Effect of Nursing Rehabilitation Program on Dizziness and Imbalance among patients with Peripheral Vestibular disorders

Hoda Abdou Abd El-Monem El-Deeb.
Lecturer of Medical-Surgical Nursing, Faculty of Nursing, Alexandria University, Egypt

Abstract

Background: Dizziness and imbalance are the most common patient's complaints results from Peripheral Vestibular disorders. Nursing interventions for Peripheral Vestibular disorders (PVD) patients are focus on assessment and prevention of potential problems, patient's teaching and educating vestibular rehabilitation exercises. **Aim of the study** was to evaluate the effect of nursing rehabilitation program on dizziness and imbalance among patients with peripheral vestibular disorders. **Research design:** A quasi experimental research design with a pretest-posttest control group was utilized. **Settings:** The study was conducted at otolaryngology clinic of the one-day treatment center, Alexandria Main University Hospital, Egypt. **Subjects:** Purposive samples of 60 adult patients were selected according to eligibility criteria. They were divided into two equal groups 30 in each study and control group. **Tools of data collection:** three tools were used to collect the necessary data namely: Structured interview questionnaire, Dizziness Handicap Inventory Scale and The Activities-specific Balance Confidence (ABC) Scale. **Results:** the study results revealed that there was a statistically significant difference between the study and control groups in favor of the study group in relation to all items physical, emotional and functional of Dizziness Handicap Inventory subscales at second and third assessment. Regarding levels of physical functioning balance there were statistically significant differences between both groups at the second and third assessment (P=0.005*& 0.001*). **Conclusion:** nursing rehabilitation program significantly improve dizziness and imbalance in patients with peripheral vestibular disorders. **Recommendations: t**he developed booklet with its straightforward instructions and illustrations should be utilized in hospitals as a teaching aid for patients with peripheral vestibular disorders.

Keywords: Nursing Rehabilitation Program, imbalance, dizziness, Peripheral Vestibular disorders
E-mail: hoda.abdo@alexu.edu.eg

Introduction

Peripheral vestibular disorders (PVD) include pathology of inner ear vestibular structures as well as the vestibular portion of the eighth cranial nerve. It affects 1 of 13 people in their lifetime and 80% of affected persons seek medical consultation. Patients younger than 50 year are more likely to have peripheral vestibular disorders and patients older than 50 generally have central vestibular disorders. Peripheral vestibular disorders include neuritis, labyrinthitis, bilateral vestibular loss, Meniere's, benign paroxysmal positional vertigo, and vestibulopathy following surgical procedures (e.g. labyrinthectomy and acoustic neuroma). Both PVD and CVD reduce the appropriate neural output for spatial orientation, postural control, and eye movement control **(Strupp ,Mandalà & Jose ,2019)**.

Dizziness and imbalance are the most common complaints results from PVD **(Ator, 2010)**. An estimated 90 million Americans (42% of the current population) experience dizziness at least once in their lifetime and most of them related to PVD. Some patients develop permanent balance deficits with subsequent functional limitations **(Timothy & Amede ,2009)**. In Egypt dizziness is a common complaint, representing about 10% to 5o% of visits to primary health care settings **(Mansour 2013)**.

Dizziness is a sensation of lightheadedness, faintness, or unsteadiness. Imbalance simply means unsteadiness or loss of equilibrium that is usually accompanied by spatial disorientation. Almost everyone experiences a few seconds of

spatial disorientation and dizziness in certain situations, this recovered rapidly and without recurrence. However, frequent episodes of dizziness and imbalance whether lasting only for a few seconds or days are a primary sign of a vestibular dysfunction, especially when linked to changes in head position (**Walker, Hall and Hurst, 2021**).

Dizziness and imbalance were found to cause impaired mental, physical and social functions. There is a strong positive correlation between dizziness and imbalance and increase risk of falling, which results in high incidence and high susceptibility to injuries. Worry of falls usually affects the patient's everyday activities, with a negative impact on his/her quality of life. Patients with balance problems seek medical advice from multiple specialties and usually they will be referred to the otolaryngologist, as the balance expert **(Petri M., Chirilă, Sorana and Cosgarea , 2017)**.

