A Health Intervention Program to Improve Balance Disorders and Prevent Falls for the Elderly

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ABSTRACT

Background: Aging is associated with a progressive decline in physical and cognitive functions, increasing the likelihood of age-related diseases and complications such as balance disorders and falls. Falls among the elderly represent a major public health concern due to their significant impact on morbidity and mortality.

Aim: This study aimed to evaluate the effect of a health intervention program on improving balance disorders and preventing falls among the elderly.

Study Design: A quasi-experimental design was utilized.

Setting: The study was conducted in two outpatient clinics (Ear, Nose, and Throat and Internal Medicine) at El Salam Hospital, Port Said City.

Sample: A purposive sample of elderly participants was recruited.

Tools: Data were collected using three tools: (1) an interviewing questionnaire covering demographic characteristics and elderly knowledge regarding balance disorders and fall prevention; (2) the Berg Balance Scale; and (3) the Hendrich II Fall Risk Model.

Results: Post-intervention, 76.6% of the elderly achieved satisfactory total knowledge scores, compared to 23.4% with unsatisfactory knowledge. Regarding balance performance, 58.4% demonstrated acceptable balance on the Berg Balance Scale post-intervention. According to the Hendrich II Fall Risk Model, 32.5% of participants were classified as having no fall risk, while 67.5% remained at high risk. Overall, there was a statistically significant improvement in elderly knowledge and balance performance following the intervention program.

Conclusion: The health intervention program effectively enhanced the elderly's knowledge and balance practices, contributing to reduced fall risk.

Recommendations: Continuous health education on fall prevention measures and the regular performance of balance exercises are strongly recommended to sustain and improve elderly functional independence.

Key words: Balance Disorders, Berg Balance Scale, Elderly, Hendrich II Fall Risk Model

INTRODUCTION

The age distribution of the world's population is in a regular change. An increase in the number of elderly and a simultaneous decline in the number of younger is a trending factor worldwide. Since the natural process of aging is defined as continuous and irreversible, high life expectancy does not only entail advantages. Aging is associated with a reduction in both physical and cognitive functions of the human body, which also involves the likelihood of the occurrence of age-related diseases **[1].** Aging is associated with declining balance. Specifically, as task complexity increases through attenuation of sensory feedback, balance impairments can be detected at younger ages. Usually, a decline in postural stability becomes glaring in advance a long time with extended challenges to topics‟ balance, with a persistent decline in stability with each decade of existence **[2].**

Balance is the ability to collect sensory and proprioceptive signals related to a person's position in space and to produce the appropriate motor responses to control body movement **[3].** The ability to control balance is based on the integration of sensory information from the somatosensory, vestibular, and visual systems, which work together with the neuromuscular system to control body alignment with respect to the environment and stabilize the body's center **[4].** As balance is a skill that involves multiple body systems, including the musculoskeletal, cognitive, and somatosensory, it can be affected secondary to multiple conditions such as neurological diseases. Balance gives an individual the ability to attain physical movement and further carry out the activities of daily living **[5]**.

Balance can be categorized-as either-static or dynamic, in static stability, the frame's middle of gravity is maintained in the base of support, in dynamic stability, the center of gravity is maintained within the base support while in movement, many factors can lead to impaired balance depending on the individual's condition, limiting factors include muscle strength, motor coordination, poor cognition, and poor sensory organization, all of which may be affected in some way with a neurological condition **[6].**

Falls are the main motive of injury in adults aged 65 or older. In 2018, 27.5% of older adults reported at least one fall in the past year, resulting in 8.4 million fall-related injuries and 32,000 deaths **[6].** Frequent falls in the elderly can lead to serious health consequences as pain, bruising, lacerations, and fractures, including upper extremity and hip fractures, and intracranial bleeding in severe cases, and efforts to reduce their incidence are necessary. Nearly 28-35% of elderly fall each year and this percentage increases to 32-42% for those over 70 years. Moreover, 20% to 39% of the elderly who fall experience fear of falling, which leads to further limiting of activity and independence due to injury **[7].** Falls have immediate and long-term effects, both for fallers and their families' quality of life, and economically for the health care system. Even without injury, falls often cause loss of mobility, confidence, and functional independence **[8]**. Falls also lead to serious social consequences such as institutionalization and increased demands for social care **[9].**

A health intervention program is important for the elderly to prevent falls and improve balance because they are often not aware of their own risk or may not realize their risk of falling but they lack knowledge, attitude, and behavior on how to prevent falls **[10].** Exercise interventions designed to promote the lower limb muscle strength and postural balance are effective in improving balance and preventing falls in the elderly **[11].** Balance exercises can help an older adult to avoid falling by improving their ability to control and maintain their body's position, whether he is moving or still. It is safe, effective and acceptable to older adults and healthcare providers. In addition, balance exercises promote increased muscle strength, aerobic conditioning, flexibility, and balance, and reduce the risk of falls and consequently improve quality of life **[12].**

Gerontological nurse has an essential role in the effective management of balance disorders and fall problems usually involve the collaboration of a multidisciplinary team, in addition to the active participation of the elderly and their caregivers. Nevertheless, the nurse is an important member to initiate and coordinate activities to promote balance. Meanwhile, geriatric nurse should be aware of clinical manifestations, types and complications of balance disorder, as well as focus on safety and promoting independence **[13].**

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Significance of the Study

A Balance disorder is one of the commonest problems affecting more than 50% of elderly especially over 75 years **[14].** Balance disorders are important reasons leading to falls and increases the possibility of death and disability; furthermore, it may cause the loss of independence. Therefore, balance disorders in elderly individuals are a symptom that leads to functional insufficiency **[3].** Fall is a worldwide health problem among elderly due to age related changes in the body and are the leading cause of injury in this age group, more than 37 million falls require medical attention and over 17 million disability adjusted life years are lost as a result of falls every year **[15].**

Each year an estimated 646.000 elderly die from falls globally of which over 80% are in low-income and middle-income countries. The reported incidence rates show wide variability from as low as 29% to as high as 40% in this population. The incidence of recurrent falls (more than two episodes per calendar year was reported to be 11%–21% **[16].** Prevalence of falls among elderly in Egypt is estimated to be 33.3% **[17].** The Egyptian census is carried out every 10 years the last one was in 2016. The percent of elderly was 4.4% in 1976, 5.75% in 1996, and rising to 6.27% in 2006, and 6.9% in 2016. The percentage is projected to be 9.2% in 2021, and it is expected to reach 20.8% in 2050 **[18].**

Balance is commonly used to describe stability and steadiness when a person is standing and sitting, due to advanced age of the elderly will suffer from balance disorder. For these reasons, it is important to maintaining balance during everyday tasks that requires complex control and coordination of both the sensorimotor and neuromuscular systems. Falls due to balance disorders can lead to decline in functional independence, that cause of hospitalization for elderly and admitted to long-term care. So, it is essential to do health intervention program to improve balance disorders and prevent falls for elderly.

Aim of the study

This study aim to evaluate the effect of health intervention program to improve balance disorders and prevent falls for elderly through:

Assessing elderly knowledge and reported practices about balance disorders and falls according to elderly needs.

Developing health intervention program about balance disorders and falls according to elderly needs.

