International Journal of Medicine Research
ISSN: 2455-7404; Impact Factor: RJIF 5.42
Received: 04-11-2020; Accepted: 19-11-2020; Published: 04-12-2020
www.medicinesjournal.com
Volume 5; Issue 4; 2020; Page No. 87-93

Independent and assisted living geriatrics: Correlates of falls, cognitive function and balance profiles

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Abstract
The speed of population ageing around the world is also increasing significantly. With increase in age this population is vulnerable diseases, disorders and accidents. Falls are considered one of the most critical problem faced by geriatrics. It is also a common public health issue and it is known as the fifth major cause leading to death among elderly population in a community. Cognition and balance abilities are the two primary factors responsible for the falls. The fore most aim of the study is to compare the association among falls, cognitive function and balance profiles of Independent and Assisted living geriatrics. Fifty elderly respondents aged 65+ years were identified for the study purpose. They were grouped as Group A: Independent Living & Group B: Assisted Living geriatrics and further classified into three namely G1- young old (65-74 years), G2- medium old (75-84 years), G3- oldest old (above 85 years) based on their age group. The Fall Proof Health and Activity questionnaire, Mini-Mental State Examination (MMSE), Berg Balance Scale (BBS), Dynamic Gait Index (DGI) and Sharpened or Tandem Romberg test were administered to obtain information related to falls, cognition, and balance profiles. The outcomes were analysed using descriptive statistics and One-way ANOVA in SPSS version 25. An evident difference in cognitive function and balance profiles were noted between groups. The results highlighted that type of living had a significant impact on cognition and balance abilities. This was considered as an important factor during the assessment and management of cognitive and vestibular issues of geriatrics.

Keywords: cognition, falls, geriatrics and type of living

Introduction
The elderly population world-wide have a longer lifespan. Most elderly people live into their sixties and beyond. The speed of population ageing around the world is also increasing significantly. With increase in age this population is vulnerable diseases, disorders and accidents. Their entire system becomes susceptible to weakness and dysfunction. The vestibular system is considered as one of the most ancient vertebrate sensory systems. Its major components contribute to the maintenance of balance and with vestibular dysfunction leads to postural instability (Brandt, 1993) [1]. In spite of recognized role of the vestibular system on its balance, there is another research work carried out on its dysfunction and falls (Sloane, 1989) [2]. Falls are considered as one of the most critical problem facing by geriatrics. It is also a common public health issue and is known as the fifth major cause leading to death among the elderly population in a community (Kannus, 2005) [3]. Among the individuals aged above 65 years, nearly one-third experience a fall in a year (Masud, 2001) [4] and with crudely only 50% of these individual's experience frequent falls (Tinetti, 1989) [5]. Injuries due to falls takes place in 20% to 60% of total fall incidents (Laippala, 1991) [6]. It ranges from slight to major injuries such as contusions and fractures and acute head injuries respectively (Stevens, 2008) [7]. It even leads to adverse effects like prolonged pain, reduced mobility, loss of independence, and death in the elderly community (Gill, 2004) [8].
The elderly population encounters numeral physical inefficiencies, impairments, or incapacitating ailments resulting in falls (Rubenstein, 2006) [9]. The utmost commonly stated cause for falling is 'accidental' which is associated to an incompetence to safely and functionally navigate the environment in order to evade a fall after an unanticipated slide or obstructed pace. In short, gait and balance issues are considered as the second most recurrent cause for falling. Difficulty or inability to execute a tandem walk, walking leisurelier than atypical gait speed and narrow stance width are the independent elements related to gait and balance which upsurge the risk of falling in an elderly population (Dargent-Molina, 1996) [10]. Other physical measures associated to increase in risk of falling includes decreased visual acuity, urinary incontinence (Tromp, 2001) [11] and deficiency of vitamin D. Additionally physically debilitating conditions such as Parkinson disease (PD), cerebellar disorders, stroke and orthostatic hypotension (Lord, 2007) [12].
Diabetes mellitus is a very common ailment which affects 20% of persons aged more than 65 years (National Diabetes Data Group, 1995) [13]. In few cross-sectional studies, it has been accompanying with multiple adverse health effects, including cognitive decline (Desmond, 1993; Croxson, 1995; Grodstein *et al*. 2001) [14, 15, 16]. Hence, diabetes mellitus affects the cognitive systems differentially and may lead to greater risk of emerging Alzheimer Disease (AD) (Arvanitakis, 2004) [17]. An individual with mild cognitive impairment has significantly increased the risk of AD (Boyle, 2006) [18]. The ototoxicity medications comprise antibiotics,