The nurse's as a health educator has great impact on public perceptions of peripheral vestibular disorders and its care. Patient education, defined as any set of planned educational activities designed to improve patients' health behaviors and health status. It is thought to be beneficial in helping patients to cope and co-operate with vestibular disorders and its manifestations. The nurse has the most extensive contact with PVD patients and bears the primary responsibility for assisting them relieving their dizziness and imbalance. Nurses are in a key position to implement nursing interventions and patient'ssince they are the health care providers who have continuous contact with patients and their families and have the best opportunities to assess and prevent potential problems, discuss medical regimen and give teaching about all aspects of care including PVD definition, manifestations, management and prevention of complications **(Lui, Lisa, Willner and Tadi 2020, Renga 2019)**.

Nursing interventions for PVD patients is focus also on educating the patients vestibular rehabilitation exercises. It is a form of physical exercises using head and trunk movements. It has been used since 1944 and has many forms of exercises include Brandt-Daroff exercises, Cawthorne-Cooksey exercises, viewing exercises, or balance exercises. Studies have shown that vestibular rehabilitation exercises aid in the natural compensatory process and improving symptoms related to many vestibular (inner ear/balance) disorders **(Lui, et al.; 2020, Renga 2019)**.

Vestibular rehabilitation exercises aim to improve the visual-vestibular interaction and increase static and dynamic postural stability. The exercises are also believed to contribute to an improvement in daily quality of life, patient's function and a reduction of symptoms of dizziness, postural instability, and gaze instability and anxiety. The clinical recovery is thought to rely on the following mechanism: compensation, which is a central process and refers to the alleviating in symptoms produced by specific movements and caused by repetitive exposure to the movement; adaptation, which is the recovery of the dynamic vestibulo-ocular responses due to the ability of the vestibular system to make long-term changes in the neuronal response to input; and substitution, which is the use of other strategies to manage the lost function **(Ricci et al.;2010)**.

Vestibular interaction exercises also called adaptation exercises as it encourages the adaptation of the remaining vestibular system to certain stimuli as head movement or eye movement. It reduces dizziness, improves balance and reduces falls by using other sensory stimuli including visual or somatosensory input to substitute for absent or reduced vestibular function. **(Kattah ,2018)**.

One of the most common and effective nursing vestibular rehabilitation exercises is gaze stability exercises. Previous studies done in foreign countries have clarified that the GSEs are effective, simple exercises that are easy to orient and train and can be applied at home. It is a set of general eye-head movements that, considered more specific to the particular positions and movements that provoke dizziness were more effective than a general exercise program in relieving symptoms of dizziness. It includes saccadic eye movement, pursuit eye movement, gaze stabilization in sitting position, gaze stabilization in standing position, Visuo-vestibular head/eyes moving in same direction and in opposite direction. These exercises are thought to be useful and effective in bilateral vestibular hypofunction, relieving subjective

complaints of dizziness and regain balance, making individuals do activities of daily livings and prevents the risks of falls. However, none of these exercise approaches specifically addressed the balance problems of vestibular patients **(Cohen, 2019)**.

Significance of the study

There is lack of evidence to evaluate the effect of gaze stability exercises in reducing dizziness and imbalance among patients with PVDs in Egypt, hence the current study might provide evidence and it will be added to the body of the nursing evidence-based practice about gaze stability exercises and its effect on dizziness and imbalance among patients with PVDs. Therefore, this study is done to investigate the effect of nursing rehabilitation program on dizziness and imbalance among patients with peripheral vestibular disorders.

Aim of the study

The aim was to evaluate the effect of nursing rehabilitation program on dizziness and imbalance among patients with peripheral vestibular disorders.

Research hypotheses

H0: Patients with peripheral vestibular disorder who receive nursing rehabilitation program will exhibit the same dizziness and imbalance as those who don't receive it.

H1: Patients with peripheral vestibular disorder who receive nursing rehabilitation program will exhibit less dizziness and imbalance than those who don't receive it.

Materials and Method

Study design

A quasi-experimental research design with a pretest-posttest with control group was utilized. the dependent variable is measured once before the intervention is implemented and after it is implemented.

Setting

The study was conducted at otolaryngology clinic of the One-day treatment center, Alexandria Main University Hospital, Egypt. It contains two rooms and open three days per weeks from 8 am to 2 pm.

Subjects

The study subjects were selected through purposive sample of 60 adult patients were recruited from the previously mentioned setting and were available at time of data collection. They were divided into two equal groups 30 in each study and control group.

The sample size was calculated by statistical power analysis of patients admitted to the neurology unit in Alexandria university hospital.

Subjects' estimation method:

G power Program

Medium effect size =0.4

Power= 80%

Alpha error=5%

Minimum required sample size=52.