Implementing health intervention program about balance disorders and falls according to elderly needs.

Evaluating the effect of health intervention program on balanced disorders and prevention of falls for elderly.

Research Hypothesis:

Health intervention program will improve elderly knowledge and reported practices about balance disorders and fall prevention.

SUBJECTS AND METHODS

Research design

A quasi-expremintal study was applied to achieve the aim of the current study.

Research setting:

The study was conducted in Ear, Nose & Throat (ENT) and Internal medicine (recently named as Cardiothoracic) outpatient clinics at Elsalam hospital-Port Said City, which affiliated to Comprehensive Health Insurance, Ministry of Health, Egypt.

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Sample: Purposive sample was used in this study

Tools for data collection

The data of this study were collected by using three tools:

1st tool: An interviewing questionnaire; it was developed after reviewing related litrature and it included 3 parts::

Part 1: Elderly demographic characteristics: It includes 9 questions such as: Gender, age, marital status, educational level, current work, source of income, ……etc.

Part 2: Elderly medical history (Past and present): - Past history includes 10 questions such as: Suffer from any family history for certain disease? If yes, what type of disease?, enter hospital the last year, reason of entering hospital, face any fall at the last 12 months etc.

- Present history includes 11 questions such as: Suffer from certain diseases, If yes, what type of disease, Taking any medications now, If yes, what medications, taking medications regularly, smoking, practicing sports regularly etc.

Part 3: Assess elderly knowledge with pre and post test about:

Balance disorders it includes 9 questions such as: Meaning, causes, symptoms, signs and risk that need physician counseling, predisposing factors to keep elderly balance, etc.

Fall prevention it includes 9 questions such as: Meaning, causes, symptoms and signs, complications of fall.etc.

Scoring system for knowledge:

The scale contains 18 questions; each item was assigned as the following:

2 = Complete correct

1 = Incomplete correct

0 = Don't known.

The total score for the elderly knowledge was calculated by the addition of the total score. Elderly's total knowledge score was classified as the following: **Total scores of knowledges** =18 questions =36 grades = 100%

-Satisfactory knowledge when total score was ≥ 50% (≥ 18 grades).

-Unsatisfactory knowledge when the total score was< 50% (< 18 grades).

2nd tool: Berg Balance Scale developed by (Berg et al., 1992): with pre and post test, This scale measures reported practices about balance in elderly, it was observed and scored pre and post program by the researcher**.** The scale contains 14 items as: Sitting to standing, standing unsupported, sitting unsupported, standing to sitting, transfers, standing unsupported with eyes closed, standing unsupported with feet together, etc. **Scoring system for Berg Balance Scale:**

The scale contains 14 items; each item was assigned as the following:

0 = Unable to do the task

1= Maximum assist need

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2= Moderate assist need

3= Minimum assist need

4= Independent (ability to finish the task without assistance).

The maximal global score of the scale was 56 points.

The total score of elderly calculated as follows:

0 to 20 means an impairment of balance and had a high risk of fall.

21 to 40 means acceptable balance performance.

41 to 56 means good balance performance.

3rd tool: **Hendrich II Fall Risk Model:** with pre and post test, this model measures reported practices about falls, it was adapted and modified from the original by **(Hendrich et al., 2007**) and was observed and scored pre and post program by the researcher. It consists of the following eight items:

Scoring system for Hendrich II Fall Risk Model:

Confusion /disorientation / impulsivity (0 mean unconfused to 4 mean confused), symptomatic depression (0 mean un depressed to 2 mean depressed), altered elimination (0 mean normal elimination to 1 mean urinary incontinence), dizziness or vertigo (0 mean no history of dizziness or vertigo to 1 mean have history of dizziness or vertigo), male gender (0 mean women gender to 1 mean male gender), any administrated of antiepileptic (0 mean no history of taking antiepileptic to 2 mean had history of taking antiepileptic), any administrated of benzodiazepines (0 mean no history of taking benzodiazepines to 1 mean had history of taking benzodiazepines), and The get-up-and-go test assessing four items as: ability to rise in single movement- no loss of balance with steps (receives score of 0), pushes up , successful in one attempt (receives score of 1), multiple attempts, but successful (receives score of 3) and unable to rise without assistance during rest, (receives score of 4).

The elderly total reported practices about fall-risk score for the Hendrich II Fall Risk Model (HIIFRM) ranged from 0 to 20 as the following:

The elderly who took ≥ 5 considered high risk of fall.

The elderly who took < 5 considered no risk for fall.

Validity

The tools validity was done by five of Faculty's staff Nursing experts in the field of Community Health Nursing, Faculty of Nursing, Helwan University and Specialties who reviewed the tools for clarity, relevance, comprehensiveness, applicability, and reliability.

Reliability

To assess reliability, the study tools were tested by the pilot subjects at first session and retested after 2weeks as test-retest reliability for calculating Cronbach's Alpha coefficient test, which revealed that each of the three tools consisted of relatively homogenous items as indicated high reliability of each tool. Cronbach's Alpha of knowledge was 0.91, Berg balance scale was 0.984 and 0.894 for the Hendrich II Fall Risk model.

Pilot study

The pilot study was carried out on 10% (7) of the sample to examine the clarity of questions and time needed to complete the study tools consumed about 15-20 minutes. Based on the results of pilot study no modifications were done. So subjects of the pilot study were included in the main study sample.

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Fieldwork

An approval letters was obtained from the Dean of Faculty of Nursing, Helwan University for director of outpatient clinics at Elsalam hospital, Port Said City, which affiliated to Comprehensive Health Insurance, Ministry of Health, Egypt.

Data was collected by the researcher in a period of 6 months (from beginning of December 2021 to end of May 2022). The data collection tools were conducted in Ear, Nose & Throat (ENT) and Internal medicine outpatient clinics. Elderly's informed consent were obtained, assured that the obtained information was kept confidentiality and used only for the purpose of the study. The researcher was conducted the study by distribution of the tool for them as pretest.

Health intervention program to improve balance disorders and prevent falls for elderly was developed based on the results obtained from the pretest questionnaire.

The effect of the intervention program was assessed after the end of the program by using the same tool one time only. The researcher interviews the elderly 2 days per week (Sunday and Wednesday) during the morning shift; 10 am - 1 pm, the researcher was taken 30-45 minutes with each elderly to fill the study tool.

Health intervention program to improve balance disorders and prevent falls for elderly was conducted in four phases:

1st preparatory phase: Tools for data collection development based on review of the past & current related literature covering various aspects of the study by using available books, periodical articles and magazines. The aim is to get acquainted with the research problem to develop the study tools.

2nd assessment phase: By using pre-test questionnaire to assess elderly knowledge about meaning balance disorders and falls, causes balance disorders and falls, symptoms, signs balance disorders and falls, risk that need physician counseling about balance disorders, complications of fall, extrinsic factors that increase fall exposure, risk of fall cause by and ways to make home safety…etc, and reported practices about berg balance scale and hendrich fall risk model.

