Risk of Falls in Older Adults in the Rural Region Case Study Paccha Cuenca, Ecuador

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Abstract: The growing aging of the population constitutes a challenge in the social and health system which considers the risk of falls as one of its main health problems. The objective of the study is to determine the risk of falls in the elderly population of the La Fortaleza group - Paccha, Cuenca. This research corresponds to a descriptive and cross-sectional case study, where the unit of analysis was the elderly from the La Fortaleza group. The Tinetti scale determine the risk of falls in older adults, with a reliability 0.95 - 0.8 and Cronbach's Alpha 0.91. The frequency and distribution statistics were analyzed in the SPSS version 25 program and to determine the statistical significance the Chi- Square statistic was used 86 older adults with a mean age of 76.65 years (SD = 7.35) were evaluated, determining a high risk of falls (61.6%) in this population. An association was obtained between the risk of falls and the age variable (p = 0.000); furthermore, the equilibrium dimension of the Tinetti scale had a greater implication than the march in the risk of falls of the older adults. Conclusion: The high risk of falls in this population is associated with older age and alterations in balance. Finally, the need for more studies of different characters and scales is analyzed.

1 INTRODUCTION

Aging corresponds a series of structural and functional changes that are accentuated after the age of 65. The theory of aging tells us that we begin to age from the moment we are born (Morejón et al., 2018) this process decreases motor, cognitive and social capacities; making older adults susceptible to falls or accidents in the environment in which they operate (Alvarado & Salazar, 2014). According to the World Health Organization (OMS, 2017) within 50 years, it is estimated that there will be a growing population of older adults worldwide, this is because the population pyramid tends to flatten at the top, as a result of a decrease in fertility and a significant increase in life expectancy (González, R., 2018). In Ecuador, a person over 65 years of age is considered an older adult (Ochoa et al., 2018).

According to data from the Institute of Statistics and Censuses of Ecuador (INEC, 2015) in 2010 the adult population was 940,000, which represented 6.5% of the population at the national level. The Ministry of Economic and Social Inclusion of Ecuador (MIES), considering data from the Economic Commission of Latin America and the Caribbean (ECLAC), established that Ecuador has an aging index of 28 older adults for every 100 children under 15 years of age and According to the INEC population projections in 2020 there were 1,264,423, in 2050 it will represent 17% and in 2075 it will be 26% of the total population (INEC, 2015). With these data, it is evident that population aging is on the rise both nationally and globally, therefore, as society ages, social and health problems increase (Terra et al., 2014).

Older adults due to the conditions indicated above present a series of risks such as suffering from cardiovascular, respiratory, muscular, joint, and metabolic diseases and the risk of suffering falls. On the other hand, falls are defined as any involuntary event that results in loss of balance and causes the

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body to hit the ground or another firm surface that stops it (Gómez et al., 2016).

Falls are one of the great Geriatric syndromes and a frailty factor in this population due to its considerable prevalence percentage that varies between 30 to 50% and the annual incidence between 25 to 35%, in addition to the fact that as age increases, the risk of falls increases being 30% in people over 65 to 50% in people over 80 (Villar et al., 2015).

Falls affect the biopsychosocial sphere of the elderly, since they are the cause of physical and psychological injuries that require prolonged periods of treatment and rehabilitation, in addition to limitations in activity and social participation (Gómez et al., 2016).

The WHO and the Ministry of Public Health of Ecuador recognize the negative impact of falls and the importance of working on it to provide the elderly with a quality of life that meets their needs, in Ecuador it is done through a model of Prioritization of Health Research 2013-2017 where falls are part of the line of investigation of unintentional or transport injuries, this document seeks to optimize resources to carry out research on this problem and from the results achieve a positive impact in the lives of adults (Ministry of Public Health, 2013) despite this information the evaluation of the risk of falls goes unnoticed by health professionals, this because older adults do not usually mention these events, they are not asked about the recurrence of falls because in some cases there are no serious injuries and mainly because it is attributed to the normal aging process (Villar et al., 2015).