The study subjects enrolled in this study according to the following criteria:

Inclusion criteria:

- Peripheral vestibular disorders as diagnosed by a neuro-otologist.
- Aged from 21-60 years old.
- Symptoms of dizziness and imbalance present for at least 3 months
- Willing to participate in the study.
- Free from orthopedic or cardiac problems.

Tools

Three tools were used to collect the necessary data.

Tool I: S**tructured interview questionnaire**: it was used to assess the patient's demographic and clinical data. It was developed by the researcher based on relevant literature (**Cohen, 2019, Courtney, Susan, Susan, Stephen, Richard, et al., 2016**). It included two parts:

Part A: Demographic characteristics: to gather the necessary data regarding age,

gender, level of education, marital status, occupation and residence area.

Part B: Medical data: to gather the necessary data regarding previous medical history, current diagnosis and current medication.

Tool II: Dizziness Handicap Inventory Scale:

This scale was adopted from **(Jacobson and Newmann,1990)**. It was used to identify difficulties that the patient may be experiencing because of patients' dizziness. It includes 23 items with 3 subscales physical subscale, emotional subscale and functional subscale. It is assessed on a 3-points rating scale ranging from (0) = No, (2) = Sometimes, (4) = Always.

Physical subscale included 6 items about physical activities that increase patients' dizziness related to looking up, walking down the aisle of a supermarket, quick movements, turning over in bed, walking down a sidewalk, and bending over.

Emotional subscale included 9 items related to patients' emotional experiences caused by dizziness include frustrated, afraid to out from being home alone, embarrassed in front of others, afraid people may think that you are intoxicated, feel handicapped, stress on patient's relationship with members of their families or friends, depressed, difficult to concentrate, and afraid to stay home alone.

Functional subscale included 8 items related to patients' functions limitations caused by dizziness include restrict travel for business or pleasure, have difficulty getting into or out of bed, restrict participation in social activities, such as going out to dinner, going to movies, dancing or to parties, have difficulty reading, restrict ambitious activities like sports, dancing, and household chores, such as sweep, avoid heights, difficult to go for a walk and interfere with job or household responsibilities.

Scoring system

Total score for questions was calculated and transferred to percent score. The level of patient's handicap was presented as follows:

- Less than 35% means mild handicap.
- 36% to less than or equal 55% means moderate handicap.
- More than or equal 56% means severe handicap.

Tool III: The Activities-specific Balance Confidence (ABC) Scale: This scale developed in 1998 by Myers and modified by Lajoie in 2004 **(Myers, 1998 and Lajoie, 2004)**. It was used to identify level of self-confidence and if the patient lose balance or become unsteady when performing certain activities.

It includes 16 questions related to walk around the house, walk up or down stairs, bend over and pick up a slipper from the front of a closet floor, reach for a small can off a shelf at eye level, stand on your tiptoes and reach for something above your head, stand on a chair and reach for something, sweep the floor, walk outside the house to a car parked in the driveways, get into or out of a car, walk across a parking lot to the mall, walk up or down a ramp, walk in a crowded mall where people rapidly walk past you, are bumped into by people as you walk through the mall, step onto or off an escalator while you are holding onto a railing, step onto or off an escalator while holding onto parcels such that you cannot hold onto the railing and walk outside on icy sidewalks. The patient was instructed to choose a corresponding number from the scale started from (0%) indicates" No confidence "and (100%) indicates "completely confident".

Scoring system

Total score for questions was calculated, the level of patient's physical functioning balance was presented as follows:

- Less than 50% means low level of physical functioning balance.
- 50% to less than 80% means moderate level of physical functioning balance.
- More than or equal 80% means high level of physical functioning balance.

METHOD

The study was accomplished according to the following steps:

1. **Approval** :

- An approval from the Ethical Research Committee, Faculty of Nursing, Alexandria University was obtained.

- An official letter clarifying the purpose of the study was obtained from the Faculty of Nursing, Alexandria University forwarded to the concerned personnel at Alexandria University Hospital to take their permission to collect data**.**

2. Tools:

- Tool (I) was developed by the researcher after extensive review of recent and relevant literature then translated into Arabic language by specialist in English language translation.
- **Tools reliability:** Tools (II) was adopted then translated into Arabic language by specialist in English language translation. Reliability was tested on 6 patients by using Cronbach's alpha test was 0.86. Tool (III) was adopted then translated into Arabic language by specialist in English language translation. Reliability was tested on 6 patients by using Cronbach's alpha test was 0.85.
- **Tool validity: t**he content validity of the tools was tested by a jury of 5 experts in the field of medical surgical nursing and 4 experts in otolaryngology medicine.

