

Effect of Environmental Home Modification on Falling Risk Reduction among Elderly in a Rural Community

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Abstract: Falling lead to some problems as fractures, soft tissue injuries, longstanding pain, impaired functional mobility, decrease quality of life, increased death, and so increase healthcare costs. **Purpose:** This study aimed to examine the effect of environmental home modification on falling risk reduction of elderly in a rural community. **Design:** A quasi- experimental design (pre-posttest) was utilized to conduct this study. **Setting:** The study was carried out at two villages (Ghemreen village and Manshat Sultan village) in Menoufia governorate through home visits-Egypt. **Sample:** the researcher selected only elderly people who have history of falling. They were 130 elderly people. The researcher divided them into two groups (case and control), 65 (case) and 65 (control). **Tools:** I: - A structured Interview questionnaire developed by the researcher II: - Modified Fall Efficacy Scale III: - Home Safety Self-Assessment Tool. **Results:** There was remarkable reduced number of falls and fall related injuries after intervention. As a result of home modification done, the number of risky homes was decreased. **Conclusions:** Implementation of environmental home modification was effective in risk reduction of falling among study group compared to control group. It was successful in reducing number of falls and fall related injuries. **Recommendation:** Careful assessment of elderly homes to identify the risks and the possibility of overcoming them.

Keywords: Home Modification, Elderly, falling, risk reduction.

1. INTRODUCTION

One of common public health concern is falls among older adults. It is a major cause of death and illness among elderly population (Venkatesha et al., 2016). About 28-35% of people aged of 65 and over fall each year and 32-42% among 70 years of age. The frequency of falls increases with age. It has been estimated that twenty to forty percent of older people aged 65 falls each year (Boelens et al., 2015). Approximately 25% of persons who fall have moderate to severe injuries, ranging from bruises or lacerations to hip fractures, resulting in more than 1.9 million emergency department visits annually (Thilo et al., 2016).

Falls in the elderly population are causing reduce functional mobility, increase elderly's dependence, decrease quality of life and decrease in the average life expectancy (Sudarsky, 2015). It contributes to overwhelming consequences as fractures, soft tissue injuries, head injury and even death. Fractures account for 70 % of severe injuries due to falls, with hip fractures being the most common. It leads to significant morbidity and mortality. The fear of fall could result in serious psychological impact. This leads to restriction of activities by the individual and decrease quality of life (Ozlem, Hale & Ozgu, 2017).

Injury in the home environment is an extremely common event, accounting for around a third of injuries in all age groups. The majority of injuries people aged 75 and over occur in the home. Environmental factors play a part in approximately half of all falls that occur at home. Falls can be caused by slipping and tripping hazards, poor lighting, or the lack of needed home modifications such as bathroom grab bars, handicapped showers, stair railings, and ramps (Eshkooor, 2016).

Home hazard assessment and modification professionally prescribed for older adults with a history of falls has led to a reduction in falls both inside and outside the home (Gillespie et al., 2015). Home modification is changing the environment to make daily activities easier, reduce accidents, and support independent living. This includes removing fall hazards such as clutter, adding supports such as handrails, and changing how or where activities occur (Bergen, Stevens & Burns, 2016). Training patients about proper use of assistive devices for mobility is an important part of improving safety. Home safety modification interventions reduce falls and are most effective in patients who have a high risk of falls or who have severe visual impairment (Moncada & Mire, 2017).

Nurses play an important role in preventing falls and injury from falls in elderly people who live in the community. They have an important role in developing and implementing a designed falls prevention plan, encourage elderly people to make specific exercises (targeting strength and balance), perform environmental review and interventions for older people who have a high risk of falling. Make home safety assessment and modification programs for older people with severe visual impairment. The visit of the nurse to the home of the elderly can constitute an important action for the evaluation of the risk and implementation of preventive measures of falls and their recurrence in the elderly people (Baixinho, Dixe & Henriques, 2017).

Aim of the Study

The aim of the current study is to examine the effect of environmental home modification on falling risk reduction of elderly in a rural community.

Research Hypothesis:

Elderly people, who will receive intervention about environmental home modification (study group), will have a reduced number of falls and fall related injuries than elderly people who will not receive any intervention (control group).

2. SUBJECTS AND METHOD

Design: A quasi- experimental design (pre-post-test) was utilized to conduct this study.

