

## Depressive Disorder And Mobility As Functional Predictors Falls In Elderly

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**SUMMARY:-Objective:** To screen and correlate signs of depression, risk and reporting of falls in the elderly. **Materials and methods:** cross-sectional study of elderly living in the community. data were analyzed using bivariate and multivariate statistics through the statistical package for social sciences, assuming  $\alpha$  error = 0.5% and 95% confidence interval. **Results:** There were 127 elderlies with a mean age  $71.84 \pm 6.97$ , most of whom were women (64.6%). The prevalence of depression was indicative of 80 (63.1%), OR:2.600, CI95%:1.237-5430, the average time spent on TUG walk (>14s), both were predictors of risk for falls. The Receiver Operating Characteristic Curve (ROC) evaluated the predictive value of depression scale whose area under the curve was 67% ( $p < 0.001$ , CI95%:574-767). **Conclusion:**there is an association between depression and fall, the higher the deficit in mobility associated with the presence of depressive clue, the greater the chance for the occurrence of loss. The screening strategy is useful for early detection of weaknesses and adoption of improved preventive measures.

**Keywords:** *frail elderly; depressive disorder; Accidental falls.*

### I. INTRODUCTION

The exponential increase in the elderly population is a worldwide social phenomenon with multifaceted consequences that require a realistic knowledge of the functional conditions that weaken the elderly. The advancing age brings with it compromises the physical and psychosocial capacity of the individual, especially in the presence of chronic diseases, which increase the risk of depressive disorder and episodes of falls among other consequences that reduce the capacity and functional independence<sup>(1-2)</sup>.

Biopsychosocial changes inherent to aging decrease the adaptive and functional capacity, and increases individual deficiency in responding to the demands of everyday activities, both physical and mental. Functional capacity (CF) is an important marker of aging quality. The absence of this capacity predisposes to several weaknesses which leads to loss of autonomy, creating dependence and limitations to perform basic activities that consequently increases the risk of falls and negative effects of personal, family and social assistance services<sup>(3)</sup>.

Modifications that reduce the physical fitness of the elderly, reduce neuromotor reflexes flexibility among other weaknesses that affect the dynamic balance, making the individual susceptible to undesirable events such as the advent of the falls. In this age phase occurs a decline of 10-15% of muscle strength is more prominent from the fifth decade of life. At senescence the period of cooling muscle strength may vary from 20-40% of 70 years old and the oldest old this reduction can be greater than 50%<sup>(3,4,5)</sup>.

These weaknesses of the elderly has several physical and psychosocial effects that favors the feelings of sadness, disappointment that are enhanced in the face of chronic diseases. Thus the losses associated with somatization provides the functional and emotional imbalance. According to the Diagnostic and Statistical Manual of Mental Disorders (DSM-V) depression is multifactorial by many factors that produce a contiguous disorders with varying frequency, intensity and duration; characterized by at least five or more depressive symptoms. The International Classification of Diseases (ICD-10) categorizes depressive disorder in mild, moderate and severe (F32-F33), and the diagnosis of this disorder is essentially clinical<sup>(5-6)</sup>

The prevalence of major depressive disorder (TD) varies from 15 to 17%. These rates are worrisome, especially in older people who already have aging own declines. These percentages in severe cases can reach 35%, depending on the location, age and associated diseases<sup>(7)</sup>. Pointed in recent years as a common condition in the elderly living in the community and directly related to important coexisting morbidity and mortality rates in the elderly. This requires management aimed at identifying and preventing these diseases and their complications, in order to intercept the development of depression and worse prognosis<sup>(8-9)</sup>.

Although depressive illness associated with falls in the elderly have significant prevalence is still an underdiagnosed and undertreated condition. However it is a clinical picture of fundamental interest of medical,

gerontology, geriatrics and health policies that are disquieting and challenged by the high frequency of this psychiatric disorder that induces physical and mental hypokinetic identified as "disease of the century"<sup>(8,10)</sup>. The World Health Organization (WHO) points out the importance of tracking this mental disorder, with a tendency to become the second most prevalent disease in the world in 2020<sup>(11,12,13)</sup>.