3. Pilot study:

A pilot study was conducted on randomly selected 6 patients with peripheral vestibular disorders not included in the actual study to assess the clarity and applicability of the tools and to identify any difficulties that may be faced during the actual study. In addition, the time needed to answer the tools was also estimated. The tools modifications were done.

4. Collection of data:

- Collection of data consumed 6 months (from the beginning of February 2017 to the end of July).

The study was carried out through four phases:

I. Assessment Phase:

- Each patient in the study and control groups, interviewed by the researcher individually and in total privacy to assure confidentiality of information and its utilization only for the purpose of the research.
- The researcher introduced herself to the patients and explained the purpose of the study and then oral consent was obtained for participation in the study.
- During this interview tool I was used to obtain demographic characteristics and clinical data from the patients and first assessment of dizziness and imbalance was done using tool (II) and tool (III).
- The assessment session took from 30-60 minutes on individual basis.

II. Planning phase:

1. Based on the data collected from the assessment phase and literature review; educational handout booklet was developed by the researcher in simple Arabic language based on review of the relevant recent literature **(Ricci, Aratani, Caovilla and Ganança, 2012, Che, Hsieh, Wei and Kao, 2012, & Alghadir, Iqbal and Whitney, 2013)** to support the given information. This booklet was contained colored pictures with simple illustrations. It contains definition of peripheral vestibular disorders physiology, definition, types, causes, manifestations, medication names, medication action, medication side effects, some safety issues to consider. benefits of gaze stability exercises and how to perform these exercises. The booklet was then reviewed by jury of 5 experts in medical surgical nursing field and 4 experts in otolaryngology medicine. After that the needed modifications were done. 30 booklets were printed and given to each patient in the study group before the beginning of the study.

III. Implementation phase (nursing intervention sessions for the study group):

Nursing intervention consisted of the following:

A. Patient education sessions:

- **Education sessions** for the study group by interviewing each patient about 45 minutes individually and privately, it was included an overview about all information present in previously prepared booklet.

B. Gaze stability exercises training sessions:

- Gaze stability exercises was demonstrated by the researcher and re-demonstrated by the patient as the follows:

1- Safe environment before started exercise was kept.

2- Eye exercises was done including:

a) **Oculomotor: Smooth pursuits**:

- Assume sitting position and give him or her paper card with written words or pictures inside it.
- Holding a single target, keep eyes fixed on target. Slowly move it side to side, up and down, and diagonally while head stays still and for 1 to 2 minutes for each direction.

b) **Oculomotor: Saccades**: The patient was instructed to:

- Assume sitting position and give him or her two cards placed inches apart side to side, move them up and down and then diagonally move eyes quickly from target to target as head stays still and for 1 to 2 minutes for each direction.

3- Head exercises was done including:

a) Gaze stabilization: Sitting: The patient was instructed to:

- Assume sitting position and keep eyes fixed on single stationary target (held in straight hand or placed on wall) and move head side to side. Repeat while moving head up and down, for 1 to 2 minutes for each direction.

b) Gaze stabilization: Standing: The patient was instructed to:

- Assume standing position feet apart keep eyes fixed on single stationary target held in hand or placed on wall and move head side to side. Repeat while moving head up and down, for 1 to 2 minutes for each direction.

c) Visuo-vestibular: Head/eyes moving in same direction

- The patient was instructed to assume sitting or standing position and holding a single target, keep eyes fixed on target. Slowly move target, head and eyes in same direction up and down, side to side and diagonally, for 1 to 2 minutes for each direction.

d) Visuo-vestibular: Head/eyes moving in opposite direction

- The patient was instructed to assume sitting or standing position and holding a single target, keep eyes fixed on target. Slowly move target up and down, side to side and diagonally while moving head in opposite direction of target for 1 to 2 minutes for each direction.

- Special instruction during exercises:

- Target must remain in focus, not blurry, and appear stationary while head is in motion perform exercise with little head movement (45º to either side of midline).
- Speed of head movement should be increased as long as the target stays in focus.
- If you use glasses, wear them while performing exercises.
- These exercises may provoke symptoms of dizziness or nausea. Work through these symptoms. If too dizzy, slow eye movement down slightly.
- Rest between each exercise.
- Exercises demand concentration; avoid distractions.
- For safety, standing exercises must be performed close to a counter or next to someone.