Setting: The study was carried out at two villages (Ghemreen village and Manshat Sultan village) in Menoufia governorate through home visits.

Subjects: A multistage random selection was used to select one district from Menoufia Governorate, which composed of nine districts; the selected district was Menouf district. The researcher selected only elderly people who have history of falling. They were 130 elderly people. The researcher divided them into two groups (case and control), 65 (case) and 65 (control). According to the following criteria:

Inclusion criteria:

Are 60 years or older.

Both genders (male & female)

Have history of falling

Agreed to participate in the study

Tools of data collection:

Tool (1): An Interviewing questionnaire which includes:

A. Demographic data: include age, sex, marital status, educational level, job.....etc

B. History of falls: questions about the date of fall, the number of falls, and injuries related to falls... etc

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C. History of medication taking: questions about the name and number of medications taken by the participants... etc. The questionnaire contained four assessment items about number of drugs taken per day (Polypharmacy). The elderly who taking 2-3 drugs is considered as "Minor polypharmacy", taking 4-5 drugs as "Moderate polypharmacy", and taking more than 5 drugs as "Major Polypharmacy.

D. Medical history: questions about medical Problems as presence of chronic diseases... etc.

Tool (2): Modified Fall Efficacy Scale (MFES): developed by National Aging Research Institute (adapted from Tinetti et al., 1990) to determine how confidently clients feel they are able to undertake each activity on a scale of 0 (not confident at all) to 10 (completely confident).

Scoring used for Modified Fall Efficacy Scale: Regarding assessing the elderly modified fall efficacy scale, the total score was (0 – 140), with higher scores reflect more confidence, less fear of falling. Lower scores reflect less confidence, more fear of falling. Each elderly was categorized into "low satisfaction" when he/she achieved (0-46), "moderate satisfaction" when he/she achieved (47-93), and "high satisfaction" when he/she achieved (94-140).

Tool (3): Home Safety Self-Assessment Tool (HSSAT): This tool developed by Occupational Therapy Geriatric Group at the University at Buffalo (2013) to estimate the number of environmental hazards in the house. The 38-item list reviewed risks in the kitchen, bathroom, stairways, bedroom, and living room. A score of 1 was given for each environmental risk. The scores were summed at the completion of the evaluation to provide a composite score of environmental hazards. Written suggestions for modifications were given to each participant, and an additional home visit was carried out after the first one to reinforce the modifications.

Categories used for Home Safety Self-Assessment Tool:

Concerning home safety, home hazards were assessed among elderly people's homes by using home safety self-assessment tool: to assess home hazards among elderly people. Every elderly went to each room/area of his home with this checklist to find the hazards that are present for every room / area in his home that could cause him to fall. After checking all the problems, he added them and wrote the total in the big box. (Each item that gets a checkmark is a potential hazard). Elderly home with less than total 5 risks items is a "safe home", if elderly home with 5-6 total risk items, it considered as "mild risky home", if elderly home with 7 - 8 total risk items, it considered as "Moderate risky home", and if elderly home with more than 8 total risk items, it considered as = "Major risky home".

Validity of the tools;

Validity of the tools was assessed using content validity by jury of three community health and medical surgical experts. The relevancy, clarity, fluency, and simplicity of each component in the tools were examined by the Experts and they found the tools are useful and helpful, and suggestions were incorporated into the tools.

Reliability of the tools

Reliability was estimated among 10 participants by using test retest method with two weeks apart between them. Then correlation coefficient (Cronbach's alpha) was calculated between the two scores for each tool. Correlation coefficients range from 0.82 to 0.89 which indicates that the tools are reliable to detect the objectives of the study.

Pilot study:

The pilot study was conducted on 10% of the study sample (13 elderly person) from the target population to evaluate the applicability of the study tools, clarity, techniques, acceptance of the study sample and time needed to fill the questionnaire. Based on the findings of the pilot study, the necessarily modifications were done. This sample was excluded from the study.

Ethical considerations and human rights:

- Approval of ethical research committee was obtained at Faculty of Nursing –Menoufia University.
- The agreements for participation were taken after the purpose of the study was explained.

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- Before data collection, the elderly people were informed about the aim of the study and what would be done with the results. They were given an opportunity to refuse to participate and they were notified that they could withdraw at any time. Also they were assured that, the information would remain confidential and used for the research purpose only.
- The researcher gave copies from general information package (booklet) about falling risk reduction to elderly people for achieving the ethical principles of research as the principle of beneficence that all subjects should benefit from the research's knowledge.