Population aging and the frequency of depression are increasing exponentially with impacts and convergence maintained in the next decade. Thus, the systematic evaluation of the elderly, with the use of simple scales that track depressive symptoms, able to detect early injury health constitutes appropriate strategy for control and prevention. Despite the significant increase in the elderly population of depressive disorders and occurrence of falls, there is still scientific research gaps that address these variables simultaneously. Thus, this study aims to track and correlate predictively depressive disorder, risk and loss report in community-dwelling elderly.

## **II. MATERIALS AND METHODS**

### **2.1 Research Ethics**

This study is part of a PhD research, which aims to analyze the association between the occurrence of falls, functional capacity and depressive disorder simultaneously in community elderly. Given the ethical principles of research in accordance with Resolution 466/12-CEP/CONEP/MS, this study was previously approved by the Research Ethics Committee of the Faculty Northeast Independent through the CAAE: 33993114.8.0000.5578 and look embodied 790.750.

### **2.2 design, place, time and study sample.**

This was an exploratory cross-sectional study, whose data collection was carried out from September to December 2014, with a sample selected by consecutive convenience composed of 127 elderly men and women, linked to the Community Center for the Elderly (ICC) in Vitória da Conquista, Bahia, Brazil.

### **2.3 Eligibility criteria**

Inclusion criteria in the study were: autonomous elderly volunteers to sign the free and informed consent (IC), linked to the elderly program assiduous to the activities of the nursing group. Exclusion criteria: use of Mini-Mental Exam MMSE State assessing cognitive ability (using cutoff  $\geq 13$ ), elderly people with previous medical diagnosis of dementia, visual impairment, severe hearing loss; refusal to participate in the study or any inability to answer the Health Patient Questionnaire (PHQ-9) or perform the walk from Timed up and go (TUG).

### **2.4 Determination sample:**

Of the 500 elderly registered at the JRC, only 321 seniors attending assiduously the activities coordinated by the nursing program group. Thus, the sample calculation considered the prevalence 16% of depressive disorders in the elderly, based on a previous study (8) assuming  $\alpha$  error = 0.5% and 95% confidence interval, with these data, obtained an estimate 127 representative individuals who were selected for convenience.

### **2.5 Research Development Protocol**

Initially, we explained the purpose and procedure of survey every elderly about the data collection questionnaires, the walking test with the previously prepared environment JRC itself. Free and Informed Consent Form (ICF) was used as an invitation to the participant volunteer. Since the data collection was performed three times a week. The collection of demographic information (gender, age, marital status) was a questionnaire plus the question of the occurrence and frequency drop last year.

To collect information on mobility and the risk of falling used the TUG, which evaluates the dynamic and transfers balance (sitting, bipedal ambulation). The patient starts sitting, transfers to the standing position and plays a walk three meters demarcated and valuer's instructions. Performs change the route turning  $180^\circ$  to return to the starting position. This performance walk (TUG) is timed in seconds, the result of which serves as a predictor of the risk of falling.<sup>(4,8,14)</sup>

The individual considered independent does not have balance disorders and makes up the TUG in  $\leq 10$  seconds; Individuals who complete the test with  $\geq 11$  indicates some degree of basic functional dependence and risk to fall. The longer the time spent in the performance of the walk, the greater the deficit of mobility and the risk of falling. The TUG is a simple test, fast, low cost and has good predictive reliability, recommended for this purpose by the American Geriatrics Society in a clinical setting.<sup>(9,11,16)</sup>

For collection of depressive symptoms was used the Patient Health Questionnaire-PHQ-9 is a scale with nine questions, and another tenth, the sum of which totals 27 points. This questionnaire was validated by Spitzer & Kroenke et al., Translated into Portuguese by Pfizer (Copyright © 2005 Pfizer Inc.NY) in Brazil Osorio Mendes, Crippa and Loureiro.<sup>(6)</sup> The PHQ-9 is an instrument that had its tracking properties validated in

Brazil for people and older adults in 2013 (6) showed good psychometric and operational characteristics with sensitivity 77-98% and specificity of 70 to 80%.<sup>(5,6,8)</sup> This range contains questions on symptoms of persistent depression in the last two weeks, as determined in the DSM-V.<sup>(6,17)</sup> whose results can be categorized or dichotomized adopting a cutoff of  $\geq 6$  points as indicative of depressive disorder, according to previous studies.<sup>(2,5)</sup>

