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Effectiveness of adherence to the modifications done in anbalaya old age home in preventing the falls among elderly people: A longitudinal study

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Abstract
Aim: To assess the prevention in falls among elderly people after adherence to the modifications done in old age home up to 2 years.
Objectives
- To determine whether occupational therapy home modifications reduces the incidence of falls or not over a 2 years long duration.
- Evaluate and then repair previous modification throughout the study duration i.e. for 2 years.

Procedure: Sample size of 24 elder persons included and evaluates the needed modification in the old age home by identifying which components are more concerned about falls. Then intervention was given by adhering to the modifications done in old age home up to 2 years. Post –test (2016), Pre-test and post-test (2018) was conducted using "Falls efficacy scale – International''.
Result: The paired 't' tests shows significant change over the fear of falls in elder people by doing home modifications for all 24 subjects.
Conclusion: Adherence to modifications in old age home helps in preventing falls among elderly people.

Keywords: geriatric, home old age, accidental fall, occupational therapy, longitudinal study

1. Introduction
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.
Falls are the second leading cause of accidental or unintentional injury deaths worldwide. Each year an estimated 6,46,000 individuals die from falls globally of which over 80% are in low- and middle-income countries. Adults older than 65 years of age suffer the greatest number of fatal falls; 37.3 million falls that are severe enough to require medical attention occur each year. Prevention strategies should emphasize education, training, creating safer environments, prioritizing fall-related research and establishing effective policies to reduce risk.
Globally, falls are a major public health problem. An estimated 6, 46,000 fatal falls occur each year, making it the second leading cause of unintentional injury death, after road traffic injuries. Over 80% of fall-related fatalities occur in low- and middle-income countries, with regions of the Western Pacific and South East Asia accounting for 60% of these deaths. In all regions of the world, death rates are highest among adults over the age of 60 years.

1.1 Prevention
Fall prevention strategies should be comprehensive and multifaceted. They should prioritize research and public health initiatives to further define the burden, explore variable risk factors and utilize effective prevention strategies. They should support policies that create safer environments and reduce risk factors. They should promote engineering to remove the potential for falls, the training of health care providers on evidence-based prevention strategies; and the education of individuals and communities to build risk awareness.
Effective fall prevention programmes aim to reduce the number of people who fall, the rate of falls and the severity of injury should a fall occur. For older individuals, fall prevention programmes can include a number of components to identify and modify risk, such as: screening within living environments for risks for falls; clinical interventions to identify risk factors, such as medication review and modification, treatment of low blood pressure, vitamin D and calcium supplementation, treatment of correctable visual impairment; home assessment and environmental modification for those with known risk factors or a history of falling; prescription of appropriate assistive devices to address physical and sensory impairments; muscle strengthening and balance retraining prescribed by a trained health professional; community-based group programmes which may incorporate fall prevention education [17].
The population of elderly persons, above 60 years, have increased substantially with most of them residing in villages, says a government report.
Based on profile of elderly person in the country, it stated that there were 10.38 crores (8.6 per cent of the population) elderly persons in 2011 as compared to 7.66 crores (5.6 per cent) in 2001.

It said 71 per cent of elderly population resides in villages while 29 per cent is in cities.

The 'Elderly in India 2016' report by Ministry of Statistics and Programme Implementation said: "Prevalence of heart diseases among elderly population was much higher in urban areas than in rural parts [18].

Occupational therapy practitioners possess the critical skills needed to address fall prevention with older adults. Research supports that fall causes are multi-factorial in nature, influenced by conditions within the individual, within the environment, and as a result of the interaction between the two. The most successful falls prevention initiatives are those that use a multi-faceted approach. Occupational therapy practitioners are skilled at evaluating and addressing influences from the person, their activity roles and routines, and the environment to maximize independence for older adults.

Occupational therapy practitioners work with the client and caregivers to review the home environment for hazards and evaluate the individual for limitations that contribute to falls. Recommendations often include a combination of interventions that target improving physical abilities to safely perform daily tasks, modifying the home, and changing activity patterns and behaviors [3].

Presently there is a definite need of carrying out a prognostic study on long duration protocols, which presently lacks under the evidence based practice. Hence, the study was undertaken to evaluate the adherence towards the modifications done in the old age home to prevent falls in elderly people.