non-steroidal anti-inflammatory drugs and loop diuretics may interact with ageing effects, which leads to severe hearing loss (Joo. Y., 2020) [19]. Hearing impairment is predominant among geriatrics with cognitive impairment. In spite of the high prevalence, the hearing aid utilization remains low. It can affect the effective communication among the caretakers and individuals with cognitive impairment (Nirmalasari O., 2017) [20].

Besides all these factors, cognitive functioning and balance abilities are considered as the two main prime factors for falls (Whitney, 2012) [21]. Recently, it had been noted that risks associated with falls is closely interrelated to severe cognitive impairment in geriatrics with dementia (Mirelman, 2012) [22]. Management guidelines and programs for falls are often directed towards the elderly population. Though, it is feasible that a mild deterioration in cognitive functioning can lead to postural instability (Muir, 2012) [23] and high risk of falling (Gleason CE, 2009) [25]. The relationship among cognitive functioning and fall risk emerges from the perspective of the frontal cortex aging and white matter of the brain changes (Gunning-Dixon, 2000) [26]. A minute changes in cognitive function causes poor judgment and decision-making skills (Fischer, 2014) declines in attention, executive function, and processing speed (Gunning-Dixon, 2000) [26] and decline in verbal reasoning and ability (Anstey, 2009) [28] which could increase the falling risk. These conditions become a specific issue when, a person with mild cognitive impairment need to involve themselves in dual tasking in day-to-day life (for example, during a conversation and climbing up a stairway or navigating an irregular surface on the street). Therefore, the early detection of cognitive impairment might help in better identification of the degree of fall risk in community-dwelling geriatrics.

Alternatively, balance impairment has also been known as a chief risk factor for falls in geriatrics (Berg, 1992) [29]. Researchers have stated that inability in balance control is associated with an increased risk of falling (Rose, 2010) [30]. Decline in biological systems, such as neurological functioning, sensory system capacity, and motor functions and increased reaction time in geriatrics, leads to a delay in stabilization of control systems, which contributes to postural instability and falls (Glorioso, 2011) [31]. Cognition plays a vital role in balance regulation in elderly individuals, where the sensory and motor systems are integrated through higher order neurological processes (Muir, 2012) [23]. Hence, the present study is aimed to find out the whether the same linear association exist between cognitive function and balance abilities of Independent Living and Assisted Living Geriatrics.

Need of The Study

Over the past few decades, the literature provides strong evidences that cognitive functioning and balance abilities were generally used to predict the number of falls in geriatric population especially in case of an individual with severe cognitive impairment and neurological conditions such as Alzheimer's disease and multiple sclerosis. Mei Teng Woo, 2017 [24] stated that balance ability and cognitive functions were the biggest risk factors for falls. But still, studies predicting falls, cognitive and balance profiles and the association between these three aspects among the Independent Living and Assisted Living Geriatrics are scarce. To remediate these issues, type of living of an individual were given importance and hence the current study is focused on the correlates of falls, cognitive and balance profile between the Independent Living and Assisted Living Geriatrics.

Objectives of The Study

The major objectives of the study were to profile the following areas among the Independent Living and Assisted Living geriatrics: (a) compare the occurrence of falls, cognition, and balance profiles; (b) examine the association among the three factors; and (c) provide recommendations in order to prevent the incidence of falls and for the development of simple screening interventions.

Method of The Study

Participants

Fifty geriatrics aged 65+ years were taken for this study by using simple random sampling method. Then they were grouped into two namely A: Twenty-five Independent Living geriatrics and B: Twenty-five Assisted Living Geriatrics. They were further divided into three groups as follows: G1- young old (65-74 years), G2- medium old (75-84 years), G3- oldest old (above 85 years) based on their age group. Inclusion criteria were individuals who could walk independently with or without the support of any assistive device, medical issues like diabetes, high blood pressure, high cholesterol and no history of other cognitive dysfunctions such as dementia, Alzheimer's disease. Exclusion criteria were individuals who had history of issues like severe rheumatic arthritis, neuropathy injury, brain injuries, cognitive dysfunction and recent stroke events i.e. within 18 months.