Data collection procedure:

- A review of available and related past and current literature covering the various aspects of the topic was done using books, articles, magazines and studies related to falling, its risk factors and its preventive strategies.
- The period of data collection starting from July 2017 to the end of December 2018 with continuous follows up during this period.
- The initial visit (pre- test): first time meeting with the participants was considered the baseline for the study. At first, it was important for the investigator to introduce herself; the elderly were assured of confidentiality, elderly people was provided with an explanation about the purpose of the study and the significance of their contribution. They provided verbal consent to share in the study. Each elderly was interviewed individually through home visits.
- A questionnaire was performed to obtain data about socio-demographic data, history of falls in the previous 12 months, history of medication taking and Medical history. Data was collected through face to face interviewing with elderly (study and control groups).
- Elderly people were asked about history of falling in the last 12 months, if the answer was "yes", then they were asked about effect of fall. Inclusion criteria: being at least 60 years old, accept to answer the questionnaire and accept for participation in the study. Then the investigator began to measure scales used in the study as modified fall efficacy scale by asking the elderly people the degree to which he /she was confident to perform fourteen daily living activities and rating them on a scale of 0 (not confident at all) to 10 (completely confident). High scores indicate more confidence and less fear of future falling. Lower scores indicate less confidence and so more fear of future falling.
- At last, the investigator began to complete questionnaire of home safety self-assessment tool which estimate the number of environmental hazards in the elderly people home. The 38-item list included hazards in the home parts as kitchen, stairways, bathroom, living room and bedroom. Each hazard in the home was given one score. Then summation of scores was performed after home evaluation to provide a composite score of environmental home hazards.
- The study group received three-part intervention by the investigator through a 8-week period to reduce fall-associated risk factors. Intervention involved education about fall risk, medication review and environmental hazard education. Control group then, took a delayed intervention (booklet) after collecting posttest.
- **Fall risk education:** General information package (booklet) was given to all persons in the intervention group. The booklet contained information about most common risk factors and simple falls prevention strategies. It is provided to improve awareness, identification of falling risk factors and the importance of different interventions. All elderly people in the intervention group received verbal and written information about fall prevention strategies by the investigator. The oral information consisted of discussion about risk factors of falling, home hazards and safe environment.
- **Medication Review:** During the pretest visit, the investigator collect data about medication history as questions regarding name and number of medications taken by the elderly, number of drugs taken per day (Polypharmacy). Taking 2-3 drugs is considered as "Minor polypharmacy", taking 4-5 drugs considered as "Moderate polypharmacy", and taking more than 5 drugs considered as "Major polypharmacy. The investigator give guidance and directions to elderly people during intervention to decrease psychotropic drugs as benzodiazepines and associated drugs, drugs causing orthostatic hypotension, central nervous system medications.

- **Environmental home modifications:** During the pretest visit an environmental assessment was done for the participant's home. The 38-question environmental in-home assessment was specifically designed to determine environmental risks within the bathroom, kitchen, living room, bedroom and stairs. Any of the environmental hazards identified were noted, and appropriate safety modifications were outlined for each subject to address. Home safety is very important for people who have fallen more than once. For example, Taking care there is adequate lighting, electrical cords are kept out of the way, and removal of loose rugs is all very important measures. Moreover, bathroom safety is critical in the home environment. Using non- slipping matt in a shower, non-slipping floor, Grab rails and adequate bathroom lighting perform a huge change in reducing fall hazards.

3. RESULTS

Figure 1: Age distribution of studied rural elderly. This figure illustrated that, younger age groups were predominant than older age groups., 47.7% were aged 60 - 69 years, 31.5% were aged 70-79 years while 20.8% were aged 80-90 years.

Figure 2: Gender distribution of studied elderly. This figure illustrated that, females were predominant than males. 44.6% were male and 55.4% were female for study group while 41.5% were male and 58.5% were female for control group.

Figure 3: Number of medication taking distributed by studied groups. This Figure revealed that falling was associated with polypharmacy, approximately 47.7% use moderate polypharmacy for study group and 53.8% for control group. Followed by minor polypharmacy 29.2%, 36.9% for study and control group respectively. Then major polypharmacy 23.1% and 9.3% for study and control group respectively.