Therefore, a comprehensive geriatric assessment where intrinsic factors are clearly identified (personal pathologies, sense organs), extrinsic factors (environmental risks) and circumstantial factors (related to the activity being carried out) (Villar et al. , 2015) will allow taking the measures of health promotion and prevention according to the needs of the elderly and work in a timely manner through the implementation of effective measures, such as: eliminating architectural barriers, work on muscle strengthening, proprioception, balance exercises - coordination , in addition to making adaptations at home and thus preserving/improving the independence and autonomy of the elderly (Terra Jonas et al., 2014).

Several scales allow the assessment of falls in the elderly, among these we have: the Downton scale that assesses risk factors such as previous falls, use of medications, sensory deficit, mental state, and gait; Tromp's multiple falls scale that assesses visual problems, urinary incontinence; and the Get up and Go Test that assesses mobility about the risk of falls. Although there is a wide variety of measurement instruments that allow assessing the risk of falls, the Tinetti scale is appropriate for assessing gait and balance; this scale is observational, standardized, and used to measure and determine the risk of falls in older adults individually with a total score of 28 points (Beorlegui et al., 2017).

The present case study is done in the context of the Physical Therapy career of the University of Cuenca. It was carried out in a rural parish of the city of Cuenca-Ecuador, where the risk of falls in older adults was evaluated in this community. Whose objective was: to determine the risk of falls in the elderly population of the La Fortaleza group of the rural parish Paccha. Cuenca - Ecuador (González & Pérez, 2021).

The document is structured as follows, section 1 presents a brief introduction to the article, in section 2 related works on the proposed research topic are shown, in section 3 the case study and its planning design are written, sections 5 - 6 cover the discussion and conclusion reached by the authors respectively. Finally, section 7 is contemplated for future work.

Finally, we emphasize the role played by the older adult within society and each of their families with their active participation within the social context; without a doubt they constitute a true example for future generations.

2 RELATED WORK

In recent years there have been several studies related to the risk of falls in older adults. The article presented below indicates that falls occur at any age being children and older adults the groups with the highest incidence, but mortality and disability are high in the latter. In addition, people who are dependent on their activities of daily living (ADL) have a 78% higher risk of falling than an older adult who does not have ADL limitations, also in this same article it is considered that 50% of falls are due to extrinsic factors, such as environmental factors, architectural environment or elements of personal use (Álvarez, 2015).

On the other hand, in the study by Topka et al. (2020) it is mentioned that one in three older adults falls at least once a year; these events are caused by the interaction of various internal and external factors. For (Morales, 2016) other factors related to falls in older adults are the collateral effects of medications, physical inactivity, cognitive and visual

alterations, and the lack of adaptations at home. Another study reports that from the age of 60, 15% of older adults present gait alterations and at 85 years these gait alterations increase by up to 50% predisposing them to falls in the older adult (Pérez et al., 2020).

Approximately 30% of 65-year-old older adults living in the community suffer at least one fall per year, this number increases when the elderly lives in institutions, 50% of these falls require medical attention, and 10% end in fracture (Suárez et al., 2018). Finally, falls and their consequences are a persistent long-term problem in the older adult, it is evidenced that there are fewer falls between midnight and six am, concluding that falls occur more during daily movement than at night; and that these occur mostly in the bedroom - bathroom (Anderson & Lane, 2020).

It is essential to know as part of a comprehensive geriatric assessment the risk of falls in the elderly population so that health professionals such as physiotherapists, kinesiologists, and personnel dedicated to the care of the elderly carry out timely activities of promotion and prevention of them.