2. Methodology

This study conforms to the provisions of the internationally accepted 1975 Helsinki Declaration, revised in 2002. The purpose of the study was "carrying out a prognostic in elderly people by adhering to modification done in the old age home.

2.1 Study Design

- Prognostic study design

2.2 Study Settings

- Anbalaya old age home

2.3 Sampling Method

- Convenient sampling

2.4 Sample Size

- 24 subjects.

2.5 Study Duration

- 6 months

2.6 Intervention Period

- 3 months

2.7 Selection Criteria

2.7.1 Inclusion Criteria

- All 60 years and above age.
- With or without previous history of fall.
- Both males and females sexes.

2.7.2 Exclusion Criteria

- Person with complete hearing and visual loss.
- Bed ridden elder persons.
- Person with any psychiatric illness.

2.8 Tools Used

FES-I (Falls Efficacy Scale International)

2.9 The falls efficacy scale international (FESI)

The Falls Efficacy Scale International (FES-I) is a short, easy to administer tool that measures the level of concern about falling during social and physical activities inside and outside 41the home whether or not the person actually does the activity. The level of concern is measured on a four point Likert scale [1=not at all concerned to 4=very concerned] (Yardley *et al*., 2005). Assessment of fear of falling, followed by appropriate interventions, is crucial to promote independence, function, wellness, and safety of older adults. Targeted population of this tool is all older adults with or without a history of fear of falls. The FES-I had excellent internal validity Cronbach's alpha=0.96 as well as test-retest reliability ICC=0.96 (Yardley, Beyer *et al*, 2005). This tool was developed to expand on the initial Falls Efficacy Scale (FES-I) (Tinetti *et al*., 1990) to include social activities that may be considered more challenging by more active people, thereby potentially causing more concerns about falling than the basic activities presented in the initial FES-I These additional activities correspond to items 11-16 on the FES-I [24].

2.10 Procedure

All old age subjects from Anbalaya old age home who were included in same group modification of 2016 were re-assessed and posttest of 2016 was retrieved then repair and some refurbishing was down for the previous modification then again new pretest was conducted with FES-I post repairs and posttest was conducted after 3 months.

2.11 Intervention

Some modifications were given in various areas of the old age home Such as

1. Putting nonskid rubber mat, grab rails, nonslip stripping on steps, and Double-sided tape for floor rugs and mats.
2. Bath mat.
3. Putting projection in the sloping surface and steps.
4. Nonskid foot wears and small chairs in the bath room.
5. Making extra step in the place of big obstacle.
6. Sticking rubber piece behind the chairs for slip resistant.
7. Putting bleaching powder for foot gripping in the cloth washing area.
8. Putting bright light in pathways.
9. Sticking projection in the hand rails for hand grip
10. Putting bushes under chair, assistive devices, table, bed
11. A firm cushioned back that provides adequate upright support, and double arm rests at time of sitting in chairs
12. Provide adequate space in one bed to anther bed
13. Night-lights typically used in bathrooms or hallways
14. Carpets with loose edges should be tacked down. Scatter or throw rugs should be removed.

15. Steps: Installed nonslip stripping on steps located in-doors and at entrances to the house, if not carpeted. Installed grab rails at steps leading into the house.
16. Rugs and mats: Remove if possible, or use double sided tape to stick the edges of the rug or mat to the floor.
17. Trailing cords: Remove.
18. Hazardous floor conditions: Repair.
19. Slippery floors: Installed grabs rails in the bathroom and toilet.
20. Lighting deficient: Identify and repair nonfunctional lights. Install a night-light.
21. Obstacles: Move out of walkways.
22. Step overs (changes in the floor height, designed to be stepped over): None.
23. Bed heights: None.
24. Chair heights: Raise or lower the height of the seat of the chair to allow the subject to sit upright with feet flat on the ground and knees bent at an angle of 90.
25. Toilets: Installed grab rails
26. Wear properly fitted shoes with good grip and low heels;
27. Avoid storage that was too high or too low by moving contents of storage to waist level.
28. Sit when dressing and undressing, particularly for putting on and removing socks and pantyhose.