Table 1: Effect of home modification intervention on studied elderly' history of falling, pre, post1, and post2-intervention. This Table indicates "causes of falling", 40% of study group has no falling during the period of follow up (one year after intervention), Drowsy showed diminished percentage from 43.1% in pre intervention to 29.2% immediately after intervention, and 20% one year after intervention, tripping also showed diminished percentage from 21.5% in pre intervention to 12.4% one year after intervention, this difference was highly significant statistically ($P=0.000$).

Concerning fear of falling in the future, elderly people who have fear of falling in the future among study group showed diminished percentage from 66.2% pre intervention to 33.8% immediately after intervention, and 4.6% one year after intervention while the percentage among the control group was 60%, 50.7%, 44.6% pre intervention, immediately after intervention and one year after intervention respectively. This difference was highly statistically significant ($P=0.000$).

Figure 4: Effect of home modification intervention on studied elderly' history of number of falling, pre, post1, and post2-intervention. This figure demonstrates that, elderly who were fall from 7-12 times among study group showed diminished percentage from 21.5% in pre intervention to 0% immediately and one year after intervention, while the percentage among the control group are 30.8%, 38.5%, 21.5% pre, immediately and one year after intervention respectively. This difference was highly statistically significant ($P=0.000$).

Figure 5: Effect of home modification intervention on studied elderly' place of falling, pre, post1, and post2-intervention. This figure demonstrates that, 40% of study group has no falling during the period of follow up (one year after intervention), falling inside home showed diminished percentage from 60% in pre intervention to 41.5% one year after intervention while the percentage among the control group 64.6%, 69.2%, 73.4% pre intervention, post1 and one year after intervention respectively. There was highly statistically significant difference between study and control group ($P=0.000$).

Table 2: Effect of home modification intervention on studied elderly 'home safety self-assessment pre, post1, and Post2-intervention. This table demonstrates efficacy of the home modification intervention on home safety among studied elderly. Immediate and one year post intervention revealed a highly significant improvement ($p<0.000$) in the different aspects of home safety. There was an overall significant difference between the proportion of each home safety, at the three different time points (pre intervention, immediately after intervention, and one year after intervention) ($P = 0.000$ HS). A repeated measures Friedman ANOVA determined that the proportion of each home safety item differed statistically significantly between time points of home based intervention ($Fr. = 13.7, P < 0.000$ HS).