In Ecuador there have been few studies on falls or similar in the elderly population, among the most recent is a research work entitled ¨Evaluation of the physiotherapeutic intervention in the prevention of falls in the elderly at the Hogar Sagrado Corazón de Jesús¨ (Cunalata & Garcés, 2017), even when it is considered that a fall entails expenses at the health level that imply treatment, rehabilitation, loss of productivity, early retirements, whether due to disability, widowhood (Calero et al., 2016); and, at the province of Azuay little updated bibliography is reported that provides information on this problem (Alvarado, L et al., 2014), therefore, this article provides updated information on the risk of falls in older adults in a rural parish of Cuenca- Ecuador.

3 CASE STUDY

This study is quantitative, descriptive in scope, and cross-sectional. The participants were older adults from the "La Fortaleza" group belonging to the Decentralized Autonomous Government project of the Paccha - Cuenca parish, which was evaluated in July 2021, to determine the risk of falls in this population.

This section presents the design and execution of the case study according to the guidelines of Runeson & Höst (2008) that propose the following organization: i) the design and planning of the case

study, ii) the preparation and collection of data, iii) analysis and interpretation of the findings and iv) threats to the validity of the study.

3.1 Design and Planning

Carrying out a design and planning of the collection and the subsequent analysis of data allows guaranteeing the directionality of the study to comply with the objectives set. In this sense, the objectives, the delimitation of the case and the unit of analysis, a brief frame of reference, and the research questions are presented.

3.1.1 Objectives of the Case Study

This case study has the following objectives:

- Characterize the participants according to age and sex.
- Identify the level of risk of falls by applying the Tinetti scale.
- Compare the factors with the highest and lowest scores derived from the Tinetti scale.

3.1.2 The Case and the Unit of Analysis

This case study corresponds to a holistic-unique study. In other words, the phenomenon (risk of falls) will be analyzed in a single context and the characteristics of the cases (participants) are homogeneous, as shown in figure 1.
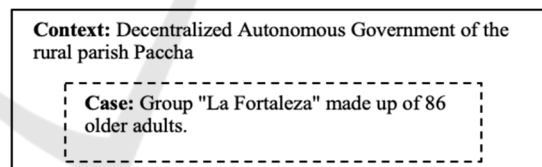

Figure 1: Case study design.

Context: in Ecuador, the Decentralized Autonomous Governments are institutions that make up the territorial organization of the state with political, administrative, and financial autonomy regulated by the Constitution of the Republic of Ecuador and the Organic Code of Territorial Organization, Autonomy and Decentralization (COOTAD) (Mafla, 2019). The rural parishes constitute remote sectors of the city, where its inhabitants live from agricultural and livestock activities. Paccha is a rural parish that is 2,600 meters above sea level, located northeast of the city of Cuenca, inhabits 6,467 inhabitants and covers a territorial area of 26.4 km, which represents 0.8% of the total cantonal territory (GAD Paccha, 2019). The population over 65 years of age represents 9.5%

of the total population of the Paccha parish (CONAGOAPRE AZUAY, 2011).

Case: the group "La Fortaleza" is directed - coordinated by a Graduate in Physiotherapy; among its objectives is to provide comprehensive care to the elderly in the Paccha parish. This group is attached to the Municipal GAD previously described in an agreement with the Ministry of Economic and Social Inclusion (MIES) since 2015 (Ministry of Economic and Social, 2015).

Theory: Falls are the fourth geriatric syndrome with the highest prevalence, they produce a decrease in the functionality of the older adult and an increase in admission to emergencies. The Tinetti scale is an instrument that makes it possible to assess older adult mobility by assessing the gait and balance domains to detect the risk of falls in the geriatric population (Guevara & Lugo, 2012). The first domain assesses balance in various actions (for example: sitting, attempts to get up, immediate standing) with a maximum score of 16 pts; For its part, the gait domain includes items related to the start of the gait, length, step height, among others; scoring a maximum value of 12 pts, which adds up to a total of 28 (Rodriguez & Lugo, 2012).

3.1.3 Research Questions: Constructing the Questions from the Dimensions

With all the aforementioned, this case study seeks to answer the following research questions:

- Are there differences between men and women with respect to standing balance?
- Who is at slight risk of falls, men or women?
- What age range is at high risk of falls or suspected of a claudication pathology?

