessary fall prevention protocols can be put in place.

LIMITATIONS

The limitations of this study can impact the validity of the results, the incidence of falls was low, which may have been higher with a longer time for follow up. Some associations may have been underpowered because of this (type 2 error). Valid compliance assessment for all drug classes may have been impractical but affected the assessment of polypharmacy. The use of convenience sampling may not be representative of the generalized population from which the sample was taken and so this leads to sampling bias. Another limitation of this study would include information bias, as some patients may not have had a true fall and so this affected the assessment of falls. There can also be recall bias as the participants would be answering questions related to an incident that previously happened and some patients being in the older population age 60 years and above may suffer with some extent of memory loss and hence affecting the overall data collection.

RECOMMENDATIONS

Falls are common as seen from the prior literature and can have adverse consequences which can be preventable. Primary care physicians, play a key role in assessing targeted groups at an increased risk of falling. This study showed that particular factors such as dizziness, impaired visual acuity and anaemia was associated with falls in the Chronic Disease clinic. According to current guidelines, primary care physicians should annually screen older adults for falls by inquiring about falls and unsteadiness while walking. Individuals who have experienced a single fall without injury should undergo an evaluation of their balance and gait. Those with a history of one fall without injury and no issues with gait or balance only need annual fall risk screening. Older adults at low risk of falls can benefit from primary prevention strategies, including education on fall risk factors, strength and balance exercises, and daily supplementation of 1000 IU of cholecalciferol for fall prevention.³⁶

Key factors that should be assessed would be comorbidities, medication and visual acuity at clinic visits. If any abnormalities detected patients should be referred to the necessary subspecialties in a timely manner to aid with these modifiable risk factors that can contribute to a fall. The Fall risk assessment tool can be implemented into Chronic disease clinics and those with high risk of falling can be educated and counselled on fall prevention strategies.

As anaemia was associated with falls, each Chronic disease patient should have a baseline complete blood count and if anaemic to be investigated and treated appropriately. All chronic disease patients should have their visual acuity tested as those with impaired acuity are at a higher risk of falls. Due to the short follow up time of three months, as this is a cohort study it can be recommended to do a follow up at 6 months and at 12 months to determine any further associations and increase in incidence of falls.

ETHICAL ISSUES

All researchers must be guided by the principles of ethics in health and all participants in research must take part voluntarily, free from any coercion or undue influence, and their rights, dignity and autonomy should be respected and appropriately protected. These principles and rights of each participant was upheld when conducting this research and steps were taken to avoid any ethical issues that may arise due to this. Each patient was ensured that confidentiality would be maintained throughout the process and only the researcher and research assistant would have access to the data being collected.

Ethics approval was obtained from the University of the West Indies and the Eastern Regional Health Authority. Informed consent was obtained from all participants. All persons who screened positive for abnormalities in this study were referred through standard clinical pathways for care.

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APPENDIX A

CONSENT FORM

The Association between Polypharmacy and Falls in an Older Chronic Disease

Population in East Trinidad. A Community based Cohort study.

Dear Participant,

I invite you to participate in a research study entailing the association between polypharmacy and falls in the older Chronic disease population age 60 years and above at the Sangre Grande Enhanced Health Center under the Eastern Regional Health Authority.

The study is being conducted by Dr. Janissa Baksh; a postgraduate student currently enrolled in the Doctor of Medicine (DM) Family Medicine program at the University of the West Indies St. Augustine.

I am asking you to kindly complete the questionnaire. Please answer all questions as honestly as possible. This will take approximately fifteen (15) minutes of your time to complete. After the questionnaire, four physical exams would be performed which would include; checking your visual acuity, lying and standing blood pressure, sensory exam of lower limbs and a timed up and go test. There are no known risks to participating, no identifiable information will be collected, and all responses will be kept confidential. Data from this study collected will be reported as a combined total and will not reflect individual responses.

Your participation is completely voluntary and refusal to participate will not bring about any undesirable effects. The information collected from this study will help to identify if there is

an association between falls in the older population and the use of polypharmacy which would be five or more medications. If there is an association, as polypharmacy is a modifiable risk factor certain measures can be implemented to health care workers to properly review patient's medications in order to prevent the harmful consequences and fatal injuries associated with falls and thus increasing the quality of life for patients.

Should you wish to participate, we will require your name and contact number. This will allow us to contact you in the future to follow up and obtain further information as required. I would like to take this opportunity to thank you for your time and kind consideration in completing the questionnaire.

Contact information:

If you wish to get in contact with the researcher following completion of the data collection, kindly email janissa.baksh@my.uwi.sta.

Consent

I am giving written consent to participate in this study, having all the information read to me by the researcher above, I understand clearly all the details required of me for this research, and I was given the opportunity to ask further questions, that were all answered to my satisfaction.