All steps of gaze stability exercises were practiced 3 times per day for 10 minutes. **(Giray et al.; 2009 and Clendaniel 2010).**

- The researcher was available in the out patients clinics 3 days per week.
- Gaze stability exercises supervision and follow up of patient in the study group was implemented by daily telephone

communication. Furthermore, the family members were advised to be present at the side of the patients during performing exercises.

- The control group was collected first to avoid contamination data and left for routine medical intervention including only taking prescribed medication.

IV. Evaluation phase:

- During routine hospital follow up, after 3 and after 6 weeks meetings with the participating patients were held to encourage patients to do exercises regularly and increased their compliance. During follow up visits they were instructed to increase the number of exercises gradually according to each patient's ability. Every patient in both study and control group was reassessed for dizziness and imbalance after 3 weeks (2^{nd} assessment) and after 6 weeks (3^{rd} assessment) from the first assessment using tool (II) and tool (III).

Ethical Consideration:

- Written informed patients' consent will be obtained before collection of data, and after explanation of aim of the study.
- Confidentiality of the collected data will be assured.
- Privacy of the study participants will be maintained.
- The researcher will emphasize that participation in the study is entirely voluntary, and withdrawal from the study will not affect the care provided, and his/her withdrawal will not affect the care he/she receives at the hospital.

Statistical Analysis:

After collection of data, data were fed to the computer and analyzed using IBM Statistical Package for Social Sciences (SPSS) version 20. (Armonk, NY: IBM Corp). Qualitative data were described using number and percent. The Kolmogorov-Smirnov test was used to verify the normality of distribution. Quantitative data were described using range (minimum and maximum. Significance of the obtained results was judged at the 5% level.

The used tests were

1- Chi-square test: For categorical variables to compare between different groups

2- Fisher's Exact or Monte Carlo correction: Correction for chi-square when more than 20% of the cells have expected count less than 5

3- Friedman test: For abnormally distributed quantitative variables, to compare between more than two periods or stages and **Post Hoc Test** (**Dunn**'s**)** for pairwise comparisons.

Results

Table (I): Frequency distribution of the study subjects according to their demographic characteristics **(n=60)**

demographic characteristics	**Study group (n = 30)**		**Control group (n = 30)**		**F / χ^2 (P)**
	N	**%**	**N**	**%**	
Age (years):					
▪ 30- < 40	3	10.0	4	13.3	0.320 (0.852)
▪ 40- < 50	6	20.0	7	23.3	
▪ 50-<60	21	70.0	19	63.4	
Gender					
▪ **Female**	20	66.7	19	63.3	0.073 (0.787)
▪ **Male**	10	33.3	11	36.7	
level of Education:					
▪ Can't read and write	13	43.4	9	30.0	1.361 (0.715)
▪ Primary &Preparatory	7	23.3	8	26.7	
▪ Secondary	7	23.3	8	26.7	
▪ University or higher	3	10.0	5	16.6	
Marital status					
▪ Single	4	13.3	2	6.7	2.733 (0.435)
▪ Married	17	56.7	23	76.6	
▪ Divorced	5	16.7	3	10.0	
▪ Widow	4	13.3	2	6.7	
Occupation:					
▪ Unemployed	9	30.0	12	40.0	3.762 (0.152)
▪ Private employee	12	40.0	15	50.0	
▪ Government employee	9	30.0	3	10.0	
Residence area					
▪ Rural	16	53.3	10	33.3	2.443 (0.118)
▪ urban	14	46.7	20	66.7	

χ^2 (P): Chi-Square Test & P for χ^2 Test - (P): Fisher Exact test & P for F Test
*: Significant at P ≤0.05

Table (I): This table showed that more than two third of study group patients and around two third of the control group patients (70%, 63.4%) respectively their ages were ranged from 50 to less 60 years of age. Concerning gender, two third of study group patients and around two third of control group patients (66.7, 63.3%) were females. In relation to the level of education, more than one third of the study group patients (43.3%) and approximately on third of the control group patients (30%) cannot read and write. As regard marital status, more than half of the study group patients (56.7%) and more than two third of the control group patients (76.7%) were married. It was observed that 40% and 50% of the study and the control group respectively had a private occupation. As for residence area 53.3% of the study group lived in rural area and 66.7% of the control group lived in urban. For the overall demographic characteristics, there was no statistically significant difference between the study and control group regarding their demographic characteristics.