3.2 Data Preparation and Collection

Lehtbridge (2005) points out that before data collection it is essential to identify the degree of involvement of the researcher at the time of data collection. In a case study, the collection is director of the first degree; that is, the researcher uses data collection methods that allow him to be in direct contact with the subjects and the data is collected in real-time. Therefore, the observation is based on the protocol designed and validated by Tinetti. Runeson & Höst (2008) propose different types of observation depending on the degree of interaction by the researcher and the degree of knowledge of the observed subjects. The types of research can be of 4 categories as presented in Table 1.

Table 1: Types of case study observed research.

		Knowledge of the observed subject	
		High	Low
Degree of interaction by the researcher	High	Category 1	Category 2
	Low	Category 3	Category 4

This study belongs to category 1 and the analysis approach will be quasi-statistical or descriptive statistical.

3.3 Analysis and Interpretation of the Findings

The results are presented below based on the objectives set out in section 3.1.1. The characteristics of the participants are shown in Table 2. It is evident that the majority of the participants are women (n = 56) and range between 75 and 79 years; being the mean age of all participants 76.65 years (SD = 7.35).

Table 2: Sociodemographic characteristics.

Sociodemographic characteristic	N	%
Sex		
Men	30	34,9
Women	56	65,1
Age		
65 – 69	10	11,6
70 – 74	12	14,0
75 – 79	21	24,4
80 – 84	19	22,1
85 – 89	16	18,6
90 – 94	6	7,0
95 – 99	2	2,3

The level of risk of falls of the participants is shown in Figure 2. It is evidenced that the majority of older adults have a high risk of falls (n = 53; 61.6%) and only 7.0% (n = 6) reports a slight risk of falling.
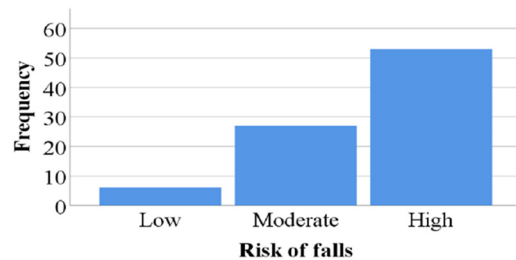

Figure 2: Frequency of risk of falls.

Table 3: Sociodemographic characteristics and level of risk of falls.

Characteristics	Mild		Moderate		High		
	n	%	n	%	n	%	p
Sex							
Female	2	3,6	16	28,6	38	67,9	0,13
Male	4	13,3	11	36,7	15	50,0	
Age							
65 to 69 years	4	36,4	7	63,6	-	-	
70 to 74 years	1	8,3	8	66,7	3	25	
75 to 79 years	1	4,8	10	47,6	10	47,6	0,00
80 to 84 years	-		2	11,1	16	88,9	
85 to 89 years	-		-		16		
≥ to 90 years	-		-		8		

The characteristics related to the level of risk of falls are shown in Table 3. It is evidenced that the risk of falls has a statistically significant difference in the different age groups (X2 = 53.691; df = 10; p = 0.000), being participants over 80 years of age those with a higher level of risk. Regarding sex, there are no statistically significant differences between men and women (X2 = 4.087; df = 2; p = 0.130); however, women (n = 38; 67.9%) score a higher risk of falls according to the Tinetti scale. The frequency of scoring the balance and gait factors is shown in Table 4. Regarding the gait parameter, it is evident that none of the participants obtained the maximum score (12 points); on the contrary, 18.60% (n = 16) of the older adults obtained a score of 8. On the other hand, concerning balance, it is shown that almost half of the participating older adults (n = 41; 47, 68%) oscillate a score between 8 and 11 points out of a total of 16 in this dimension.

Table 4: Frequency of Balance and Gait Score.