Materials

Fall Proof Health and activity questionnaire (D. Rose, 2010) was either self-administered or by informal interview with the researcher. It is used to predict the multiple dimensions that contribute to balance and mobility.

Mini Mental State Examination (MMSE), a 30-point questionnaire adapted from Folstein *et al.* 1975, which predicts the risk of cognitive impairment was administered to measure the cognitive functions which quantitatively assesses the severity of cognitive impairment and helps to document the cognitive changes over time. It has cognitive functioning level of three categories as follows: no cognitive impairment (>24), mild cognitive impairment (18-23), severe cognitive impairment (<17).

The Berg Balance Scale (BBS) is the subjective assessment tool which is used universally in predicting falls among elderly individuals was formulated by Berg, 1992 [29]. It consists of 14 subtests to measure the functional abilities and balance, with scores ranging from 0 to 4 for each subtest. The categories of low risk of falling (41-56) and increased risk of falling ($\leq$ 40) while the maximum score of this assessment is 56.

The Dynamic Gait Index (DGI) was developed by Shumway-Cook in 1997 as a clinical tool based on the physical measure to measure gait, balance and fall risk. It assesses walking during both steady state and more challenging tasks. There are about eight functional walking tests which are performed by the subject and rated out of three scores based on the lowest category which applies. 24 is the possible total individual score. Scores of 19 or less have been considered as an increase incidence of falls.

Sharpened or Tandem Romberg test (SR) was a variation of Romberg test which was given by Furman & Cass, 2003. It comprises of support by position narrowing the patient's base of placing feet in a heel to toe for about 60 seconds in two different states: eyes open (EO) and eyes closed (EC). The inability of an individual's performance indicates vestibular impairment.

Procedure

The study objective and purpose were clearly elucidated to the participants. The demographic details of the individuals were collected. Then, the tests were performed in a standard order. All interviews were conducted in their own preferred language (Tamil, English and Telugu) to ensure good comprehension of questions and provision of precise and reliable information. The data was collected and the responses of the individuals were documented. The only limitation of the study was the self-reporting with a possibility of underreporting scores by the older participants.

Analysis

The demographics of the participants were tabulated using descriptive statistics. The association between the age, gender, BMI, MMSE and test outcomes among both the groups were compared based on the individual responses by using One-way ANOVA in SPSS version 25.

Hypotheses Tested

The occurrence of falls, cognitive function and balance profile is associated with an individual's age, gender and BMI by framing hypothesis and tested with the help of ANOVA single factor.

V Analysis and Discussion

The below mentioned table reveals the demographic characteristics, cognitive level assessments, the risk of falls, balance, gait and the integrity of vestibular system. Besides, medical conditions, number of falls in the past one-year, assistive devices for vision, hearing and walking in young-old, medium-old and oldest-old among both the groups.

Table1: Demographic Details of the participants [a]