Table (II): Frequency distribution of the study subjects according to their clinical Data. (n=60)

Clinical data	Study group (n = 30)		Control group (n = 30)		Test of Sig.	p
	No.	%	No.	%		
Medical history						
▪ Diabetes	5	16.7	6	20.0	χ^2= 2.162	0.540
▪ Hypertension	7	23.3	11	36.7		
▪ Hepatic disease	6	20.0	3	10.0		
▪ No medical history	12	40.0	10	33.3		
Current Diagnosis						
▪ benign paroxysmal positional vertigo (BPPV)	15	50.0	11	36.7	χ^2 =2.226	0.694
▪ Meniere's disease	5	16.7	4	13.3		
▪ Vestibular dysfunction	3	10.0	6	20.0		
▪ Neuritis	3	10.0	5	16.7		
▪ Labyrinthitis	4	13.3	4	13.3		
Current medications						
▪ Anticholinergics	10	33.3	9	30.0	χ^2 =2.184	0.901
▪ Antihistamine	7	23.3	9	30.0		
▪ Benzodiazepines	9	30.0	5	16.7		
▪ Calcium channel antagonists	16	53.3	11	36.7		
▪ Antiemetics	21	70.0	18	60.0		
▪ Anti-inflammatories	8	26.7	9	30.0		
▪ Antibiotics	7	23.3	8	26.7		

N.B: Some patients has more than one response in relation to current medications, therefore the number of each category exceeded the allocated sample size.

χ^2 (P): Chi-Square Test & P for χ^2 Test

*: Significant at P ≤0.05

Table (II): In relation to clinical data, there was no statistically significant difference between the study and control group. Concerning medical history, it was noticed that 23.3% of study group and 36.7% of control group patients had hypertension. Regarding current diagnosis, half of study group patient and more than one third of control group patients (36.7%) were diagnosed as benign paroxysmal positional vertigo (BPPV). In relation to current medications, more than two third of the study group patients (70%) and more than half of the control group patients (60%) were used antiemetics, followed by calcium channel antagonists that represent (53.3%,36.7%) respectively.

Table (III): Comparison between both studied groups according to dizziness handicap inventory subscales items in patients with peripheral vestibular disorders. (n=60)

Dizziness Handicap Inventory subscales		1st assessment					2nd assessment					3rd assessment				
		Study group (n=30)		Control group (n=30)		Significance level	Study group (n=30)		Control group (n=30)		Significance level	Study group (n=30)		Control group (n=30)		Significance level
		No.	%	No.	%		No.	%	No.	%		No.	%	No.	%	
Physical subscale item (does this activity increase the patient's problem?)																
looking up	Always	27	90.0	4	13.3	FE=0.162	3	10.0	13	43.3	$\chi^{2=}$11.891	0	0.0	6	20.0	$\chi^{2=}$16.999
	Sometimes	3	10.0	26	86.7	P=0.687	22	73.3	17	56.7	P=0.003*	8	26.7	17	56.7	P=0.000*
	No	0	0.0	0	0.0		5	16.7	0	0.0		22	73.3	7	23.3	
walking down the aisle of a supermarket	Always	23	76.7	20	66.7	FE=0.742	5	16.7	15	50.5	$\chi^{2=}$8.584	1	3.3	8	26.7	$\chi^{2=}$18.531
	Sometimes	7	23.3	10	33.3	P=0.389	18	60.0	13	43.3	P=0.014*	8	26.7	17	56.7	P=0.000*
	No	0	0.0	0	0.0		7	23.3	2	6.7		21	70.0	5	16.7	
quick movements of head	Always	26	86.7	5	16.7	$\chi^{2=}$0.131	7	23.3	21	76.7	$\chi^{2=}$14.172	3	10	15	50.0	$\chi^{2=}$14.541
	Sometimes	4	13.3	25	83.3	P= 0.718	20	66.7	9	30.0	P=0.001*	16	53.3	13	43.3	P=0.001*
	No	0	0.0	0	0.0		3	10.0	0	0.0		11	36.7	2	6.7	
turning over in bed	Always	19	63.3	17	56.7	$\chi^{2=}$0.278	2	6.7	9	30.0	$\chi^{2=}$8.909	0	0.0	8	26.7	$\chi^{2=}$15.700
	Sometimes	11	36.7	13	43.3	P=0.598	19	63.3	19	63.3	P= .0120*	14	46.7	18	60.0	P=0.000*
	No	0	0.0	0	0.0		9	30.0	2	6.7		16	53.3	4	13.3	
walking down a sidewalk	Always	27	90.0	4	13.3	FE=0.162	7	23.3	17	56.7	$\chi^{2=}$8.600	1	3.3	13	41.4	$\chi^{2=}$17.296
	Sometimes	3	10.0	26	86.7	P=0.688	17	56.7	12	40	P=0.014*	14	46.7	14	46.7	P=0.000*
	No	0	0.0	0	0.0		6	20	1	3.3		15	50.0	3	10.3	
bending over	Always	28	93.3	27	90.0	FE=0.220	6	20	20	66.7	FE=14.872	1	3.3	13	43.3	$\chi^{2=}$20.261
	Sometimes	2	6.7	3	10.0	P=0.640	20	66.7	10	33.3	P=0.001*	14	46.7	15	50.0	P=0.000*
	No	0	0.0	0	0.0		4	13.3	0	0.0		15	50.0	2	6.7	
Emotional subscale (Because of your problem, do you feel?)																
Frustrated	Always	16	53.3	20	66.7	χ^{2}=1.111	14	46.7	16	53.3	$\chi^{2=}$13.600	2	6.7	13	41.4	$\chi^{2=}$13.673
	Sometimes	14	46.7	10	33.3	P=0.292	21	70.0	14	46.7	P=0.001*	18	60.0	15	50.0	P=0.001*
	No	0	0.0	0	0.0		5	16.7	0	0.0		10	33.3	2	6.7	
afraid to out from home alone	Always	29	96.7	28	93.3	FE=0.351	12	40	20	66.7		3	10.0	13	43.3	$\chi^{2=}$12.055
	Sometimes	1	3.3	2	6.7	P= 0.554	13	43.3	10	33.3	$\chi^{2=}$7.391	11	36.7	12	40	P=0.002*
	No	0	0.0	0	0.0		5	16.7	0	0.0	P=0.025*	16	53.3	5	16.7	
embarrassed in front of others	Always	11	36.7	16	53.3	FE=1.692	6	20	12	40	$\chi^{2=}$7.027	0	0.0	8	26.7	$\chi^{2=}$16.310
	Sometimes	19	63.3	14	46.7	P= 0.193	19	63.3	18	60.0	P=0.030*	17	56.7	20	66.7	P=0.000*
	No	0	0.0	0	0.0		5	16.7	0	0.0		13	43.3	2	6.7	