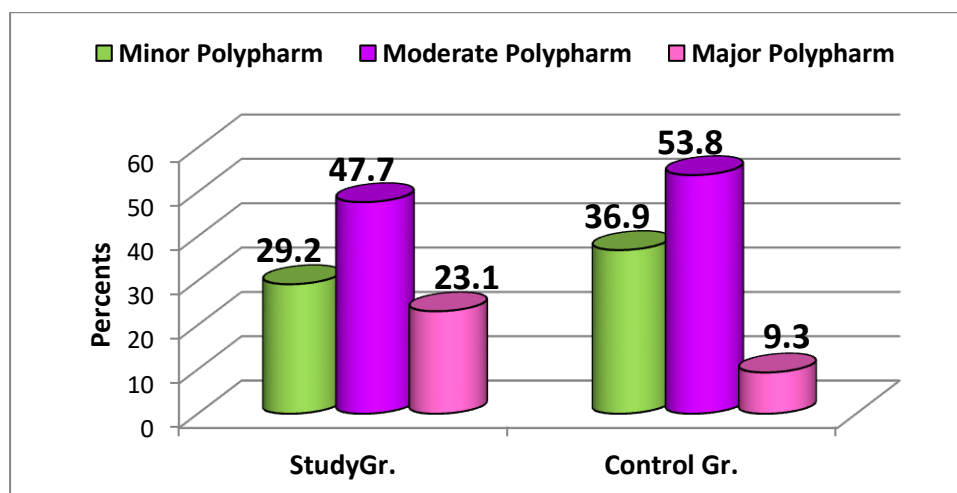
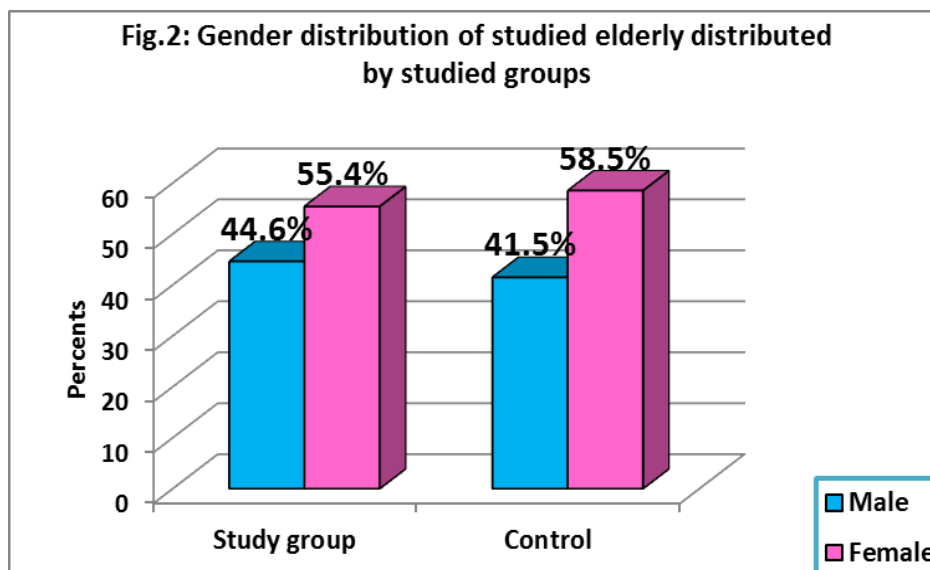
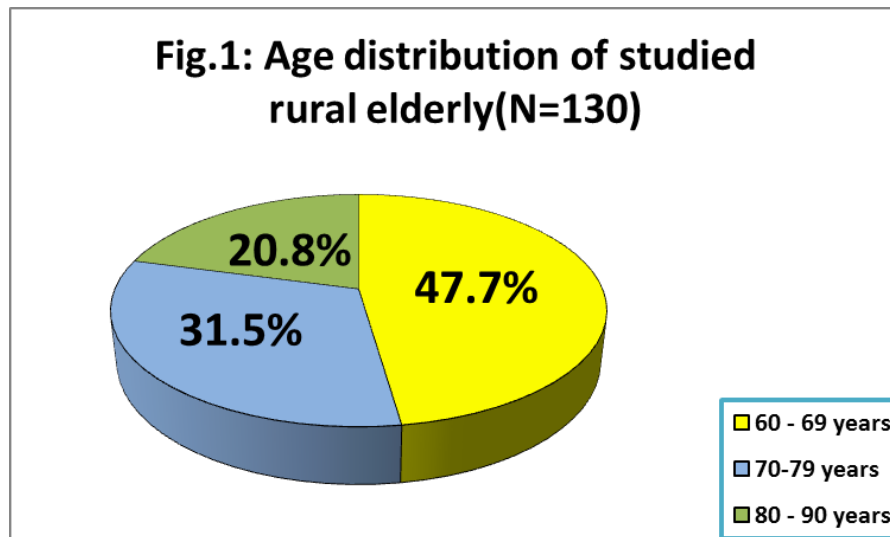


Fig.3: Number of medication taking distributed by studied groups (N = 130)

Table 1: Effect of home modification intervention on studied elderly' history of falling, pre, post1, and post2-intervention (N = 130)