3rd planning and implementation phase: By developing the health intervention program contents. In this phase the researcher implemented the intervention program sessions, with the clearance of general objectives as follow:

-By the end of the intervention program, the elderly was able to improve their knowledge meaning balance disorders and falls, causes balance disorders and falls, symptoms, signs balance disorders and falls, risk that need physician counseling about balance disorders, complications of fall, extrinsic factors that increase fall exposure, risk of fall cause by and ways to make home safety…etc, and reported practices about berg balance scale and hendrich fall risk model. -The program was done through four theoretical and practical sessions each session lasted 30-40 minutes and immediately did the post test.

Elderly were divided into 15 groups, each group consists of 5-6 elderly, and each group took 1-2 week (2 elderly per day). The program was implemented within six months. By the end of each session, the elderly were informed about the content of the next session, its time and a brief summary was given emphasizing the most important points.

Health Education Program Booklet

A booklet including all content of the program it was design and given to elderly as an educational reference during and after the program implementation. Contents of booklet including theoretical part as (meaning of balance, balance benefits, factors that affect elderly’s ability to maintain balance, meaning of balance disorders, types of balance disorders, common symptoms of balance disorders, causes of elderly’s balance disorders, effect of some drugs on elderly’s balance, signs and risks that you should consult a doctor when they appear, scales to determine the health of body balance, strategies to help the elderly maintain balance, meaning

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of fall, risk factors that lead to falls, causes of fall, complications of fall, the importance of keeping the elderly from falling, fall prevention methods. And Practical part include: Otago exercise and Epley maneuver.

Teaching methods

Lecture/ group discussion

Demonstration/ re-demonstration

Brain storming

Media:

Pictures and data show.

Handout prepared by the researcher.

Colored posters and videos

Four sessions (2 theoretical sessions and 2 practical sessions)

The pretest knowledge questionnaire, Berg balance scale and Hendrich II Fall Risk model was collected from elderly (pre-program assessment).

Inform the elderly that each session started by summary about the previous session and objectives of new topics.

First session: At the beginning of the first session, the researcher welcomes and introduce self to elderly, an orientation to the program was given, and take informed consent of elderly, set an agreement on the time and duration of sessions. The researcher provide a trust, warm and secure atmosphere between elderly group to relieve anxiety, tension, and increase the motivation to participate in all sessions of the intervention program. Begin with the content of the booklet, provide introduction about meaning balance disorders, symptoms, causes, complications taking into consideration the use of clear and simple language. Discussion, motivation and reinforcement during session were used to enhance learning.

Second session: Meaning of falls, causes and risk factors by Arabic booklet developed by researcher

Third session: Performing Otago strength and balance training exercise program based on the result of the pre-test the researcher was do.

-Meeting the elderly was done in waiting area of outpatient clinic.

Fourth session: Performing the EPLY maneuver to enhance balance.

4th evaluation phase: This phase aimed to evaluate the effect of health intervention program on elderly's knowledge and reported practices about berg balance scale and hendrich fall risk model.

Post-test was done immediately after implementation of the health intervention program.

Ethical considerations:

An official permission to conduct the proposed study was obtained from the Scientific Research Ethics Committee, Faculty of Nursing, Helwan University. Participation in the study was voluntary and subject was given complete full information about the study and their role before signing the informed consent. The ethical considerations were included explaining the purpose and nature of the study, stating the possibility to withdraw at any time, confidentiality of the information where it was not be accessed by any other party without taking permission of the participants. Ethics, values, culture and beliefs were respected.

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Statistical analysis:

The collected data were organized, tabulated and analyzed using appropriate statistical test. The data were analyzed by using the Statistical Package for Social Science (SPSS) version 24, which was applied to calculate frequencies, percentages, mean and standard deviation, as well as test statistical significance, associations by using Chi-square test (x2), is a test used to study association between two qualitative variables, and matrix correlation to detect the relation between the variables for (p value). It considered as follows: Highly statistically significant at $p < 0.001$, statistically significant when $p < 0.05$ and not significant when $p > 0.05$.

RESULTS

Table (1): Indicates that, 63.6 % of studied elderly were males, 53.2 % of them their ages were more than 65 years, the mean age of elderly were 68.5 ±6.7 year. Related to marital status, 46.8 % of the elderly were married. According to elderly's education, 46.8% of them were had basic education and 55.8 % of them weren't worked. In addition, 44.2 % of the elderly their source of income were pensions and 58.4 % of them their income not enough. According to living with 46.8 % of them were lived with their husbands/wife.

Figure (1): Illustrates that, 56% of elderly were visited the cardiothoracic clinic. And 44% of them visited the ear-nose &throat clinic.

Table (2): Shows that, 35.1 % of the elderly had suffered from certain disease in family history. 63% of the elderly had suffered from tumors and 85.2 of them had diabetes. According to enter the hospital during last year, 58.4% of them didn't enter hospital and 50.0% of them had entered the hospital for medication. 59.7% of them falled during the last 12 months, 52.2 of them falled once, 76.1% of elderly who falling had ability to standup alone. 80.4% of them injured due to falling.

Table (3): Indicates that, 57.1% of the elderly suffer from certain diseases. 88.6% of them suffered from hypertension, 97.4% of them take medications now. 34.7% of them take heart medications and 61.3% of them take anticoagulants medication. 64.9% of the elderly take their medications regularly. 54.5% of them currently non-smokers. 100% of the elderly currently didn`t practice any sports regularly, 66.2% of the elderly lose their balances even if they didn`t fall and 70.6% of them stopped current activities due to loss of balance. 57.1 % of them had the ability to care of themselves.

Table (4): Reveals that, there was a marked improvement in elderly's knowledge post intervention program with highly statistically significant difference at (P= 0.001), As evidenced, 22.1% of elderly didn't know about causes of balance disorder pre intervention program, While this decreased to 10.4% post intervention program. And statistically significant difference at (P= 0.005). As evidenced, 18.2% of elderly didn't know symptoms and signs of fall pre intervention program. While this decreased to 7.8% post intervention program.

Figure (2): Illustrates that, 59.8% of elderly had unsatisfactory total knowledge pre intervention program. While improved to 23.4% of them had unsatisfactory total knowledge post intervention program. And 40.2 of them had satisfactory total knowledge pre intervention program. While this improved to 76.6 of them had satisfactory total knowledge post intervention program.

Table (5): Indicate that, there was highly statistically significant improvement in all items of elderly reported practices about berg balance scale post intervention program, as evidenced by 44.2% of the elderly **unable to do** response of setting to standing pre intervention program, which decreased to 13.0% post intervention program. Also 62.3% maximum assist needed response of pick up object from the floor from a standing position, which decreased to 36.4% post intervention program. And 61.0% unable to do response of Turn 360 degrees, which decreased to 26.0% post intervention program.

Figure (3): Reveals that, 84.4 % of elderly had impairment of balance pre intervention program, which decreased to 36.4 % post intervention program, while 15.6 % of them had acceptable balance performance, which improved to 58.4 % post intervention program. In pre intervention no one elderly had good balance performance, which improved to 5.2 % post intervention.

Table (6): Indicates that, there was slightly improvement in elderly reported practices about hendrich II fall risk model post intervention program, as evidenced by, 49.4% of elderly had confused pre intervention program, which decreased to 37.7%. Also no one of them had ability to rise in a single movement - no loss of balance with step pre intervention, which improved to 49.4 %. And 26.0% of them had multiple attempts but successful, which become 5.2% post intervention program.