Characteristics	GA1	GA2	GA3	GB1	GB2	GB3
Age, years, mean (SD)	69.5 (3.34)	78.7 (2.54)	86.4 (1.67)	70.3 (3.24)	77.8 (2.65)	87.5 (1.87)
Height, inches, mean (SD)	157.7 (5.35)	159.7 (6.30)	158.4 (6.46)	157.5 (6.85)	157.6 (5.50)	156.2 (7.73)
Weight, kg, mean (SD)	64.5(6.77)	62.8(6.46)	58.2(2.94)	61.7(6.22)	58.1(8.82)	57(9.89)
BMI, mean (SD)	25.94 (2.39)	24.61 (2.03)	23.22 (1.31)	24.92 (2.24)	23.39 (3.12)	23.27 (2.58)
MMSE scores, mean (SD)	25.4 (1.95)	21.9 (1.85)	19.4 (2.30)	22.5 (1.87)	21.5 (3.34)	17.5 (2.07)
BBS scores, mean (SD)	44.4 (3.56)	35.7 (5.51)	31.2 (6.18)	38.66 (4.63)	30 (7.18)	29.16 (8.25)
DGI, mean (SD)	20.8 (1.23)	17.2 (3.39)	14 (3.80)	17.88 (2.80)	15.7 (4.13)	12.83 (3.65)
SREO, mean (SD)	48.9(5.72)	36.1(5.44)	31.6(3.78)	45.3(3.57)	29.4(7.21)	18(7.37)
SREC, mean (SD)	37(8.37)	15.5(4.99)	13.8(3.70)	26.2(8.37)	18.8(7.13)	8(3.22)
Gender, n (%)						
Male	5(20%)	6(24%)	2(8%)	4(16%)	4(16%)	2(8%)
Female	5(20%)	4(16%)	3(12%)	5(20%)	6(24%)	4(16%)
Medical conditions, n (%)						
Hypertension	3(12%)	0	1(4%)	0	3(12%)	4(16%)
High cholesterol	5(20%)	4(16%)	0	5(20%)	3(12%)	4(16%)
Diabetes	2(8%)	6(24%)	4(16%)	4(16%)	4(16%)	2(8%)
Falls in the past I year, n (%)						
Yes	0	4(16%)	4(16%)	2(8%)	5(20%)	5(20%)
No	10(40%)	6(24%)	1(4%)	7(28%)	5(20%)	1(4%)
Eyeglass user, n (%)						
Yes	3(12%)	4(16%)	1(4%)	4(16%)	3(12%)	3(12%)
No	7(28%)	6(24%)	4(16%)	5(20%)	7(28%)	3(12%)
Hearing aid user, n (%)						
Yes	2(8%)	2(8%)	0	2(8%)	1(4%)	0
No	8(32%)	8(32%)	5(20%)	7(28%)	9(36%)	6(24%)
Assistive device used in walking, n (%)						
Yes	0	0	2(8%)	0	1(4%)	4(16%)
No	10(40%)	10(40%)	3(12%)	9(36%)	9(36%)	2(8%)
MMSE categories, n (%)						
No cognitive impairment (>24 scores)	9(36%)	2(8%)	0	3(12%)	4(16%)	0
Mild cognitive impairment (18-23 scores)	2(8%)	9(36%)	3(12%)	6(24%)	5(20%)	2(8%)
Severe cognitive impairment (<17 scores)	0	0	2(8%)	0	2(8%)	4(16%)
BBS categories, n (%)						
Low fall risk (41-56 scores)	9(36%)	1(4%)	0	2(8%)	1(4%)	0
Increased fall risk (<40 scores)	1(4%)	9(36%)	5(20%)	7(28%)	9(36%)	6(24%)
DGI categories, n (%)						
Safe ambulators (>22/24 scores)	8(32%)	3(12%)	1(4%)	4(16%)	1(4%)	0
Risky ambulators (<19 scores)	2(8%)	7(28%)	4(16%)	5(20%)	9(36%)	6(24%)

SREO, secs, n (%)						
0-10	0	0	0	0	0	1(4%)
11-20	0	0	0	0	2(8%)	3(12%)
21-30	0	2(8%)	3(12%)	0	3(12%)	2(8%)
31-40	1(4%)	5(20%)	2(8%)	1(4%)	5(20%)	0
41-50	5(20%)	3(12%)	0	8(32%)	0	0
51-60	4(16%)	0	0	0	0	0
SREC, secs, n (%)						
0-10	0	1(4%)	1(4%)	0	2(8%)	5(20%)
11-20	1(4%)	7(28%)	4(16%)	3(12%)	4(16%)	1(4%)
21-30	1(4%)	2(8%)	0	4(16%)	4(16%)	0
31-40	5(20%)	0	0	1(4%)	0	0
41-50	3(12%)	0	0	1(4%)	0	0
51-60	0	0	0	0	0	0

Source: Primary data [a] N = 50 GA1, GA2 and GA3 - Group A young old; medium old and oldest old participants respectively. GB1, GB2 and GB3 - Group B young old; medium old and oldest old participants respectively.

Abbreviations: BMI (Body Mass Index), MMSE (Mini Mental State Examination), DGI (Dynamic Gait Index), SREO (Sharpened Romberg Eyes Open test), SREC (Sharpened Romberg Eyes Closed test), SD (Standard Deviation).