History of falling	Pre-intervention					Immediate after intervention					One year after intervention					P4 Friedman test, P
	Study group		Control		X ² test, P1	Study group		Control		X ² test, P2	Study group		control		X ² test, P3	
	No.	%	No.	%		No.	%	No.	%		No.	%	No.	%		
Causes of falling																
No falling	-	-	-	-		-	-	-	-		26	40	0	0		X ² =16.2P=0.000 HS Fr=21.3 P=0.000 HS
Slippery	13	20	19	29.2	X ² =1.6 P=0.7 NS	16	24.6	13	20	X ² =2.7, P= 0.09 NS	9	13.8	17	26.2		
Tripping	14	21.5	13	20		16	24.6	10	15.4		8	12.4	11	16.9		
Drowsy	28	43.1	25	38.5	19	29.2	20	30.8	13	20	23	35.4				
Without cause	10	15.4	8	12.3	14	21.6	22	33.8	9	13.8	14	21.5				
Complications of falling																
No falling	-	-	-	-	X ² =4.4 P=0.4 NS	-	-	-	-	X ² = 15.2, P=0.000 HS.	25	38.5	0	0	X ² = 41.3, P=0.000 HS. Fr=24.5 P=0.000 HS	
Hematoma	22	33.8	23	35.4		43	66.1	19	29.2		4	6.2	25	38.5		
Fracture	14	21.5	13	20	10	15.4	11	16.9	8	0	15	23.1				
Wounds	12	18.5	13	20	2	3.1	20	30.8	0	0	14	21.5				
Abrasions	13	20	16	24.6	10	15.4	15	23.1	3	4.5	11	16.9				
Fear of falling in the future																
Yes	43	66.2	39	60	X ² =0.5 P=0.4 NS	22	33.8	33	50.7	X ² = 3.14 P=0.06 NS.	3	4.6	29	44.6	X ² = 27.8 P=.0000 HS Fr=14.6 P=0.000 HS	
No	22	33.8	26	40		43	66.2	32	49.3		62	95.4	36	55.4		
Total	65	100	65	100	65	100	65	100	65	100	65	100				

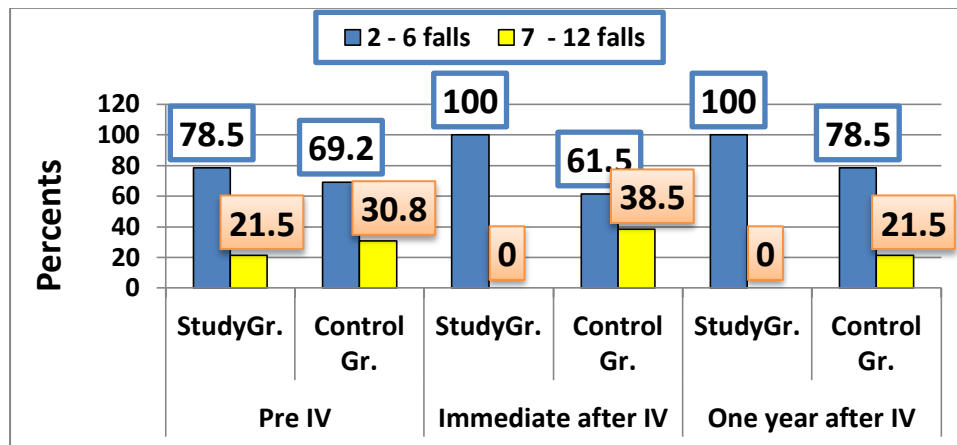


Fig.4: Effect of home modification intervention on studied elderly' history of number of falling, pre, post1, and post2-intervention (N = 130)

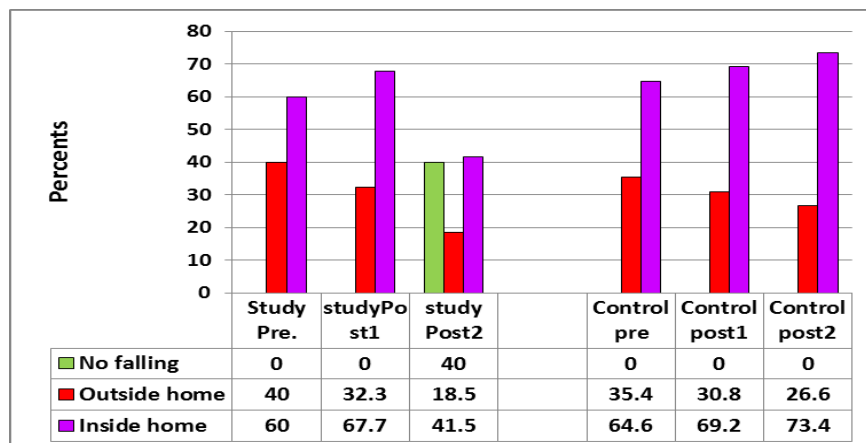


Fig.5: Effect of home modification intervention on studied elderly' place of falling, pre, post1, and post2-intervention

Table 2: Effect of home modification intervention on studied elderly 'home safety self-assessment pre, post1, and Post2-intervention (N = 130)