Figure (4): Shows that, 10.4% of elderly had no risk pre intervention program to become 32.5% post intervention program, 89.6% had high risk pre intervention program to become 67.5% post intervention program.

Table (1): Frequency Distribution of Elderly regarding Demographic Characteristics (n=77)

Demographic characteristics	No	%
Gender		
Male	49	**63.6**
Female	28	36.4
Age (Years)		
60 – 65	36	46.8
> 65	41	**53.2**
Mean ±SD 68.5 ±6.7		
*** Marital Status**		
Married	36	**46.8**
Widowed	24	31.2
Divorced	17	22.1
Educational level		
No read and write	4	5.2
Basic education	36	**46.8**
Secondary education	24	31.2
University education or higher	13	16.9
Do you work currently?		
Yes	34	44.2
No	43	**55.8**
Source of Income		
Pension	34	**44.2**
Children assistance	8	10.4
Current work	31	40.3
Relative's assistance	4	5.2
**** Income level**		
Not enough	45	**58.4**
Enough	32	41.6
Who are you living with?		
Husband / Wife	36	**46.8**
With children	18	23.4
Alone	23	29.9

None of elderly were single ** None of elderly had enough and save income

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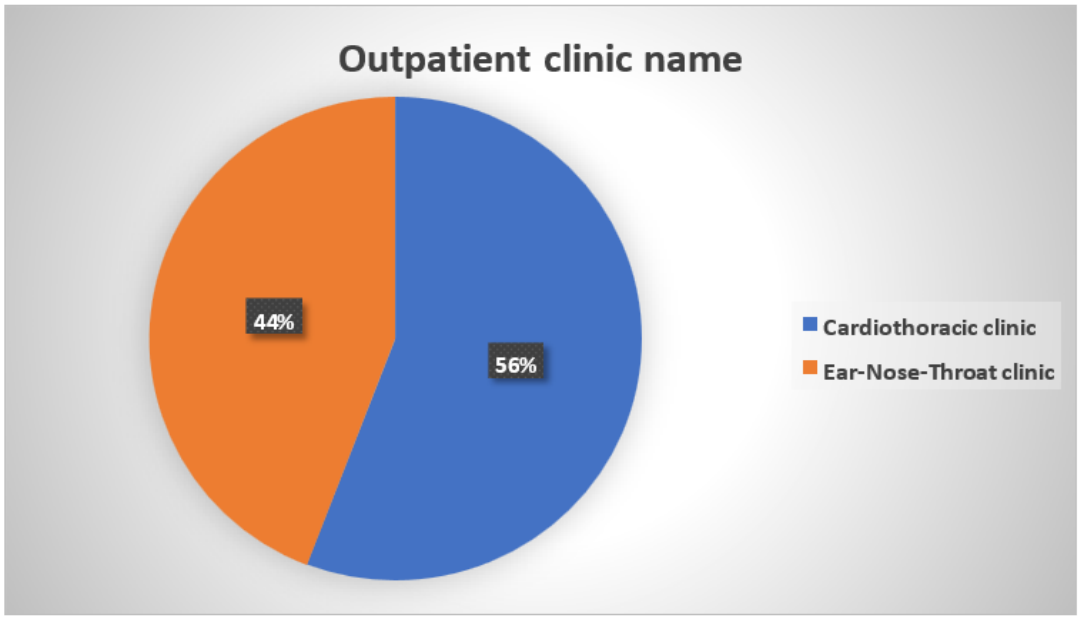

Figure (1): Percentage Distribution of the Elderly according to Outpatient Clinic attendance (n=77)

Table (2): Frequency Distribution of Past History for the Elderly (n=77)

Past history items	No	%
History for certain disease in the family history		
Yes	27	**35.1**
No	50	64.9
***If yes, do you suffer from: (n=27)**		
Tumor	17	**63.0**
Hypertension	15	55.6
Diabetes	23	**85.2**
Enter the hospital during last year		
Didn't enter	45 6	**58.4**
Once		7.8
Twice	9	11.7
Three times	17	22.1
Reason of entering hospital (n=32)		
Diagnosis	14	43.8
Medication	16	**50.0**
Surgery	2	6.2
Fall during the last 12 months		
Yes	46	**59.7**
No	31	40.3
If yes,		
Number of falls (n=46)	24	**52.2**
Once	17	37.0
Twice	3	6.5
Three times	2	4.3
Four times		
Ability to standup alone		
Yes	35	**76.1**
No	11	23.9
Injury from fall		
Yes	37	**80.4**
No	9	19.6

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Fear of fall again		
Yes	41	89.1
No	5	10.9
The surrounding environment cause falling		
Yes	43	93.5
No	3	6.5

The elderly have more than one family history of disease

Table (3): Frequency Distribution of Present History for the Elderly (n=77)

Present history items	**No**	**%**
Suffer from certain diseases		
Yes	44	**57.1**
No	33	42.9
***If yes, what kind of disease? (n=44)**		
Hypertension	39	**88.6**
Diabetes	36	81.8
Heart diseases	25	56.8
Arthritis	24	54.5
Renal failure	11	25.0
Take medications		
Yes	75	**97.4**
No	2	2.6
***If yes, what medications do you take? (n=75)**		
Heart medications	26	**34.7**
Hypertension medications	39	52.0
Diabetics	35	46.7
Anticoagulants	46 6	**61.3** 8.0
Pain killers	26	34.7
Bronchodilators		
Take medications regularly		
Yes	50	**64.9**
No	27	35.1
Specific habits Smoking		
Yes	35	45.5
No	42	**54.5**
Practice sports regularly		
Yes	0	0.0
No	77	**100.0**
Loss balance even if you didn't fall		
Yes	51	**66.2** 33.8
No	26	
If yes, stop current activity due to loss of balance (n=51)		
Yes	36	**70.6**
No	15	29.4
Do you have the ability to take care of yourself?		
Yes	44	**57.1**
No	33	42.9
If not, who cares about you? (n=33)		
Husband / Wife	17	51.5
Children	9	27.3
Relatives	7	21.2

* The elderly have more than one response

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Table (4): Statistical Difference of the Elderly Knowledge regarding Balance Disorder and Falling Pre and Post Intervention Program (n=77)