Name of Participant:

Contact Number:

Consent given: Yes/ No

Date:

Signature of participant:

Person Obtaining Consent

I have read this form to the subject. An explanation of the research was given and questions from the subject were solicited and answered to the subject's satisfaction. In my judgement, the subject has demonstrated comprehension of the information and has provided oral consent to participate in this study.

Name of Researcher:

Signature of Researcher obtaining consent:

APPENDIX B

QUESTIONNAIRE

The information that you record in this questionnaire will be treated with extreme confidentiality.

Thank you for your time. Please answer ALL questions as truthfully as you can.

Please place a tick in the box next to the appropriate response.

SECTION 1 : DEMOGRAPHICS

1 What is your age group?

2 What is your gender?

Male

Female

3 Please indicate your ethnicity

Afro-Trinidadian

Indo-Trinidadian

Mixed Afro/Indo

Mixed (other)

Other (Please Indicate) _____

SECTION 2: MEDICAL

1. Did you ever have a history of a fall within the last year ? (an event which results in a person coming to rest inadvertently on the ground or floor or other lower level)

Yes

No

If over a year ago how long ago did you have a fall? _____

2. If you had a history of a fall were you ever admitted to the hospital when you fell?

Yes

No

If yes, how long did you stay in the hospital for?

3. If you had a history of a fall did it result in any fractures (broken bones) ?

Yes

No

4. If you had a history of a fall were you able to function as normal and perform all your daily activities of living after the fall ?

Yes

No

5. Did you have any further falls?

Yes

No

If yes how many falls did you have ? _____

6. If you had a fall what were the names of the medications you were taking at the time of your fall?

7. What comorbidities do you suffer from?

Diabetes Mellitus

Hypertension

Ischemic Heart disease

Stroke

Anaemia

Osteoarthritis

Other (Please Indicate) _____

8. How many different drugs are you currently taking?

9. How many different drug types were you taking at the time if you had a history of a fall?

10. Do you drink alcohol?

Yes

No

If Yes please specify

How much do you drink? _____

11. How often do you drink?

Daily

Weekly

Monthly

Other please specify _____

12. What you drink? _____

13. How long have you been drinking?

14. What are the names of the medications you are currently taking?

15. Do you take your medication every day?

Yes

No

16. Do you exercise?

Yes

No

If Yes please specify how often and type of exercise.

SECTION 3: FALL RISK ASSESSMENT TOOL

Working together to prevent falls

FALLS RISK ASSESSMENT TOOL (FRAT)	UR NUMBER
	SURNAME
	GIVEN NAMES
	DATE OF BIRTH
<i>Please fill in if no patient/resident label available</i>	

(see instructions for completion of FRAT in the FRAT PACK-Falls Resource Manual)

PART 1: FALL RISK STATUS

RISK FACTOR	LEVEL	RISK SCORE
RECENT FALLS <i>(To score this, complete history of falls, overleaf)</i>	none in last 12 months.....	2
	one or more between 3 and 12 months ago.....	4
	one or more in last 3 months.....	6
	one or more in last 3 months whilst inpatient / resident....	8
MEDICATIONS <i>(Sedatives, Anti-Depressants Anti-Parkinson's, Diuretics Anti-hypertensives, hypnotics)</i>	not taking any of these.....	1
	taking one	2
	taking two	3
	taking more than two.....	4
PSYCHOLOGICAL <i>(Anxiety, Depression ↓Cooperation, ↓insight or ↓Judgement esp. re mobility)</i>	does not appear to have any of these.....	1
	appears mildly affected by one or more.....	2
	appears moderately affected by one or more.....	3
	appears severely affected by one or more.....	4
COGNITIVE STATUS <i>(AMTS: Hodkinson Abbreviated Mental Test Score)</i>	AMTS 9 or 10 / 10 OR intact.....	1
	AMTS 7-8 mildly impaired.....	2
	AMTS 5-6 mod impaired.....	3
	AMTS 4 or less severely impaired	4
(Low Risk: 5-11 Medium: Risk: 12-15 High Risk: 16-20)		RISK SCORE /20

Automatic High Risk Status: (if ticked then circle HIGH risk below)

- Recent change in functional status and / or medications affecting safe mobility (or anticipated)
 Dizziness / postural hypotension

FALL RISK STATUS: (Circle): LOW / MEDIUM / HIGH →

List Fall Status on Care Plan/ Flow Chart

IMPORTANT: IF HIGH, COMMENCE FALL ALERT

PART 2: RISK FACTOR CHECKLIST

		Y/N
Vision	Reports / observed difficulty seeing - objects / signs / finding way around	
Mobility	Mobility status unknown or appears unsafe / impulsive / forgets gait aid	
Transfers	Transfer status unknown or appears unsafe ie. over-reaches, impulsive	
Behaviours	Observed or reported agitation, confusion, disorientation	
	Difficulty following instructions or non-compliant (observed or known)	
Activities of Daily Living (A.D.L's)	Observed risk-taking behaviours, or reported from referrer / previous facility	
	Observed unsafe use of equipment	
	Unsafe footwear / inappropriate clothing	
Environment	Difficulties with orientation to environment i.e. areas between bed / bathroom / dining room	
Nutrition	Underweight / low appetite	
Continence	Reported or known urgency / nocturia / accidents	
Other		