Dizziness Handicap Inventory subscales		1st assessment					2nd assessment					3rd assessment				
		Study group (n=30)		Control group (n=30)		Significance level	Study group (n=30)		Control group (n=30)		Significance level	Study group (n=30)		Control group (n=30)		Significance level
		No.	%	No.	%		No.	%	No.	%		No.	%	No.	%	
afraid people may think that you are intoxicated	Always	8	26.7	14	46.7	χ^2=5.754 P= 0.056	4	13.3	11	36.7	χ^2=12.378 P=0.002*	0	0.0	5	16.7	χ^2=20.867 P=0.000*
	Sometimes	18	60.0	16	53.3		17	56.7	19	63.3		14	46.7	24	80.0	
	No	4	13.3	0	0.0		9	30.0	0	0.0		16	53.3	1	3.3	
Handicapped	Always	13	43.3	12	40.0	χ^2=3.165 P= 0.205	2	6.7	9	30.0	χ^2=7.482 P=0.024*	0	0.0	7	23.3	χ^2=14.352 P=0.001*
	Sometimes	17	56.7	15	50.0		19	63.3	18	60.0		13	43.3	18	60.0	
	No	0	0.0	3	10.0		9	30.0	3	10.0		17	56.7	5	16.7	
stress with family relationship or friends	Always	17	56.7	15	50.0	χ^2=0.268 P= 0.605	8	26.7	13	43.3	χ^2=6.190 P=0.045*	2	6.7	8	26.7	χ^2=13.659 P=0.001*
	Sometimes	13	43.3	15	50.0		17	56.7	17	56.7		14	46.7	20	66.7	
	No	0	0.0	0	0.0		5	16.7	0	0.0		14	46.7	2	6.7	
are you depressed	Always	18	60.0	22	73.3	χ^2=1.200 P=0.273	6	20	18	60.0	χ^2=12.000 P=0.002*	2	6.7	12	40.0	χ^2=16.481 P=0.000*
	Sometimes	12	40.0	8	26.7		20	66.7	12	40.0		16	53.3	17	56.7	
	No	0	0.0	0	0.0		4	13.3	0	0.0		12	40.0	1	3.3	
difficult for you to concentrate	Always	27	90.0	23	76.7	χ^2=1.920 P=0.166	7	23.3	15	50	χ^2=10.909 P=0.004*	0	0.0	8	26.7	χ^2=18.655 P=0.000*
	Sometimes	3	10.0	7	23.3		15	50	15	50		15	50.0	20	66.7	
	No	0	0.0	0	0.0		8	26.7	0	0.0		15	50.0	2	6.7	
afraid to stay home alone	Always	22	73.3	16	53.3	χ^2=2.584 P=0.108	6	3	9	30.0	χ^2=8.021 P=0.018*	0	0.0	4	13.3	χ^2=19.112 P=0.000*
	Sometimes	8	26.7	14	46.7		17	56.7	21	70.0		13	43.3	24	80.0	
	No	0	0.0	0	0.0		7	23.3	0	0.0		17	56.7	2	6.7	
Functional subscale (Because of your problem, do you?)																
restrict your travel	Always	8	26.7	14	46.7	χ^2=4.081 P=0.130	3	10	10	33.3	χ^2=6.655 P=0.036*	0	0.0	6	20.0	χ^2=15.532 P=0.000*
	Sometimes	20	66.7	16	53.3		22	73.3	19	63.4		13	43.3	20	66.7	
	No	2	6.7	0	0.0		5	16.7	1	3.3		17	56.7	4	13.3	
have difficulty getting into or out of bed	Always	24	80.0	19	63.3	χ^2=2.052 P=0.152	3	10.0	14	46.7	χ^2=11.475 P=0.003*	0	0.0	9	30.0	χ^2=15.493 P=0.000*
	Sometimes	6	20.0	11	36.7		19	63.3	14	46.7		15	50.0	17	56.7	
	No	0	0.0	0	0.0		8	26.7	2	6.7		15	50.0	4	13.3	
restrict your participation in social activities	Always	24	80.0	21	70.0	χ^2=0.800 P=0.371	10	33.3	18	60.0	χ^2=7.619 P=0.022*	2	6.7	2	6.7	χ^2=15.521 P=0.000*
	Sometimes	6	20.0	9	30.0		15	50.0	12	40.0		13	43.3	19	63.3	
	No	0	0.0	0	0.0		5	16.7	0	0.0		15	50.0	2	6.7	
have difficulty reading	Always	12	40	17	56.7	χ^2=1.700 P=0.427	20	66.7	11	36.7	χ^2=6.165 P=0.046*	0	0.0	6	20.0	χ^2=10.741 P=0.005*
	Sometimes	5	16.7	4	13.3		6	20.0	8	26.7		6	20.0	11	36.7	
	No	13	43.3	9	30.0		20	66.7	11	36.7		24	80.0	13	43.3	
performing more	Always	18	60.0	19	63.3	χ^2=0.071	6	20.0	11	36.7	χ^2=7.033	0	0.0	7	23.3	χ^2=20.724