	Pre – Intervention			**Post – Intervention**			**Chi – Square**							
Balance Disorder Knowledge Items	**Complete Correct**	**Incomplete Correct**	**Don't know**	**Complete Correct**	**Incomplete Correct**	**Don't know**								
	No	**%**	**No**	**%**	**No**	**%**	**No**	**%**	**No**	**%**	**No**	**%**	**X^2**	**P-Value**
Meaning of balance disorder	38 34	49.4 44.2	24 26	31.2 33.8	15 **17**	19.5 **22.1**	60	77.9 87.0	9 12	11.7 15.6	8 **8**	10.4 **10.4**	13.887 18.639	<0.001** <0.001**
Causes of balance disorder							67							
Symptoms of balance disorder	24	31.2	26	33.8	26	33.8	58	75.3	10	13.0	9	11.7	29.460	<0.001**
Signs and risk that need physician counseling	55	71.4	11	14.3	11	14.3	67	87.0	6	7.8	4	5.2	5.917	0.051
Factors affect on elderly body balance	23	29.9	29	37.7	25	32.5	64	83.1	8	10.4	5	6.5	44.574	<0.001**
Effect of medications on balance disorder	58	75.3	11	14.3	8	10.4	69	89.6	6	7.8	2	2.6	6.023	0.049*
Negative effects for balance disorder	25	32.5	34	44.2	18	23.4	61	79.2	11	14.3	5	6.5	34.173	<0.001**
Nutritional supplements help[balance	26	33.8	34	44.2	17	22.1	60	77.9	11	14.3	6	7.8	30.458	<0.001**
Exercises to strengthening lower limbs	15	19.5	41	53.2	21	27.3	62	80.5	10	13.0	5	6.5	57.377	<0.001**
Falling Knowledge Items														
Meaning of fall	13	16.9	24	31.2	30	39.0	66	85.7	6	7.8	5	6.5	63.827	<0.001**
Causes of falls	37	48.1	26	33.8	16	20.8	68	88.3	6	7.8	3	3.9	30.526	<0.001**
Symptoms and signs of fall	49	63.6	14	18.2	14	**18.2**	67	87.0	7	9.1	6	**7.8**	8.272	0.016*
Complications of fall	27	35.1	36	46.8	14	18.2	56	72.7	11	14.3	10	13.0	24.097	<0.001**
Extrinsic factors that increase fall exposure	48	62.3	17	22.1	12	15.6	68	88.3	7	9.1	2	2.6	14.757	<0.001**
Risk factors that cause fall	12	15.6	37	48.1	28	36.4	64	83.1	7	9.1	6	7.8	70.268	<0.001**

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Ways to make home safety	24	31.2	34	44.2	19	24.7	64	83.1	8	10.4	5	6.5	42.443	<0.001**
Measures used to prevent fall	8	10.4	45	58.4	24	31.2	65	84.4	6	7.8	6	7.8	85.130	<0.001**
Methods used to prevent fall	33	42.9	22	28.6	22	28.6	63	81.8	9	11.7	7	9.1	22.563	<0.001**

Statistically significant at p-value ≤ 0.005

** Highly statistically significant at p-value ≤ 0.001.

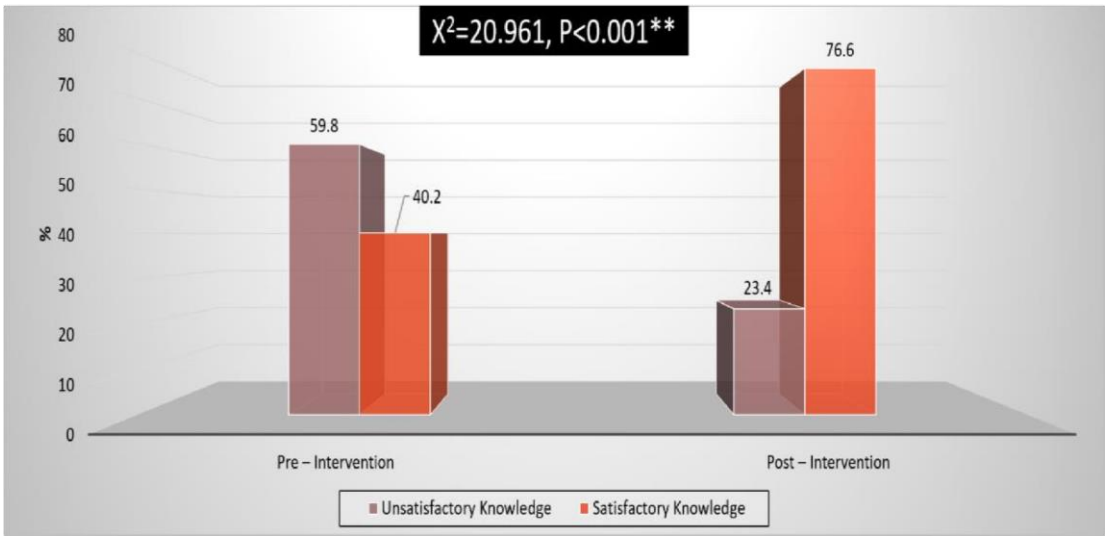

Figure (2): Percentage Distribution of the Elderly according to Total Knowledge Score Pre & Post

Intervention Program (n=77)

Table (5): Statistical Difference of the Elderly reported practices according to Berg Balance Scale Pre and Post Intervention Program (n=77)

	Pre – Intervention										**Post – Intervention**										**Chi – Square**	
Berg balance scale items	**Unable to do**		**Maximum assist needed**		**Moderate assist needed**		**Minimum assist needed**		**Independent**		**Unable to do**		**Maximum assist needed**		**Moderate assist needed**		**Minimum assist needed**		**Independent**			
	No	**%**	**No**	**%**	**No**	**%**	**No**	**%**	**No**	**%**	**No**	**%**	**No**	**%**	**No**	**%**	**No**	**%**	**No**	**%**	**X^2**	**P- value**
Setting to																						
standing	34	**44.2**	33	42.9	5	6.5	5	6.5	0	0.0	10	**13.0**	16	20.8	12	15.6	30	39.0	9	11.7	48.7	<0.001**
Standing																						
unsupported	36	46.8	37	48.1	3	3.9	1	1.3	0	0.0	8	10.4	26	33.8	31	40.3	12	15.6	0	0.0	52.1	<0.001**
Setting with back unsupported but feet supported on floor or																						

on a																						
stool	40	51.9	21	27.3	9	11.7	7	9.1	0	0.0	26	33.8	0	0.0	0	0.0	38	49.4	13	16.9	67.3	<0.001**
Standing to																						
setting	38	49.4	22	28.6	5	6.5	12	15.6	0	0.0	26	33.8	8	10.4	12	15.6	31	40.3	0	0.0	20.1	<0.001**
Transfers	19	24.7	37	48.1	19	24.7	2	2.6	0	0.0	9	11.7	26	33.8	0	0.0	29	37.7	13	16.9	61.0	<0.001**
Standing unsupported with eyes																						
closed	32	41.6	25	32.5	19	24.7	1	1.3	0	0.0	18	23.4	8	10.4	30	39.0	10	13.0	11	14.3	33.5	<0.001**
Standing unsupported with feet																						
together	41	53.2	33	42.9	0	0.0	3	3.9	0	0.0	28	36.4	9	11.7	0	0.0	31	40.3	9	11.7	48.2	<0.001**
Reaching forward without stretched armed																						
while standing	10	13.0	43	55.8	20	26.0	4	5.2	0	0.0	0	0.0	28	36.4	39	50.6	10	13.0	0	0.0	21.9	<0.001**

Table (5): Continue…

Pick up object from the floor from a standing																						
position	21	27.3	48	**62.3**	4	5.2	4	5.2	0	0.0	2	2.6	28	**36.4**	7	9.1	40	51.9	0	0.0	51.2	<0.001**
Turning to look behind over left and right shoulder while																						
standing	43	55.8	27	35.1	7	9.1	0	0.0	0	0.0	29	37.7	18	23.4	20	26.0	10	13.0	0	0.0	20.8	<0.001**
Turn 360																						
degrees	47	**61.0**	23	29.9	7	9.1	0	0.0	0	0.0	20	**26.0**	28	36.4	18	23.4	11	14.3	0	0.0	27.2	<0.001**
Place alternate foot on step or stool while standing																						