Score	Balance		Gait	
	N	%	N	%
3	0	0,00	2	2,33
4	1	1,16	6	6,98
5	6	6,98	13	15,12
6	7	8,14	12	13,95
7	6	6,98	13	15,12
8	10	11,63	16	18,60
9	11	12,79	11	12,79
10	9	10,47	9	10,47
11	11	12,79	4	4,65
12	7	8,14	0	0,00
13	5	5,81	-	-
14	6	6,98	-	-
15	7	8,14	-	-
16	0	0,00	-	-

3.4 Threats of Validity

A case study, due to the nature of the research, entails threats to validity that need to be mitigated. Next, the threats that this study has had and the different solutions to face them are presented.

3.4.1 Construct Validity

The theoretical proposal about the assessment of the risk of falls has been consolidated by Dr. Mary Tinetti (1986). This construct has been widely addressed by the scientific community (Köpke & Meyer, 2006; Stucka et al., 1999). To evaluate it, scales have been validated that allow quantifying the dimensions that compose it (gait and balance). The Tinetti scale is a tool whose main objective is to determine the risk of falls in the elderly, it is made up of two dimensions: balance, which is subdivided into 9 items and gait into 7 items. The responses of the items are scored as: 0 when it is not possible to maintain stability in the face of postural changes or has an abnormal gait pattern, 1 when there is stability in the face of postural changes or gait patterns through postural compensation and 2 when there is no difficulty. to carry out the activities of the scale.

The maximum score of the balance dimension is 16 points and the gait dimension is 12 points. The sum of both dimensions gives us a total score of 28 points, categorizing the risk of falls as mild with a score of less than 19 points, moderate between 19 to 24 points and high risk with a score lower than 19 points.

3.4.2 Internal Validity

The factors that can influence the results during the application of the Tinetti Scale are: the use of medications in the wrong doses, confusion in the administration of very frequent situations in the elderly population, or the use of medications such as antidepressants and diuretics that mainly affect mobility, gait, and balance (Cabrera, Roy, & Toriz, 2019). Therefore, in the present study older adults who meet these conditions were considered exclusion criteria.

3.4.3 External Validity

The data provided by the Tinetti Scale on falls in the elderly are of vital importance for the Ministry of Public Health, Geriatric Centre's and Decentralized Autonomous Governments due to the costs in treatment and rehabilitation, as it requires the hiring of gerontologists and the specialization of nurses,

doctors, physiotherapists in the specific management the older adult (Villar. T., 2015).

3.4.4 Reliability

The Tinetti scale in Latin America has been validated in Spanish since 2012 with inter-and intra-observer reliability of 0.95 - 0.8 and a Cronbach's Alpha of 0.91 (Rodriguez & Lugo, 2012); the gait dimension has a sensitivity of 88% - specificity of 63%, while the balance dimension has a sensitivity of 81% and specificity of 75% (Park, et al., 2018).

4 DISCUSSION

The objective of this case study is to determine the risk of falls in the elderly population of the La Fortaleza group - Paccha, Cuenca. The importance of it lies in the fact that older adults are especially sensitive to physiological changes derived from the aging process that can reduce their locomotion and hence their functionality. In the geriatric age, falls represent the most common cause of accidents generating physical, psychological, and economic consequences that negatively influence the quality of life of the elderly (de Alejo et al., 2020).

After applying the Tinetti scale, it was determined that the study population presents a risk of falls, being distributed as follows: high risk of falls 61.6%, moderate risk of falls 31.4% and low risk of falls 7 %, results similar to those obtained in the study by Silva et al. (2014) in which it was recorded that 54.7% had a high risk of falls, in the same way in the study by Samper et al. (2016) 73.1% presented a high risk of falls, as can be seen in these studies there are significant values of high risk of falls which demonstrates the importance of evaluating balance and gait through a standardized scale such as the Tinetti scale since through this assessment the geriatric patient could be recommended and guided about any technical help they would need to prevent and/or reduce this problem.