Home safety self-assessment	Pre-intervention					Immediate after intervention					One year after intervention					P4 Friedman test, P
	Study group		Control		X ² test, P1	Study group		Control		X ² test, P2	Study group		control		X ² test, P3	
	No	%	No	%		No	%	No	%		No	%	No	%		
Safe home	10	15.4	22	33.8	X ² =4.1, p=0.12 NS	24	36.9	20	30.8	X ² =21.4, p=0.000 HS	23	35.4	17	26.2	X ² =32.8 P=0.000 HS	Fr=13.7 P=0.000 HS
Mild risky home	8	12.3	17	26.2		20	30.8	17	26.2		21	32.3	24	36.9		
Moderate risky home	29	44.6	17	26.2		17	26.2	17	26.2		19	29.2	16	24.6		
Major risky home	18	27.7	9	13.8		4	6.1	11	16.8		2	3.1	8	12.3		
Total	65	100	65	100		65	100	65	100		65	100	65	100		

Sig. = Significant HS= High significant NS = Not Significant Fr test= Friedman ANOVA for repeated measurements test

P1= Comparison of each home safety item pre- intervention in the study and control groups.

P2= Comparison of each home safety item in the study and control groups, immediately after intervention.

P3= Comparison of each home safety item in the study and control groups, one year after intervention.

P4= Non parametric two-Way Repeated Measures Friedman test for comparison of each home safety item, between the three levels of intervention (Pre, immediate after, and one year after intervention), in both the study group, and control.

4. DISCUSSION

Falls in older persons are a major public health issue. They are the most frequent type of accidents in people aged 65 and older, and are the major cause of injury-related hospitalization in this age group. Injurious falls are associated with disability; elderly people become more dependent and increased mortality. When falls do not result in physical injury, they can cause older people to have fear of falling, with consequent restrictions on daily activities and onset of functional decline (Gale, Cooper & Sayer, 2016). The present study aimed to examine the effect of home based- intervention on falling risk reduction of elderly in a rural community.

Regarding Medical history results of the current study revealed that, the majority of the studied elderly demonstrated that chronic diseases suffered by them were: joint pain or arthritis, vertigo, kidney disease, hypertension and blurred vision. However, the lowest percentages of chronic diseases suffered by studied rural elderly were: liver diseases, urinary incontinence, tingling in limbs and hearing problems. Findings of the current study, are similar to what was reported by Paliwal, lattum & Ratliff, (2017) who studied "Chronic health conditions as a risk factor for falls among older adults". They found that chronic conditions such as depression, arthritis, diabetes and chronic kidney disease show a significant association with falls.

Also, This finding is consistent with the results of a study by Kistler, Khubchandani, Jakubowicz, Wilund, Sosnoff, (2018) who studied "Falls and fall-related injuries among elderly population aged 65 or older ". They reported that comorbid conditions (diabetes, cancer, and arthritis) were found to significantly influence the probability of falls and fall-related injuries. Also, study by Kamińska, Brodowski, Karakiewicz, (2015) who studied "Fall risk factors in community-dwelling elderly depending on their physical function, cognitive status and symptoms of depression". They found that falls were associated with chronic medical conditions.

Moreover, other studies by McAdams-DeMarco, Suresh, Law, Salter, Gimenez, Jaar & et al., (2015), Abdel-Rahman, Yan, Turgut & Balogun, (2013) and Rossier, Pruijm, Hannane, Burnier & Teta, (2014) and Di Fabio R., et al, (2015). They showed that chronic conditions as "diabetes and arthritis, vertigo, dizziness" were associated with history of falling. This may be related to medications prescribed for chronic medical conditions have more side effects as vertigo, dizziness and drowsiness and so increasing the risk of falling in addition to the risk associated with the chronic condition itself.

Regarding place of falling, results of the current study revealed that, falling inside home was predominant than falling outside home. This finding is similar to the study conducted by Pradnya Dhargave & Ragupathy Sendhilkumar, (2016) who studied "Prevalence of risk factors for falls among elderly people living in long-term care homes". They reported that majority of falls occurred at home and low percentage occurred at various other locations. This may be because of presence of more home hazards inside the home.

In contrast; Lord, Ward, Williams, Anstey & (2014) who studied "Physiological factors associated with falls in older women"., they showed that fifty six percent of home hazards falls occur outside the home (in the garden, street, footpath, or shops), while the remainder (forty four) occur at various locations in the home. This may be attributed to the difference in lifestyle of elderly people in developed countries.