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unsupported	28	36.4	42	54.5	4	5.2	3	3.9	0	0.0	17	22.1	30	39.0	18	23.4	12	15.6	0	0.0	18.9	<0.001**
Standing unsupported																						
one foot in front	38	49.4	35	45.5	2	2.6	2	2.6	0	0.0	20	26.0	18	23.4	8	10.4	31	40.3	0	0.0	40.1	<0.001**
Standing on one																						
leg	42	54.5	29	37.7	6	7.8	0	0.0	0	0.0	28	36.4	9	11.7	29	37.7	11	14.3	0	0.0	39.4	<0.001**

** Highly statistically significant at p-value ≤ 0.001.

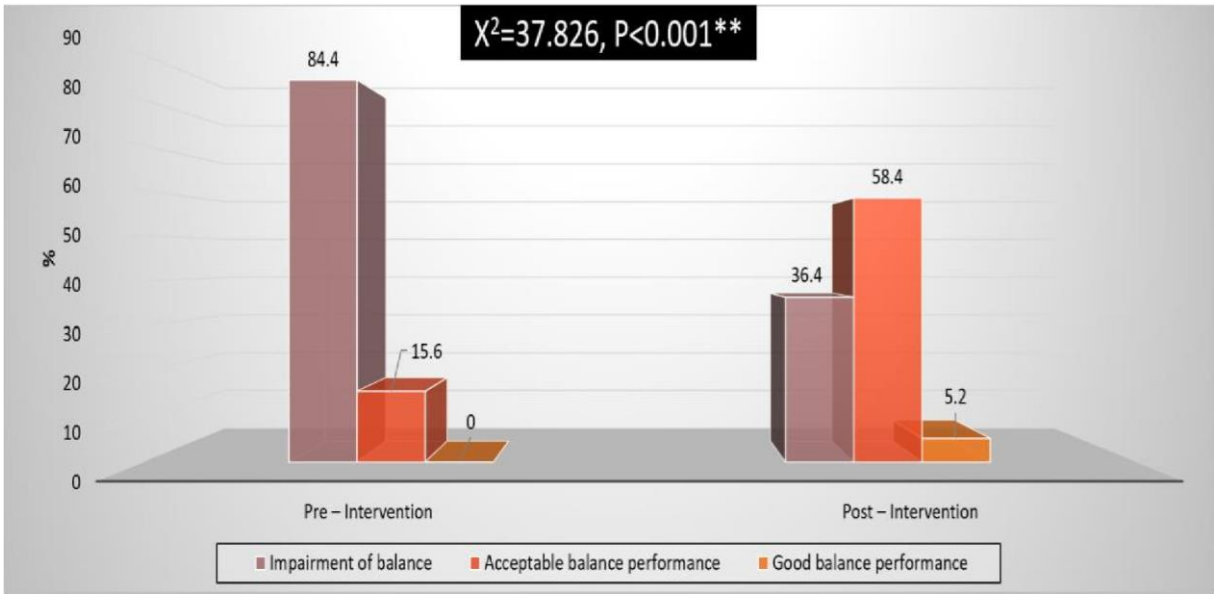

Figure (3): Percentage Distribution of the Elderly Reported Practices according to Total Score of

Berg Balance Scale Pre and Post Intervention Program (n=77)

Table (6): Statistical Difference of the Elderly Reported Practices according to Hendrich II Fall Risk Model Score Pre & Post Intervention Program (n=77)

Fall Risk Factors	**Pre – Intervention**		**Post – Intervention**		**Chi–Square**	
	No	**%**	**No**	**%**	**X^2**	**P- value**
Confusion, Disorientation, Impulsivity						
Un-confused	39	50.6	48	62.3		
Confused	38	**49.4**	29	**37.7**	2.140	0.144
Symptomatic Depression						
Un-depressed	27	35.1	27	35.1		
Depressed	50	64.9	50	64.9	0.000	1.000
Altered Elimination						
Normal elimination	9	11.7	9	11.7		
Urinary incontinence	68	88.3	68	88.3	0.000	1.000
Dizziness Vertigo						
No history of dizziness and vertigo	10	13.0	10	13.0		
Have history of dizziness and vertigo	67	87.0	67	87.0	0.000	1.000
Male gender						
Women gender	28	36.4	28	36.4		

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Male gender	49	63.6	49	63.6	0.000	1.000
Any administered antiepileptics						
No history of taking antiepileptics	36	46.8	36	46.8		
Have history of taking antiepileptic	41	53.2	41	53.2	0.000	1.000
Any administered Benzodiazepines						
No history of taking benzodiazepines	30	39.0	30	39.0		
Have history of taking benzodiazepines	47	61.0	47	61.0	0.000	1.000
Get up & Go test						
Ability to rise in single movement- no loss of balance with step	0	**0.0**	38	**49.4**		
Pushes up, successful in one attempt	11	14.3	21	27.3		
Multiple attempts, but successful	20	**26.0**	4	**5.2**		
Unable to rise without assistance during rest	46	59.7	14	18.2	68.858	<0.001**

** Highly statistically significant at p-value ≤ 0.001.

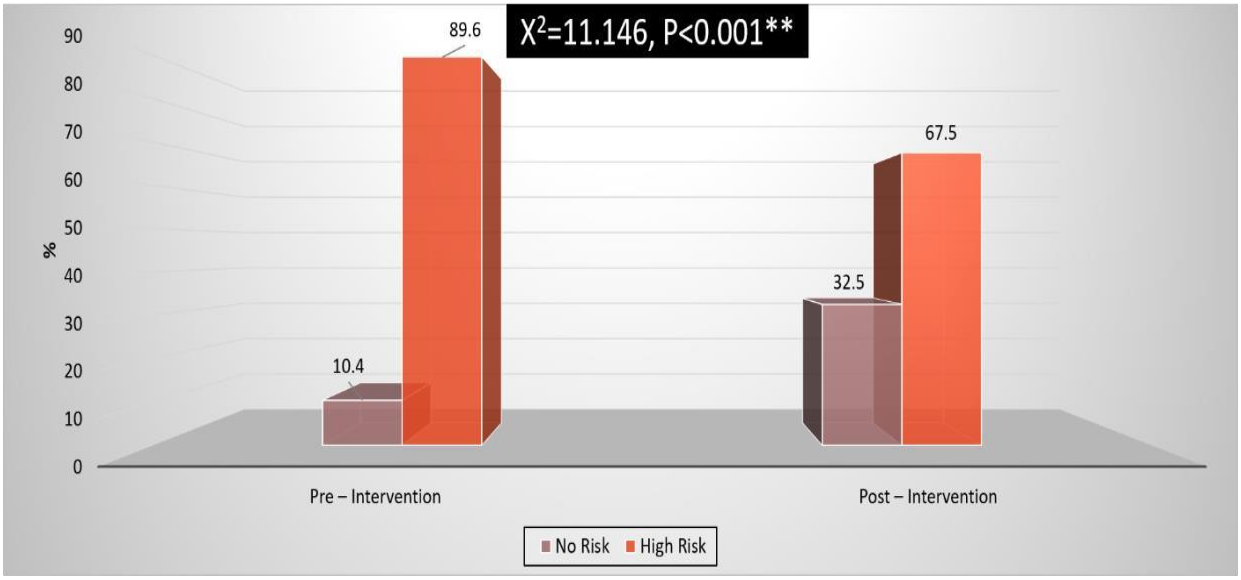

Figure (4): Percentage Distribution of the Elderly Reported Practices according to Total Hendrich