In the descriptive analysis of the present study, when relating the risk of falls with sex, there was no statistical relevance (p = 0.13), coinciding with the study by Carballo et al., (2018). However, several studies indicate that the female sex has a higher risk of falls arguing that the physiological and structural characteristics at the musculoskeletal level, hormonal changes related to menopause and the performance of multiple housework predispose the possibility of suffering a fall (Petronila et al., 2017; Samper et al., 2016; Silva et al., 2014; Smith et al., 2017). It is important to mention that most of the studies are carried out in a sample made up of more women than men, as in our study where 65.1% belong to the female sex, this difference between the female and male sex could be justified because the life expectancy is greater in women (Samper et al., 2016).

The average age in our study was 76.65 (SD = 7.35) years and statistically the risk of falls was higher in advanced ages, observing a high risk of falls in ages over 80 years. About this, the study by Samper et al., (2016) mentions that there is controversy regarding the age range and the risk of falls because on the one hand it is stated that the risk of falls is higher in the 80 years and that people have more pathologies; and on the other hand, people under 75 years of age fall more because they have more movement, which increases exposure to risk factors, in addition to not recognizing that their physical condition is decreasing and they may suffer falls due to carelessness.

According to a study where the Tinetti scale was applied to a group of older adults it concluded that when the balance is slightly compromised there was a slight deterioration in gait, especially in activities of daily living (Álvarez, M & Espinosa, A., 2018).

As can be seen older adults are at risk of falling, therefore, it is suggested that physical activity plans and programs that involve balance exercises, coordination, dissociation of upper and lower limbs, muscle strengthening, and gait be promoted.

According to Martínez et al., (2018) aging is considered an achievement in public health and socioeconomic policies, which is why the Ecuadorian state seeks to implement public policies with an emphasis on human rights and social participation with the family, community and state, by promoting active ageing multifactorial and multicomponent preventive interventions are considered the most effective because they have as pillars physical exercise, medical evaluation, environmental modification and medication adjustment in preventive interventions. (MIES, 2015).

5 CONCLUSIONS

At the end of the study, it was determined that of the 86 older adults evaluated with the Tinetti scale, 61.6% had a high risk of falls. The factor that was associated with a high risk of falls was age (p = 0.000) being statistically significant; about sex, there are no statistically significant differences between men and women. And regarding the gait and balance

parameter of the Tinetti scale, it is evidenced that none of the participants obtained the maximum score in the gait parameter (12 points) and 18.60% (n =16) of the older adults obtained a score of 8; on the contrary, in the equilibrium parameter, it is shown that almost half of the participating older adults (n = 41; 47.68%) obtained a score between 8 and 11 points out of a total of 16 in this dimension which this means that the balance dimension had a greater implication than the walking dimension in determining the risk of falling according to the Tinetti scale in the older adults of the La Fortaleza group, this may be because balance demands the integral performance of multiple systems such as the vestibular, visual and proprioceptive; and if there is an alteration at the level of balance the risk of suffering a fall is imminent. The application of the Tinetti scale has proven to be feasible in our study population allowing us to evaluate the risk of falls and collect information of interest to the Autonomous Decentralized Government (GAD) of the urban parish ¨Paccha¨ to interventions and strategies are developed to reduce the risk of falls.

6 FURTHER WORK

This research is a case study that has the limitation of not being able to extrapolate the results to other contexts; therefore, it is suggested to carry out multicentre studies, which allow characterizing the risk factor. For this reason, it is also suggested that analytical and longitudinal studies be carried out to identify factors associated with the loss of functionality of the Elderly.

In addition, it is recommended to generate kinetic intervention programs which combine balance and coordination exercises aimed at the elderly population, empower older adults on the prevention of falls, their causes, and consequences through communication strategies, develop studies that analyse the risk of falls about the influence of extrinsic factors, finally we suggest that the governments of the day develop projects aimed at the development of comprehensive geriatric care framed in the improvement of the physical and mental health of the elderly.

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