Regarding History of medication taking (polypharmacy), the current study revealed that, falling associated with polypharmacy. Consistent to the current study, a study by Kamińska, Brodowski, Karakiewicz, (2015) who studied "Fall risk factors in community-dwelling elderly depending on their physical function, cognitive status and symptoms of depression". They reported that medication use significantly affected falling among the studied population. Also, this result is supported by a study conducted in Egypt by Hamed, Mohammed and Aly, (2017) who studied "Elderly falls prevalence and associated factors in Sohag Governorate". They reported that medication use significantly affected falling among the studied population. In addition, other studies conducted by Azidah, Hasniza & Zunaina, (2016) and Woolcott, Richardson & Wiens, (2014), they reported that psychotropic medications including antidepressants, hypnotics, drugs used in dementia, and antipsychotics have been shown to increase the risk of falling. This may be related to adverse effects (side effects) of the drugs and medications prescribed.

Moreover, study by Kamińska, Brodowski, Karakiewicz, (2015) who studied "Fall risk factors in community-dwelling elderly depending on their physical function, cognitive status and symptoms of depression". They found that total number of medications taken, was associated with falling. This may be due to effects of these drugs on individual's balance and functional mobility and may cause drowsiness, thereby increasing the risk of falls.

Regarding number of fallings, the current study showed that, there was diminished number of fallings among study group after intervention. This result is supported by study conducted by Jon Pynoos, Bernard & Anna, (2016) who studied "Environmental assessment and modification as fall-prevention strategies for older adults. They reported that home assessment and environmental modification play an important role in reducing the risk of falls and was effective in reduce number of falls and fall-related injuries among elderly people.

Also, this finding is on the same line with the results of a study by Stark Susan, Somerville Emily, Keglovits Marian, Conte Jane, Li Melody, Hu Yi-Ling & Yan Yan, (2017) who studied "protocol for the home hazards removal program". They showed that environmental home modification reduced the risk and number of falls among studied participants. In addition, this finding is in agreement with study by Gillespie et al., (2015) who studied "Interventions for preventing falls in elderly people living in the Community". They indicated that home modification programs, effectively reduced number of falls.

Moreover, this finding is in agreement with pynoos, Steinman, do nguyen & bressette, (2017) who studied "Assessing and adapting the home environment to reduce falls and meet the changing capacity of older adults". They reported that modificate the environments of older adults reduce their risk for falls and fall-related injuries.

Concerning fear of falling in the future, the current study revealed that home modification interventions reduced fear of falling among study group. This result is congruent with study by Heloísa, Lopes, Guandalini, Taminato, Barbosa & Leite de Barros, (2019) who studied "Fear of falling and risk of falling" They reported that home modification interventions help to reduce fear of falling. This finding is consistent with the results of study by Teixeira, Andrade, Santos & Caires, (2019) who studied "Falls among the elderly: environmental limitations and function losses". They reported that home modification, generates reduction in fear of falling and limiting dependence.

Regarding home hazard modification results of the current study revealed a highly significant improvement in the different aspects of home safety after intervention. This finding is similar to what was reported by Tomoko et al., (2014),

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who studied "Effectiveness of a home hazard modification program for reducing falls in community dwelling older adults". They showed that home hazard modification programs showed increase home safety and so reduction in overall falls.

Also, this result is supported by Gillespie et al., (2015) who studied "Interventions for preventing falls in older people in the community". They showed that home safety assessments and home hazards modification interventions among study group were effective in reducing the risk of falling. In addition, this finding is similar to the study conducted by meta-analysis study of home interventions by Clemson and colleagues, (2013). They demonstrated that home modification interventions result in reduction in fall risk.

Moreover, this result came on the same line with a randomized controlled trail study conducted by Kamei et al., (2014) who used an innovative approach to teach older people to identify fall hazards in the home and undertake appropriate fall mitigation strategies intervention. They concluded that this intervention result in increased awareness of home hazards as well as a reduction in falls in those aged 75 years and older when compared to the control group.

5. CONCLUSION

Implementation of environmental home modification was effective in risk reduction of falling among study group compared to control group. It was successful in reducing number of falls and fall related injuries in the study group than control group.

6. RECOMMENDATIONS

Careful assessment of elderly homes to identify the risks and the possibility of overcoming them. Emphasize the need for the elderly to use assistive devices that help to reduce the risk of falls and its complications.

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