II Fall Risk Model Score Pre & Post Intervention Program (n=77)

DISCUSSION

Falls are an extreme trouble among the aged population. Balance problems are a main cause of falls and may lead to worry about falling and reduced self-belief. Latest evidence had cautioned that a multi-issue workout intervention specializing in flexibility, strength, balance, and patience can effectively improve stability, mobility, and physical overall performance in addition to reducing the prevalence of falls and falls-related accidents in the elderly **[19].** This study aimed to evaluate the effect of a health intervention program to improve balance disorders and prevent falls among the elderly.

Part (I): Demographic characteristics of the elderly:

The findings of the present study revealed that, more than two-thirds of the elderly were males **(Table 1)**. This study was in the same direction with **[20]** in Portugal, who conducted study entitled "Effects of a "modified" Otago exercise program on the functional abilities and social participation of older adults living in the community" (n = 34) and found that 76.47% of the studied elderly were males. While disagreed with **[21]** in Thailand, who conducted study titled "Effects of modified-Otago exercise program on four components of actual balance and perceived balance in healthy older adults" (n = 16) and reported that 93.75% of the studied elderly were female. From the researcher point of view, this result may due to increase prevalence rate in

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elderly women because they have a consequence of the decline in their bone mass that occurs faster than that of men specifically after menopause.

Concerning age, the present results clarified that, more than half of the studied elderly were more than 65 years. This result was in agreement with **[22]** in Canada, who conducted a study entitled "Association of balance function with all-cause and cause-specific mortality among US adults" (n= 5816) and found that 61.9% of the participants were aged 65 years or older. From the researcher point of view, this result may due to increased prevalence of this disease in this age group and chronic diseases more common (hypertension, diabetes and dementia) that need polypharmacy and may elderly forgotten their treatment or repetition of it which led to increase risk factors to loss of balance and fall.

Regarding to the income, the current results showed that, less than half of the studied elderly their main source of income were pensions. While, nearly two thirds of them mentioned that their income was not enough. This result in line with **[23]** in Egypt, who conducted study entitled "The information needs and behavior of the Egyptian elderly living in care homes" (n=63) and found that 28.6% of participants were labelled as average-income people, where they were paid E£1501– 2000 (Egyptian pounds) per month through monthly pensions.

While I disagreed with **[24]** in Egypt, who conducted a study entitled "Factors Affecting Medication Adherence among Elderly in Rural Areas" (n= 120) and reported that 56.7% of the studied elderly had sufficient income.

Also, the current result is in agreement with **[25]** in Egypt, who conducted a study entitled

"Vulnerable older populations without special health care in Egypt: A need for assessment & reform" (n = 53) and reported that 71.3% mentioned that one of the main problems that elderly people might face is the decreased income due to inability to work, pensions, or lack of skills and competency to keep up with the changing work requirements. This result may be because the pensions for the Egyptian elderly are not in line with the conditions of the rising prices in Egypt.

Part (II): Medical history (past and present):

Related to history for the elderly, more than one third of the studied elderly mention they suffer from certain diseases in family history, and the majority of those elderly suffer from diabetes, and half of them enter the hospital for taking medication **(Table 2)**. This findings in the same line with **[26]** in Thailand, who conducted study entitled "Effects of a simple home-based exercise program on fall prevention in older adults: A 12-month primary care setting, randomized controlled trial" (n=439) and found that 74.4% suffering from hypertension, 37.9% suffering from diabetes, 57.9% suffering from osteoarthritis. From the researcher's point of view, these results are due to normal physiological function changes that associated with the aging process and may be due to genetic factors.

The current results showed that less than two-thirds of the studied elderly had fallen during the last 12 months, and more than half of the elderly had fall once. While more than three-quarters of them were able to stand up alone, and majority of them had an injury from a fall and the majority of them fear from fall again. These findings were inconsistent with the study by **[27]** who reported that 58.82% of the study sample didn't had history of falls in the last 12 months, 85.29% had fear of falling, and 73.53% use upper extremities assistance to stand from a chair. From the researcher point of view, this result might be because of the studied elderly related chronic diseases such as hypertension, diabetes and due to change in gait regarding aging process that make them easy to expose falling, also due to lack of knowledge about surrounding environment modifications to consist with the elderly to prevent falls.

This rational in line with **[28]** In Egypt, who conduct a study entitled "Effect of a fall prevention program for elderly persons attending a rural family medicine center" (n= 100) and found that home modifications included removal of tripping hazards 62%, installing grab bars next to the toilet and in the bathtub or shower 5%, using non-slip mats in the bathtub and on shower floors 43%, putting handrails on both sides of stairways 16% and improving home lighting 36% may be effective in reducing falls.

Related to present history for the elderly, more than half of the studied elderly mention they suffer from certain diseases, and the majority of elderly suffer from hypertension **(Table 3)**.

This result was supported by **[29]** in Egypt, who conducted a study entitled "Otago exercise program: A golden technique on health status and risk of falls among older adults with chronic diseases" (n= 48) and found that 60.4% of incidence chronic disease among studied elderly was hypertension. From the researcher point of view, this result may be due to normal physiological aging changes, unhealthy lifestyle and stressors.

Concerning loss of balance, more than three fifths of the studied elderly were losing their balance even if they didn't fall and they stopped doing things due to loss of balance. This result in the same line with **[30]** in Turkey who conducted a study "The effect of fear of falling on balance and dual task performance in the elderly" (n= 60) and reported that (36.7%) of the studied elderly mentioned they had a history of loss of balance without fall incidence in the past year. From the researcher's point of view, this result may be due to changes in gait due to the aging process.

Concerning the ability to take care of herself, more than half of the studied elderly had the ability to take care of themselves, and more than half of them receive their care from their wives/ husbands. This result was supported by **[31]** in Iran, who conducted a study entitled "Design, implementation and evaluation of informal home care support intervention program for lonely older adults in the community" (n = 32) and said that 56.4% of the studied elderly of the studied aged had been able to care for themselves. From the researcher's point of view, this result may be due to the loss of motor function related to the normal aging process.

Research hypothesis:

The following results proved the research hypothesis, which stated that a health intervention program would improve elderly knowledge and reported practices about balance disorders and fall prevention.