### 2.6 Statistical analysis

The dependent variable was the report of the independent falls were depressive disorder (PHQ-9) and risk falling (TUG). The analysis of the data received descriptive statistical treatment, calculated frequencies, averages, standard deviations. bivariate analysis (Pearson) and multivariate (linear regression and odds ratio), used software Statistical Package for Social Sciences (SPSS) v.20.0, considered the significance of  $p < 0.05$  and CI: 95% for all analyzes. The verification of the accuracy of test scales (TUG and PHQ-9) was represented by the Receiver Operating Characteristic Curves (ROC).

## III. RESULTS

The study included 127 older adults with a mean age of  $72.25 \pm 6.9$  (CI95%:70.97-73.52), the sample consisted of 82 (64.6%) women and 45 (35.4%) of men. Most were in the age group 60 to 70 and more than half (52.1%) of the elderly found themselves without conjugal union. The decline recorded in the last year was reported by 70 (51.1%), indicative of depression tracked by PHQ-9 was 80 (63%), as Table 1.

**Table 1** -sample characterization Socio-demographic and the occurrence of falls in the elderly in Vitória da Conquista (n= 27).

Variables categorized	N	%
Age group: 60-70 anos	90	70.9
Age group: 71-80 anos	22	17.3
Age group: >81 anos	15	11.8
Female	45	35,4
Feminino	82	64,6
Estado Civil - Em União conjugal	61	48
Estado Civil - Sem União conjugal	66	52
Homens que caíram	21	30
Mulheres que caíram	49	70
Com transtorno depressivo	80	63
Sem transtorno depressivo	47	37

In assessing the risk of falling by TUG the average time for the performance of the walk was  $17.8 \pm 8.16$  sec. The Pearson correlation between the occurrence of reported loss and the TUG Performance obtained coefficient  $r=0.358$  ( $p=0.001$ ). 80 elderly tracked indicative of depression by PHQ-9 was 35 (27.6%) of them had mild clue, 34 (26.8%) moderate and 11 (8.7%) was considered severe indication. The bivariate Pearson correlation between falls occurred and indicative of the PHQ-9 depression obtained coefficient  $r=0.226$  ( $p<0.001$ ). These results are shown in Table 02.

**Table 2** - Correlation analysis between the occurrence of fall, the risk of falling and indicative of depressive disorder. Vitoria da Conquista, Bahia, Brazil in 2014 (N=127).

Variables correlated	r	p-valor
Functional mobility (TUG)*		
Falls Episode	0.358	0.000
Depressive disorder (PHQ-9)		
Falls Episode	0.226	0.001

\*TUG test of time in seconds; r = correlation pearson

Table 3 shows the association of self-reported falls with depressive symptoms and mobility assessed by TUG-t. The frequency of depressive symptoms had a higher significance in the elderly who reported having fallen whose odds ratio (OR) was 2.60 (CI95%: 1.237-5.430). Increased dependence identified by mobility test (TUG) is associated with a higher chance of falls, which OR was 4.87 (CI95%: 2.198-10.796), so the elderly with depression indication have nearly five times more likely to suffer the adverse event of the fall.

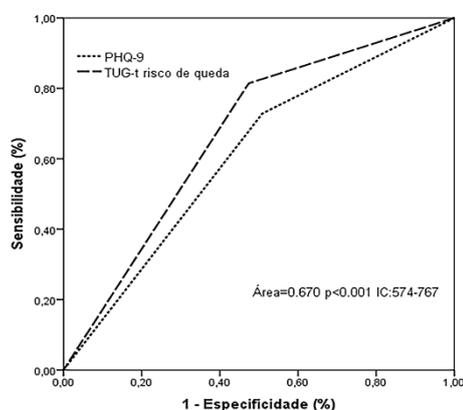
**Table 3** - Association between history of falls, indicative of depression and the risk assessed for mobility (TUG-t) with seniors in Vitória da Conquista, Bahia, Brazil, in 2014.