As per the above table, in age, GA3 individuals have an average age of 86.7 years and they do not deviate much (1.67) from mean but GA1 individuals who has mean age of 69.5 years which deviates more (3.34). GA1 individuals deviate less in height (5.35) while GB3 individuals deviates more (7.73). In GA3 individuals, less deviation of weight (2.94) whereas more deviation is noted in GB3 individuals (9.89). GA3 individuals deviate less in BMI (1.31) and GB2 individuals deviate much (3.12). In MMSE scores, GA2 individuals deviate less (1.85) while GB2 individuals deviate more (3.34). There is much deviation of BBS scores is noted in GB2 individuals (8.25) and less deviation in GA1 individuals (3.56). A lesser deviation of DGI scores is observed in GA1 individuals (1.23) and greater deviation in GB2 individuals (4.13). In SREO, lesser deviation and greater deviation is GB1 (3.57) and GB3 (7.37) respectively. At the same time, less deviation of SREC is noted in GB3 (3.22) and more deviation in GA1 & GB1 individuals (8.37). As observed from the above table, there is no much variation in gender among both the groups. In medical conditions, individuals in GA1 (20%); GB1 (20%) and GB3 (16%) are likely to have high cholesterol; diabetes is more in GA2 (24%), GA3 (16%) and GB2 (16%); hyper tension is found to be high in GB3 individuals (16%) when compared to other groups. Individuals in GB2 & GB3 have 20% of fall incidence in the past one year while GA2 & GA3 individuals have quite less incidence (16%). It is evidently seen as the age increases; the fall incidents also increase. The number of eye glass users is high in Group B where GB1 individuals uses more (16%) when compared to other groups. Group A has the greater number of hearing aid users (16%) especially in GA1 & GA2 when compared to Group B. Number of individuals using assistive device users for walking is high in Group B (20%) particularly in GB2 & GB3 when compared to Group A.

According to the MMSE scores, GA1 has maximum individuals with no cognitive impairment (36%) while GA2 has 8%; GA1 has 8%, GA2 has 36% and GA3 has 12% individuals with mild cognitive impairment; GA3 has 8% individuals with severe cognitive impairment. Group B has 28% individuals with no cognitive impairment. Individuals with mild cognitive impairment are 24% in GB1; 20% in GB2 & 8% in GB3. GB2 and GB3 has 8% and 16% individuals with severe cognitive impairment respectively. Hence, Group B individuals has more cognitive issues when compared to Group A.

As per BBS scores, 40% individuals in Group A has less risk of falling whereas 12% in Group B. In the meanwhile, 60% individuals in Group A and 88% individuals in Group B has a high risk of falling. Therefore, it is clear that individuals in Group B has a greater number of individuals who has a high risk of falling in comparison with Group A.

From the scores of DGI, Group A has 48% and Group B has 20% safe ambulators whereas risky ambulators are 52% and 80% in Group A and Group B respectively. Thus, Group B has riskier ambulators when compared to Group A.

According to SR, in eyes open state, 20% of individuals in Group A and 44% of individuals in Group B perform less than 30 seconds. In the meanwhile, in eyes closed state, 68% individuals in Group A and 92% in Group B perform less than 30 seconds. From the above data, it is clear that Group B perform poorer than Group A as the age increases.

The association between age and test outcomes was studied by framing the null hypothesis as follows:

H_0 – Age do not influence the test outcomes

Table 2: One-way ANOVA - The relationship between age and test outcomes

Tests	GA1		GA2		GA3		GB1		GB2		GB3	
	P value	Result	P value	Result	P value	Result	P value	Result	P value	Result	P value	Result
MMSE	0.126	A*	0.360	A	0.048	R*	0.143	A	0.039	R	0.043	R
BBS	0.850	A	0.030	R	0.026	R	0.330	A	0.006	R	0.005	R
DGI	0.006	R	0.401	A	0.140	A	0.692	A	0.203	A	0.167	A
SREO	0.124	A	0.033	R	0.143	A	0.790	A	0.006	R	0.009	R
SREC	0.011	R	0.056	A	0.153	A	0.014	R	0.007	R	0.257	A