3. Data Analysis

The data collected was subjected to statistical analysis. The following parameters were calculated namely, mean, standard deviation, standard error mean, lower 95% confidence interval, upper 95% confidence interval by using figure pad instant software the "t" test was calculated between FES-I (pretest) and FES-I (posttest).

The level of significance was set to be "p" value < 0.05

Mean age of the population was 74.08 years

Male: female ratio of the population was 11: 13.

Table 1: Characteristic of data of Pretest and Posttest 2018

	FES-I(pretest)	FES-I(posttest)
Mean	40.45	33.29
standard deviation	8.34	7.53
Sample size	24	24
standard error (SE) mean	1.70	1.53
lower 95% confidence interval	36.93	30.10
upper 95%confidence interval	43.98	36.47

Table 1 data shows the comparison between FES-I in pre and posttests of 2018 scores of all 24 subjects, mean values are 40.45 and 33.29, respectively standard deviation 8.34 and 7.53,respectively sample size 24, standard error of mean 1.70 and 1.53, lower 95% confidence interval 36.93 and 30.10, respectively upper 95% confidence interval 43.98 and 36.47respectively.

Table 2: T test between FES-I (pretest) and FES-I (posttest) 2018

S. No.	Variable 1	Variable 2	P value	t value	Level of Significance
1	FES-I (pretest)	FES-I (posttest)	<0.05	3.12	Significant

Table 2: Shows that comparison between FES-I in pre and post test scores of all 24 subjects, 't' value is 3.12'p' value is <0.05 This difference is considered to be statistically significant.

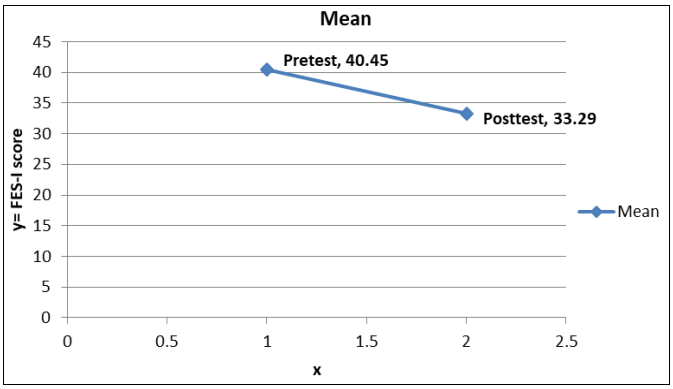

Fig 1: Pre test and Post test (2018)

Fig 1: Shows that comparison between FES-I in pre and post test scores of all 24 subjects, mean values are 40.45 and 33.29, respectively and 't' value is 3.12 'p' value is <0.05 This difference is considered to be statistically significant.

Table 3: Comparison between 2016 posttest, pretest, posttest 2018

Mean	Post test (2016)	Pre test (2018)	Post test (2018)
	41.88	40.45	33.29

Table 3: Shows that comparison between FES-I in 2016 posttest and 2018 pre and post test scores mean values are 41.88 and 40.45 and 33.29, respectively.

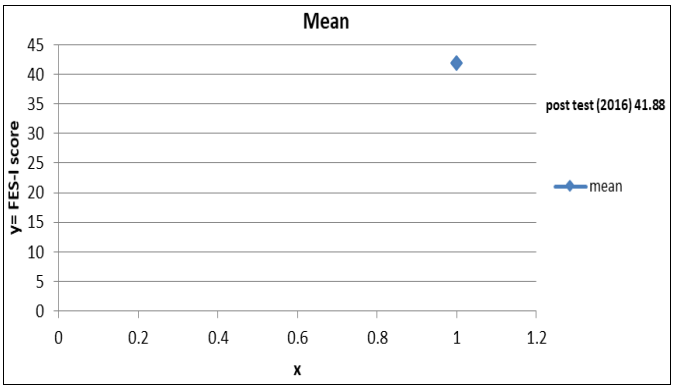

Fig 2: Posttest (2016)

Fig 2: Shows the FES-I post test score of all 25 subjects mean value of 41.88 respectively