Variable	OR*	IC95%	p-valor**
Depressed disorder (PHQ-9)	2,60	0,1237- 5,430	0,009
Functional mobility (TUG)	4,87	2,198-10,796	0,000

\*odds ratio; \*\*fisher exact test

To check the predictive accuracy of the PHQ-9 as a diagnostic tool range of risk for depression was used Receiver Operating Characteristic (ROC) curve that expresses the sensitivity and specificity regarding the positive and negative predictive values found by the scale used in this study. The area under the curve for TUG-t variable referring to the risk reduction was 57% and the PHQ-9 was 67%, 95% CI: 574-767. These results show good accuracy discriminative the scale used, which adopted cutoff of  $\geq 6$ . (Figure 1)

**Figure 1.** ROC curve for the performance of the PHQ-9 as compared to the indicative functional mobility risk for falls in the elderly in Vitoria da Conquista, Bahia, Brazil in 2014 (N = 127).



#### IV. DISCUSSION

This study found that 63% of seniors with depressive disorders tracked by PHQ. The fall accident occurred in 55% of the elderly in the last year, both results were prevalence among women. The categorization indicative of the levels of depression identified 35 elderly people with mild clue, 45(35.5%) patients with moderate or severe signs. These results were significant and from a public health point of view these figures are worrying because it is a non-clinical sample, and often depressive symptoms and mood changes go unnoticed when last for more than two weeks may characterize the disorder depressive and generate underreporting of the disease. The relationship between the risk of falls and indicative of depression was studied by a systematic review of 59 studies using the PHQ-9 screening for depression and occurrence of falls. He stressed the importance of tracking the use for effective early intervention, the risk identified in population groups.<sup>(13)</sup> These authors demonstrated the influence of depression in the increased occurrence of loss associated with the symptoms of impaired attention, concentration, functional capacity that interfere with postural control.<sup>(9,18)</sup> Thus, the depressive symptoms associated with fall history requires greater attention from health professionals and caring for patients institutionalized or not, and population-based research groups.

Growing old has been characterized by psychomotor decline that gradually changes the functional capacity and mobility of the elderly in this study of community-dwelling elderly, supposedly independent, was identified significant instabilities way linked to the deficit of mobility that increase the risk for undesirable outcomes of loss and occurrence depressive symptoms. The loss of functional independence of the elderly may be due to conditions such as those leading to falls and other injuries. Similar study analyzed the association and warned of the negative impact of falls on the life of the elderly, which can etiologically be related to the presence of psycho-emotional disorders that leads the individual to loss of independence.<sup>(3,9)</sup>

The weakness that reduce physical function and cognitive or in the elderly, are preponderant associated with occurrence of falls, which generates the fear of falling again, the recurrent falls and injuries have worse prognoses. Elderly people with the altered CF and decreased performance for activities of daily living, are potentially more susceptible to social isolation and physical inactivity, these changes may explain the increased chances of falling in this population.<sup>(14,18)</sup> In our multivariate analysis showed that the time taken to perform the test walk (TUG), remained significant when related to socio-demographic variable of marital status (separated, widowed, single), the elderly as lonely seems more prone to feelings of sadness and helplessness, these symptoms when they last more than two weeks associated with other feelings related to loss, can create

conditions for the risk of falling, we found in this study that the applicant fall was significant in 18% of the elderly, most of whom found themselves without union married.

As quantified walk performance timed during the TUG, serves as an important indicator of the level of mobility and dynamic balance. Research has reported that this parameter can support as efficient and as able to predict the fall, mobility deficit, some degree of functional limitation or disability, dementia and other conditions. A time taken > 14 seconds to perform the TUG-t is related to a high risk of falls, the results of this study were similar to two other recent studies.<sup>(10,14,18)</sup>

Research using the PHQ-9, pointed out that this simple tool is one of the most used to track symptoms of depression, with adequate psychometric properties demonstrating sensitivity and specificity of 61% and 94% respectively, to track mood disorders in adults. Showed that 89.5% sensitivity and 77.5% specificity when applied to adolescents (8). When applied to the population of adults and elderly the PHQ had a sensitivity of 92% and specificity of 89%.<sup>(5)</sup>