Source: Primary data (@5% level of significance) *Accepted: Not significant; *Rejected: Significant

Table 2 shows the association among age and the test outcomes. It reveals that a significant difference is noted among the age and MMSE scores in GB2 and GB3 individuals as well as in GA3 individuals. It states the fact that as the age increase, the cognitive decline occurs and it is more obviously observed in Group B than Group A. A significant difference is found between BBS scores and age in GA2 & GA3 and also in GB2 & GB3 individuals. The static and dynamic balance deteriorates with the increase in age which causes greater risk of falling. In GA1 individuals, a significant difference is noted in DGI scores which implies improper gait pattern, imbalance and high risk of falling. In SR, due to instability, even in eyes open state, a significant difference is observed in GB2 & GB3 individuals and GA2 individuals which shows an impaired vestibular system. In the meanwhile, as the visual cues are cut down in the eyes closed state, irrespective of the type of living, a significant difference is witnessed in GA1 & GA2 and also in GB1 & GB2 individuals which shows a vestibular impairment.

The association between gender and test outcomes was studied by framing the null hypothesis as follows:

H_0 – Gender do not influence the test outcomes

Table 3: One-way ANOVA - The relationship between gender and test outcomes

Tests	GA P value	Significance interference	GB P value	Significance interference
MMSE	0.076	Accepted: Not significant	0.159	Accepted: Not significant
BBS	0.051	Rejected: Significant	0.023	Rejected: Significant
DGI	0.250	Accepted: Not significant	0.048	Rejected: Significant
SREO	0.197	Accepted: Not significant	0.441	Accepted: Not significant
SREC	0.481	Accepted: Not significant	0.173	Accepted: Not significant

Source: Primary data (@5% level of significance)

The above-mentioned table shows the relationship between the gender and the test outcomes among both the groups. In MMSE, no significant difference is observed among gender. A significant gender difference is noted in BBS scores among both the groups. In DGI scores, a significant difference is found in only Group B individuals. In SR, there is no significant difference observed between male and female. The current findings were supported by former researchers (Patil, 2019 & F O Black, 1982) [33]. It shows that physiological difference among male and female do not affect the subjective vestibular test results.

The association between BMI and test outcomes was studied by framing the null hypothesis as follows:

H_0 – BMI do not influence the test outcomes

Table 4: One-way ANOVA - The relationship between BMI and test outcomes

Tests	GA P value	Significance interference	GB P value	Significance interference
MMSE	0.096	Rejected: Significant	0.468	Accepted: Not significant
BBS	0.369	Accepted: Not significant	0.956	Accepted: Not significant
DGI	0.280	Accepted: Not significant	0.521	Accepted: Not significant
SREO	0.266	Accepted: Not significant	0.905	Accepted: Not significant
SREC	0.150	Accepted: Not significant	0.894	Accepted: Not significant

Source: Primary data (@5% level of significance)

Table 4 portrays the association among the BMI and test outcomes between both the groups. As per the above table, there is a significant difference found among the BMI and MMSE scores only in Group A individuals. The present findings were supported by Kim, 2012 [35] as decreased BMI is associated with the cognitive decline in the elderly population.

The association between MMSE and other test outcomes was studied by framing the null hypothesis as follows:

H_0 – MMSE do not influence the other test outcomes

Table 5: One-way ANOVA - The relationship between MMSE and other test outcomes

Tests	GA P value	Significance interference	GB P value	Significance interference
BBS	0.001	Rejected: Significant	0.101	Accepted: Not significant
DGI	0.003	Rejected: Significant	0.021	Rejected: Significant
SREO	0.000	Rejected: Significant	0.001	Rejected: Significant
SREC	0.000	Rejected: Significant	0.003	Rejected: Significant

Source: Primary data (@5% level of significance)

The above-mentioned table shows the relationship between MMSE and other test outcomes. It is evident that there is a significant difference among MMSE scores and results of BBS, DGI and SR among both the groups. It reveals irrespective of the type of living, as the cognition declines, imbalance occurs which leads to the greater risk of falling and disintegrity of vestibular system.