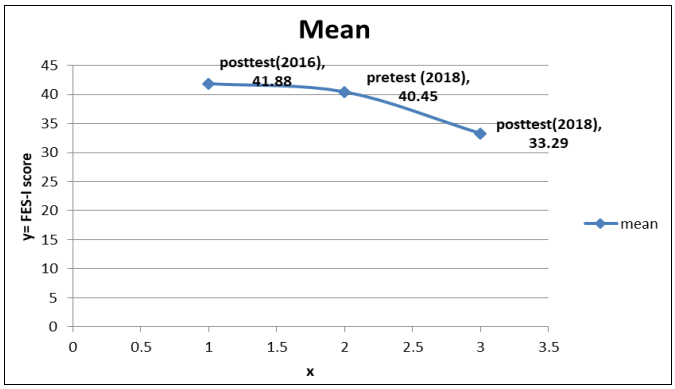

Fig 3: Comparison between 2016 posttest, pretest, posttest 2018

Fig 3: Shows that comparison between FES-I in 2016 post test and 2018 pre and post test scores mean values are 41.88 and 40.45 and 33.29, respectively.

4. Discussion

This study identified that 24 subjects in old age home discussed the issue of fall with health care. Falls in elderly people rarely has a single cause or risk factor (intrinsic, extrinsic or exposure risk). Many elderly people are reluctant to report a fall because they attribute falling to the aging process or because they fear being subsequently being restricted in their activities. All old age subjects from Anbalaya old age home were included in same group. Modifications of 2016 were reassessed and then repaired wherever required and some refurbishing was done for the previous modifications. Then again new pretest was conducted on January 2018 with FES-I post (2016) repairs and then posttest was conducted after 3 months i.e. on April 2018. The aim of the study was to assess the prevention in falls among elderly people after adherence to the modifications done in old age home for a period of 2 years and, also evaluate and then repair previous existing modifications. FES-I (Falls Efficacy Scale-International) expressed that there it is significance change of fall in elderly people after evaluation and modifications.

Anbalaya Old Age Home was started in 2006 by a small group of ladies from Komarapalayam. With the help of Sampoorani Ammal Charitable trust the Anbalaya trust was formed. The old age home initially started with 15 members and then by 2010 with a full capacity of 30 members. The Anbalaya trust provides 76 Rupees per day to each member along with food, clothing, bedding which is provided by Sampoorani Ammal Charitable Trust. Plus there has been no government funding to the Anbalaya Old Age Home in past or at present.

There were 25 subjects included in the sampling done during 2016, out of which, one dropout was reported due to the subjects' discontinuation of further stay with Anbalaya Old Age Home. The reason for discontinuation as documented by the Anbalaya Old Age Home manager was transfer of subjects' sons' job location. Thus, the pre and post test of 2018 included only 24 subjects.

Table 1 denotes the comparison between FES-I in pre and post tests of 2018 scores for all 24 subjects, mean values are 40.45 and 33.29, respectively, standard deviation 8.34 and 7.53, respectively, standard error of mean 1.70 and 1.53, respectively, lower 95% confidence interval 36.93 and 30.10, respectively, upper 95%confidence interval 43.98 and 36.47, respectively, in parameter calculated. Adherence to the modification has definitely shown better preventions in falls and even fear of falls. The main issues which arise are the maintenance of the modifications. As its clear that the Old Age Home is neither funded nor has a profitable trust to carry out the modifications. Occupational Therapist after the evaluations requires the funds and also regular follow ups to facilitate adherence and refurbishing the modifications. All the above modifications were carried out with limited budgeting and cost effective materials. Table 1 scores though acceptable are not very drastic even for the longitudinal study of 2 years long duration.