Another outstanding result was the presence of depression and self-reported falls in the elderly who were without marital union (single, widowed, separated) represented by 71%. The depressive disorder is different from the fleeting sadness, as is a lasting change in the state of mood and mood that persists for longer than two weeks. Often depression is a representation of somatic clinical conditions resulting from losses in the life of the elderly; lonely elderly, because living with a partner (a) can minimize loneliness and function as a protective factor against depression.<sup>(19)</sup>

The longevity elderly a propensity to fall twice more, and the common occurrence of concomitant depressive symptoms; it is noteworthy that this is a preventable condition starting from scratch knowledge.<sup>(14,20)</sup> The results show the influence of the vulnerability of the elderly to the risk of physical and psychiatric illnesses associated factors also the role of policies and programs with screening and preventive actions aimed to ensure the quality of life of those who live longer.

Finally, the depressive disorder and falls in the elderly draw attention for its high frequency and negative repercussions, despite being considered a public health problem and cause major changes in functional capacity, limit the autonomy of the elderly. Its repercussions cause personal, family and social suffering. Requires planned preventive actions against these demands for the health of the elderly in Brazil and worldwide. Especially on the quantitative growth trend of the elderly and the possibility of occurrence of this type of illness. Making healthy the search for security for healthy aging and prevention to avoid these diseases health. Tracking and active search with simple and validated instruments, represent a good strategy for action in the clinical setting.

One of the limitations of research relates to the small sample size and the type of cross-study does not identify causal relationship between variables. The absence of randomization that may allow intrinsic biases of this type of study beyond recall bias, and it is a unicentric research.

Some contributions of this study allow us to add information tested that may increase the actions and preventive care by the nursing staff and other professionals concerning the mental health of the elderly living in the community. Especially the importance of the themes that coexist in the geriatric population and seriously impacts the quality of life of the elderly. So these results as well as draw the attention of professionals involved in all health care levels, extends to policy makers aimed at the health of the elderly, for the development of interventions to mitigate the risks and effects of depression and falls.

## **V. CONCLUSION**

This study met its goal and was able to demonstrate that there is an association between falls and depression disorder occurring simultaneously in community-dwelling elderly. The results were significant and troubling, though these clinical conditions can be detected by screening strategy and thus support the work of the multidisciplinary team managers for decision-making within the health care and primary and secondary prevention. It is expected that the results of this study will help to clarify and warn about the importance of the issue and suggested for adoption of more comprehensive assessments regarding the mental health of the elderly suffering fall. This implies in conducting further research with more rigorous study design and larger sample in order to equip managers and professionals working in geriatrics.

## **REFERÊNCIAS**

- [1] Alvarega, MRM et.al. Síntomas depresivos en ancianos: análisis de los ítems de la Escala de Depresión Geriátrica. *Acta paul. enferm.* [Internet]. 2012 [cited 2015 Jun 02]; 25(4): 497-503.
- [2] Bian C, Chunbo L, Qianglin D, Heng W. Reliability and validity of patient health questionnaire: Depressive syndrome module for outpatients. *Scientific Research and Essays. Academic Journals.* 2011; 6(2): 278-282.
- [3] Eulário MC, Andrade TF, Melo RLR, Neri AL. Latent structure of depression in the elderly: a taxometric analysis. *Cad. Saúde Pública.* [Internet]. 2015 [cited 2015 Mar 07]; 31(3): 555-564.