Part (III): Knowledge of the elderly about balance disorders and falls:

The current study indicated that there was a marked improvement in the elderly's knowledge about balance disorders and falls in post-implementation of the intervention program, with a highly statistically significant difference. As evidence, the majority of the studied elderly had complete correct answers post implementation of the intervention about the causes of balance disorder, and a statistically significant difference. As evidence, the majority of the studied elderly had complete correct answers post implementation of the intervention about the signs and symptoms of fall (**Table 4).**

These findings were supported by **[32]** in Spain, who conducted a study entitled

"Effectiveness of feedback-based technology on physical and cognitive abilities in the elderly" (n=200) and revealed that there was improvement in the studied elderly feedback compared with the results before implementation of the intervention regarding signs and symptoms of fall (97.5%), causes leading to balance disorder (95.8%). From the researcher's point of view, this result may be due to consistent presentation using simple language, wide explanation, and clear educational methods as using posters, PowerPoint handouts and instructional media, including video. In addition, the researcher had provided enough time for discussion and answered questions for further clarification.

About elderly total knowledge regarding balance disorders and fall pre and post-intervention program, the current study indicated that there was a marked improvement post-intervention program with a highly statistically significant difference ($p<0.001$). This evidence in that more than three-quarters of the studied elderly had satisfactory total knowledge post-intervention program **(Figure 2)**.

This result in agreement with **[10]** in Egypt, who conducted study entitled "Risk of falls and effect of a health education program in prevention of falls among elderly in geriatric homes in Cairo, Egypt" (n = 120) and revealed that there was a statistically significant improvement in the knowledge scores of elderly participants in both post-intervention and follow-up phases as compared to pre-intervention phases ($P<0.01$).

Part (IV): Elderly reported practices about Berg balance Scale pre and post intervention program:

The current study revealed that there was a marked improvement in all items of elderly reported practices about balance, Berg balance scale post intervention program with highly statistically significant difference. As evidence, more than two fifth of the studied elderly unable to do response of setting to standing pre the intervention program, which decreased to a minority of them post intervention program. Also, more than half of the studied elderly had maximum assist needed response of pick-up object from the floor from a standing position, which decreased to more than one-third post-intervention program. Whereas, more than a half of the studied elderly were unable to do response by turning 360 degrees, which decreased to nearly one quarter post-intervention program **(Table 5).**

This result was supported by **[33]** in United States, who conducted a study entitled "Disseminating the Otago exercise program: Perceived and actual physical performance improvements from participants" (n = 210) and found that there was significant improvement in the studied subjects functional movements post the Otago Exercise Program implementation such as reporting no difficulty in walking across a room (p = .008), walking one block (p = .003), stooping/crouching/kneeling (p = .001), getting out of a straight-back chair (p < .001), and climbing one flight of stairs (p = .004). From the researcher's point of view, this improvement may be due to the improvement in the studied elderly's level of knowledge regarding balance disorders, which reflected on considered her practices that as an indicator of the positive impact of performing Otago exercise.

Also, this result was in agreement with **[34]** in Serbia, who conducted study entitled "The effectiveness of group Otago exercise program on physical function in nursing home residents older than 65 years: A randomized controlled trial" (n=38) and found that there was significant improvement within participants' Berg Balance Scale (p<0.001) after implementation of Otago exercise program.

Concerning total score of berg balance scale pre and post intervention program, the present study indicated that, there was a marked improvement. As evidence, the majority of the studied elderly had impairment of balance pre-intervention program, which decreased to more than one-third post-intervention. While less than one-fifth of them had acceptable balance performance, which improved to more than half post intervention program. In pre intervention no one elderly had good balance performance, which improved to minority post intervention program **(Figure3)**.

This result was in agreement with **[35]** in Egypt, who conducted a study entitled "Assess the effect of exercises program on balance and prevention of recurrent falling among elderly people" (n=80) and revealed that, there were improvement in balance scores which increased from (15%) in first observation to (80%) in last observation after intervention. From the researcher point of view, this result may be due to the effect of educational program and the Otago exercise intervention which improve muscle strength and balance disorder problems.

Part (V): Elderly reported practices about Hendrich II fall risk model score pre and post intervention program:

The current study revealed that, there was slightly improvement pre and post-intervention program regarding risk factors of falls. As evidence, improvement in altered elimination and dizziness-vertigo. While there was a marked improvement in the Get up & Go test. As evidence, one of the studied elderly could rise in a single movement- with no loss of balance in step pre-intervention, which improved to less than half of them, and more than half of them were unable to rise without assistance during rest, which improved to a minority of them **(Table 6)**.

This findings in agreement with **[36]** in Pakistan, who conducted study entitled "Effects of half-somersault and brandt-daroff exercise on dizziness, fear of fall and quality of life in patients with posterior canal benign paroxysmal positional vertigo: A randomised control trial" (n= 20) and reported that there was significant improvement in risk fall scores (p < 0.05) among the studied participants after implementation of Epley's maneuver. From the researcher's point of view, this result may be due to the effect of health intervention, including Epley's maneuver and knowledge about fall risk protective measures.

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According to the total score of the Hendrich II fall risk model pre and post intervention program, minority of the studied elderly had no risk pre intervention program. To become more than one third post intervention program, the majority of them had a high risk pre intervention program to become about two thirds post intervention program **(Figure 4).**

These findings were in accordance with **[37]** in Canada, who conducted study entitled "Effect of a home-based exercise program on subsequent falls among community-dwelling highrisk older adults after a fall a randomized clinical trial" (n= 172) and found that there was statistically significance difference (P = 0.006) in fall risk among the studied elderly after intervention. From the researcher point of view, this result may be due to the effect of health intervention program that enhanced elderly balance and they were interested to know how to prevent fall.

CONCLUSION

The current study demonstrated that implementing a health intervention program for elderly individuals significantly improved their knowledge regarding balance disorders and fall prevention, as well as their functional balance performance. Post-intervention, the majority of participants achieved satisfactory knowledge scores, and there was a marked reduction in balance impairment as measured by the Berg Balance Scale. Moreover, the proportion of the elderly with low or no fall risk increased, indicating the program's positive effect on fall prevention.

Despite these improvements, a proportion of participants remained at high risk of falling, reflecting the influence of persistent intrinsic factors such as chronic diseases and polypharmacy. Therefore, health education alone, while essential, should be complemented with regular follow-up and individualized interventions to achieve comprehensive fall risk reduction.

RECOMMENDATIONS

Based on the study findings, the following recommendations are proposed:

1. **Continuous Health Education Programs:**

- Provide regular educational sessions for elderly individuals in outpatient clinics and community settings about balance disorders, fall risk, and preventive strategies.

2. **Balance and Strength Training:**

- Encourage elderly individuals to engage in simple, structured balance and lower-limb strengthening exercises under supervision to improve stability and reduce fall risk.

3. **Routine Fall Risk Assessment:**

- Integrate screening tools such as the **Berg Balance Scale** and **Hendrich II Fall Risk Model** into routine geriatric assessments to identify high-risk individuals early.

4. **Multidisciplinary Approach:**

- Collaborate with physicians, physical therapists, and community health nurses to address intrinsic and extrinsic fall risk factors, including medication review, chronic disease management, and home safety assessment.

5. **Community and Policy Implications:**

- Establish community-based fall prevention programs and health campaigns to raise awareness and promote a culture of safe aging.

- Policymakers should support programs aimed at reducing falls to minimize hospitalization, disability, and healthcare costs among the elderly population.

6. **Future Research:**

- Conduct randomized controlled trials with longer follow-up to evaluate the sustainability of knowledge and balance improvements and to assess the long-term effect on actual fall incidence.

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