Table 2 denotes the paired "t" test between FES-I pretest and FES-I posttest using Figure pad Instat software version 3.1. Paired "t" value identify was 3.12, "p" value <0.05, it denotes there is a significance level of significance in change over all elderly people after refurbishing the modifications. The above findings are also supported through Robert G. Cumming *et al*., (1999) studies. In he carried out home visits by an occupational therapist for assessment and modification of environmental hazards: He concluded that home visits by occupational therapists can prevent falls among older people who are at increased risk falling. Basic required modifications were done in this newly constructed old age home such as, putting Nonskid rubber mat, bath mat, putting projection in the sloping surface and steps, nonskid foot wears and small chairs in the bath room, making extra step in the place of big obstacle, sticking rubber piece behind the chairs for slip resistant, putting bleaching powder for foot gripping in the cloth washing area, putting bright light in pathways and sticking projection in the hand rails for hand gripping.[8]

Table 3 denotes comparison of means between posttest 2016, pretest, posttest of 2018 using FES-I, and the mean values are 41.88 and 40.45 and 33.29, respectively. This pattern of comparison was adapted as the 2016 posttest using the FES-I with same modification is a well published and documented study of recent times. "Study to Prevent Falls in Elderly People by Adhering to the Modifications Done in the Old Age Home", Mohammed Faris KT, Jay Vijay Sonawane (2015) was also carried out at Ambalaya Old Age Home with the nominal funding from Sampoorani Ammal Charitable Trust. In a fashion to continue with the well documented research of similar funding the comparison of means was done under the protocol of longitudinal study. All the longitudinal studies in past have not just been beneficial in preventing falls but also in reducing fear regarding falls and ultimately uplifting the parameters like self-confidence, self-esteem, ADL independence, community mobility and finally the psychological components. These fundamental finding are widely supported by various research articles and authors worldwide [15] Like, Margaret Stevens, D'Arcy J. Holman, Nicole Bennett (2001) in their study conducted on Preventing Falls in Older People: Impact of an intervention to reduce

environmental hazards in the home Intervention consisted of a home hazard assessment, an educational strategy on general fall hazard reduction and ways to reduce identified home hazards, and the free installation of safety devices: grab rails, nonslip stripping on steps, and double-sided tape for floor rugs and mats. All intervention subjects received the home hazard assessment, and 96% received the educational strategy. Grab rails were installed in 77% of homes, rugs were stabilized in 8%, and nonslip step stripping was installed in 36% with follow-up of subjects for 1 year intervention resulting in a small reduction in the mean number of hazards per house.[9]

Susan Stark, Amanda Landsbaum, (2009) in her study on Client - centered home modifications improves daily activity performance of older adults: home modification intervention program and examine the impact of the intervention on daily activity performance over time. She concluded that home modification strategies such as adaptive equipment (e.g., tub bench), architectural modifications (e.g., ramp), major home renovations (e.g., roll-in shower), and training in using the compensatory supports and strategies during daily activities. Difficulty using the toilet solutions included a new toilet that was 19 inches in height, a raised toilet seat, spacer between the floor and toilet base that raised the toilet to a height of 19 inches. Other architectural modification included grab bars, handrails, additional lighting, and reacher devices. After home modification, participants' perception of their daily activity performance at home improved significantly and was maintained 2 years post-modification [13].

Adherence to the modification is not just the primary factor but carrying out the quality checks, reassessments and also refurbishing the previous modifications turns out to be the key factors in prevention of falls among old age home people.

Also it is to be noted that mostly fall prevention must become a standardized protocol among all the community dwelling old age people or both urban and rural backgrounds.

Routine follow ups shall be carried out by Occupational Therapist especially in rural backgrounds. The Occupational Therapist and other healthcare professionals' density in urban sectors is not sufficient but much better than the rural scenario. Still it is a fact that major part of Indian population is resides in rural parts. Thus, to sustain the quality of life and to avoid falls the regular follow ups is must by an Occupational Therapist.

After evaluating under the longitudinal design and followed by derivation of significant interpreted data, the null hypothesis can be rejected.

5. Conclusion

Adherence to modifications done in old age home helps in preventing falls among elderly people.

6. Limitations and Recommendations

Limitations

- Study was carried out on small sample size.
- Other treatments were not indicated and only were carried out.
- FES-I is individualized self-rating scale and is used individually on patient.
- During the period of study i.e. from 2016 to 2018, 6 subject had vacated the Ambalaya old age home and 2 new subject had taken new admission, this change of subject is not accountable.
- Only one old age home was included.

7. Recommendations

- The study can be performed on larger sample size.
- Study can be performed in different old age homes.
- Outcome can be checked using various other scales.
- Increasing the budget for more modification in old age home.

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