- [4] Marques WV, Cruz VA, Rego J, Silva NA. Influência da capacidade funcional no risco de quedas em adultos com artrite reumatoide. *Rev. Bras. Reumatol.* 2014; 54(5): 404-408.
- [5] Baader MT, Molina FJL, Venezian BS, Rojas CC, Fariás SR et al. Validación y utilidad de la encuesta PHQ-9 (Patient Health Questionnaire) en el diagnóstico de depresión en pacientes usuarios de atención primaria en Chile. *Rev. chil. neuro-psiquiatr.* [Internet]. 2012 Mar [citado 2016 Jun 08]; 50(1): 10-22.
- [6] Santos IS, Tavares BF, Munhoz TN, Almeida LSP, Silva NTB, Tams BD. et al. Sensitivity and specificity of the *Patient Health Questionnaire-9* (PHQ-9) among adults from the general population. *Cad. Saúde Pública* [Internet]. 2013 [cited 2014 Nov 09]; 29( 8 ): 1533-1543.
- [7] Teston EF, Carreira L, Marcon SS. Depressive symptoms in the elderly: comparison of residents in condominium specific for elderly and in the community. *Rev. bras. enferm.* [Internet]. 2014 [cited 2015 Jun 17]; 67( 3 ): 450-456.
- [8] Douglas MM, Do MPH. Carl. R. Screening for Depression. Darnall Army Medical Center, Fort Hood, Texas Am Fam Physician. [Internet] 2012 2014 [cited 2015 Jan 29]; 85(2):139-144. Available from: <http://health.usnews.com/doctors/douglas-maurer-251447>
- [9] Moreira MA, Oliveira BS, Moura KQ, Tapajós DM, Maciel ÁCC. Can the gait speed identify elderly with fear of falling? *Rev. bras. geriatr. gerontol.* [Internet]. 2013 [cited 2015 Mar 23]; 16( 1 ): 71-80.
- [10] Alvarenga PP, Pereira DS, Anjos DM. Mobilidade funcional e função executiva em idosos diabéticos e não diabéticos. *Rev. bras. fisioter.* [Internet]. 2010 [cited 2015 Jun 02]; 14(6): 491-496.
- [11] Alexandre TS, Meira DM, Rico NC, Mizuta SK. Accuracy of Timed Up and Go Test for screening risk of falls among community-dwelling elderly. *Rev. bras. fisioter.* [Internet] 2012;16 (5):381-388.
- [12] Perez M, Lourenço RA. FIBRA-RJ Network: frailty and risk of hospitalization in the elderly in Rio de Janeiro, Brazil. *Cad. Saúde Pública* [Internet]. 2013 [cited 2015 Mar 11]; 29(7): 1381-1391.
- [13] Barroso SM, Melo APS, Guimarães MDC. Barroso SM, Melo AP, et.al. Fatores associados à depressão: diferenças por sexo em moradores de comunidades quilombolas. *Rev. bras. epidemiol.* [Internet]. 2015 [cited 2015 Jun 04]; 18(2): 503-514.
- [14] Bretan O, Silva Júnior JE, Ribeiro OR. Corrente JE. Risk of falling among elderly persons living in the community: assessment by the Timed up and go test. *Braz. j. otorhinolaryngol.* [Internet]. 2013 [cited 2015 Feb 26]; 79( 1 ): 18-21.
- [15] Alencar MA et.al. Profile of elderly living in a long-term care institution. *Rev. bras. geriatr. gerontol.* [Internet]. 2012 [cited 2014 Jan 29]; 15( 4 ): 785-796.
- [16] Nicolini-Panisson RD, Donadio MV. Normative values for the Timed 'Up and Go' test in children and adolescents and validation for individuals with Down syndrome. *Dev Med Child Neurol.* 2014 [cited 2015 Sep 22]; 56(5):490-497.
- [17] Bergerot CD, Laros JÁ, Araujo TCCF. Avaliação de ansiedade e depressão em pacientes oncológicos: comparação psicométrica. *Psico-USF.* 2014 [Internet] 19(2):187-197.
- [18] Ricci NA, Gonçalves DFF, Coimbra IB, Coimbra AMV. Fatores associados ao histórico de quedas de idosos assistidos pelo Programa de Saúde da Família. *Saudesoc.* [Internet]. 2010 [cited 2015 Sep 22]; 19(4): 898-909. Available from: [http://www.scielo.br/scielo.php?script=sci\\_arttext&pid=S0104-12902010000400016&lng=en](http://www.scielo.br/scielo.php?script=sci_arttext&pid=S0104-12902010000400016&lng=en)
- [19] Oliveira MF, Bezerra VP, Silva AO, Alves MSCF, Moreira MASP, Caldas CP. The symptomatology of self-referred depression by elderly people who live in a shantytown. *Ciênc. saúde coletiva.* [Internet] 2013; 17( 8 ): 2191-2198.
- [20] Lavedán S, Jürschik GP, Botigué ST, Viladrosa MM. Prevalence and associated factors of falls in community-dwelling elderly. *Atencion Primaria.* [Internet]. 2015 [cited 2015 Sep 22]; 47(6):367-75.