APPENDIX C – EXAMINATION

Patient code:

Age:

Date of birth:

Weight: Height: Body Mass Index:

Visual Acuity: Right eye Left eye

With glasses

Without glasses

Blood pressure:

Lying Blood pressure:

Standing Blood pressure:

Sensory lower limb exam: Right lower limb Left lower limb

Fine touch

Crude touch

Vibration

Proprioception

Power

Coordination

Timed up and go test:

Visual acuity- This was checked with and without glasses if patients wore them. The use of a Snellen chart was used to check for visual acuity.

The blood pressure lying and standing- Each patient blood pressure was taken supine and after one and three minutes of standing and recorded. If the patient was unable to stand the blood pressure reading for sitting was obtained.

Sensory exam- To test vibration sense, the examiner placed a finger under the patient's distal interphalangeal joint and pressed a lightly tapped 128 Hz tuning fork on top of the joint. Testing of crude touch, was done using a monofilament. Testing fine touch was done using a cotton bud. Both right and left lower limbs were tested comparing both sides and if any abnormalities it was recorded up to the dermatomal level that the exam was normal. Proprioception was also tested whilst the patient eyes were closed. The ability of the patient to determine the direction of movement as the great toe moved upward or downward was assessed. When moving the digit, it was important to grasp it on both sides, rather than on the top and bottom. If there were any abnormalities the most proximal joint such as the ankle would have been tested and recorded.

Timed Up and Go' test -The test is performed by observing the subject rising from a standard arm chair, walking a fixed distance of 10 feet across the room, turning around,

walking back to the chair, and sitting back down. The timed part of the test records the time (in seconds) from initial getting up to reseating. An older adult who takes ≥ 12 seconds to complete the Timed up and go test is at risk for falling.



THE UNIVERSITY OF THE WEST INDIES
ST. AUGUSTINE, TRINIDAD AND TOBAGO, WEST INDIES
CAMPUS RESEARCH ETHICS COMMITTEE
TELEPHONE: (1-868) 662-2002 ext. 82755 E-mail: campusetics@sta.uwi.edu

July, 26 2023

Janissa Baksh
School of Medicine
Faculty of Medical Sciences
Email: janissabaksh@gmail.com

Dear Janissa Baksh,

Ref: CREC-SA.2288/08/2023

Title: The Association between Polypharmacy and Falls in the Older Population Age 65 Years and Above in the Primary care setting at a Local Health Centre under the Southwest Regional Health Authority

I am pleased to advise that your application for research on the above captioned topic has been approved on behalf of Campus Research Ethics Committee, St. Augustine.

Approval is valid for one (1) year.

Sincerely,

Professor Jerome De Lisle
Chair
Campus Research Ethics Committee

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Eastern Regional Health Authority

Head Office: Supercare Building, Eastern Main Road
PO Box 4479, Sangre Grande, Trinidad
Tel No.: 228-3742, 226-9176
Fax No.: (868) 226-1264/1265

PHO: 55/23
ERHA-REC.027/09/2023
September 13, 2023

Dr. Janissa Baksh
Public Health Observatory Department
Eastern Main Road,
Sangre Grande.

Dear Dr. Baksh,

APPROVAL GRANTED TO CONDUCT RESEARCH PROJECT

Please be advised that approval has been granted for your research project entitled *"The Association between Polypharmacy and Falls in the Older Population Age 65 Years and Above in the Primary care setting at a Local Health Centre under the Eastern Regional Health Authority"*.

Given the importance of your research project to health services delivery in the eastern region, we anticipate that a copy of the project findings will be lodged with the ERHA upon completion of your investigation.

Sincerely,

Dr. Cindy Ann Badaloo,
Chairman of the Research Ethics Committee (REC)
Copy: Mr. Ronald Tsoi-a-Fatt, Chief Executive Officer

www.erha.co.tt

"Caring is the Key"

Board Members: Ms. Esme Rawlins-Charles (Chairman), Ms. Sasha CA Darbeau (Deputy Chairman), Ms. Barbara Punch, Mrs. Glofia Andrews, Ms. Sarah Mootoor-Charles, Mr. Avind Moonan, Dr. Michelle Trotman, Ms. Lucy Torres, Dr. Marjani/Abdul-Richard, Mr. Ronald Tsoi-a-Fatt (Chief Executive Officer)



Completion Date 13-Mar-2023
Expiration Date 13-Mar-2027
Record ID 53622316

This is to certify that:

Janissa Baksh

Has completed the following CITI Program course:

Not valid for renewal of certification through CME.

RCR Basic Course
(Curriculum Group)
Group 3: ST. AUGUSTINE
(Course Learner Group)
1 - Basic Course
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Under requirements set by:

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