Major Findings of The Study

Type of living had a significant impact on the test outcomes. Group A had mild cognitive decline with lower risk of falling when compared to Group B for the following reasons. As they were allowed to do their routine work leisurely in a familiar environment in their own pace as they wished to perform it reduced their anxiety and stress leading to a peaceful life. In Independent Living since they lived with their families, kith and kin were always there to nurse and care them both physically and mentally. Chit-chatting and playing with their grandchildren made them to feel zestful and enlightened. The intake of nutritious and preferred food at proper time kept them healthy. Routine medical checkups were done and medications were provided at stipulated time without fail. Besides all these factors, environmental modifications for appropriate accessibility were made out of

extra care which helped in the reduction of falls.

Recommendations

Due to ageing, geriatrics tend to lose their control over balance due to various causes like vision impairment, poor posture, spinal degeneration, inability to walk due to weaker hips and legs, drugs consumption, low blood pressure which leads to high risk of falling. Besides all these causes, inactivity is considered as the foremost. It can be improved by training the overall upper and lower body along with the balance system. Hence, it is mandatory to provide a balance program which incorporates endurance, strength and balance training which is more essential for promoting and sustaining good balance. The well cooperation among the brain, nervous system, muscles and bones helps an individual to get rid of falls. When the sensory information from vision, vestibular system and joints works together with musculoskeletal system, an individual can be energetic and independent which improves elderly balance.

Vestibular Rehabilitation Therapy (VRT) is a treatment program based on exercises which are designed to promote vestibular adaptation and substitution. The ultimate goals of VRT are to enhance gaze stability, to reduce dizziness, to improve postural and gait stability and to improve independence in execution of activities of daily living. The following exercises can be carried out from simple to complex conditions in order to develop confidence and independence. (i) Gaze stabilization exercise is to control the eye movements during head movement. While exercising, as it makes some individuals to feel dizzy, an individual can try with smaller and reduced speed of head movements, focusing nearer target with a blank background. (ii) In balance and gait training, an individual can hold onto a chair and stand quietly in a wide base & firm surface without swaying head movements. (iii) Visual dependence training is a combination of gaze stabilization and balance exercises but with an emphasis on abnormal visual input suppression in everyday life. An individual can start with a broad daylight context which has strong visual inputs with a blank background. (iv) Physical conditioning for individuals undergoing VRT, since it is quite challenging, can initiate with a brisk walk along with a support of a stable family member. Also, physical exercises help an individual to stay fit and healthy. They are generally comprised of two categories: (a) isotonic exercises (same tension) and (a) isometric exercises (same length). Isotonic exercises involve contraction of a specific or a group of muscles while isometric exercises are the static contraction of muscles without any evident movements. It is much better to work in a combination of both as it supports the individual's quality of life. Neuro plasticity of the brain says that "Practice makes Permanent". So, although these exercises are quite difficult in learning, an individual can gradually cultivate it into their day-to-day life by practicing it regularly.

Besides all these factors, if they complain of any reduced hearing sensitivity, giddiness or any otological issues, it is mandatory to consult an Audiologist for further screening and intervention procedures like auditory and vestibular rehabilitation which is cost-effective and safe treatment technique without the need for any sophisticated instruments. (Elbeltagy, 2018) [34].

Contribution and Scope For Further Research

The major implication of the current study is that while assessing geriatrics aged below 85 years, type of living should be considered as an important factor because it plays a vital role in an individual's falls, cognition and balance profile as it forms the major findings of the study. As well, the health professionals could use few subjective vestibular tests like DGI and SR, the rapid and simple procedures which would provide accurate results along with test tools like Fall proof health & activity questionnaire and BBS which could be better predictors for imbalance, fall risks, impaired vestibular system. The present study can be extended by assessing for individuals from different ethnic background and objective vestibular assessment like Vestibular Evoked Myogenic Potentials (VEMP), Video nystagmography (VNG) could be done.

Conclusion

The current findings of cognitive and balance assessments, revealed that elderly of assisted living aged more than 75 years had the greater number of fall incidents associated with severe cognitive impairments when compared to independent living elderly. Hence, it could be concluded that the type of living has a significant impact on the test outcomes. It should be considered as an important factor during the assessment and management of cognitive and vestibular issues of geriatrics. Growing old is a natural process but making their lives worth living ought to be the concern of each one of us. Providing them the psychological comfort is most essential for their well-being and longevity.

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