Dizziness Handicap Inventory subscales		1st assessment					2nd assessment					3rd assessment				
		Study group (n=30)		Control group (n=30)		Significance level	Study group (n=30)		Control group (n=30)		Significance level	Study group (n=30)		Control group (n=30)		Significance level
		No.	%	No.	%		No.	%	No.	%		No.	%	No.	%	
ambitious activities like sports,….	Sometimes	12	40.0	11	36.7	P=0.791	16	53.3	18	60	P=0.030*	13	43.3	21	70.0	P=0.000*
	No	0	0.0	0	0.0		8	26.7	1	3.3		17	56.7	2	6.7	
avoid heights	Always	24	80.0	22	73.3	χ^2=0.542P=0.373	4	13.3	1	43.3	$\chi^{2=}$8.637	0	0.0	5	16.7	$\chi^2$17.333
	Sometimes	6	20.0	8	26.7		18	60/0	15	50.0	P=0.013*	10	33.3	20	66.7	P=0.000*
	No	0	0.0	0	0.0		8	26.7	2	6.7		20	66.7	5	16.7	
difficult for you to go for a walk by yourself	Always	23	76.7	20	66.7	χ^2=0.739P=0.397	4	13.3	13	43.3	$\chi^{2=}$8.013	1	3.3	9	30.0	$\chi^2$17.400
	Sometimes	7	23.3	10	33.3		19	63.4	15	50.0	P=0.018*	12	40.0	18	60.0	P=0.000*
	No	0	0.0	0	0.0		7	23.3	2	6.7		17	56.7	3	10.0	
interfere with your job or household responsibilities	Always	29	96.7	28	93.3	χ^2=0.739P=0.397	4	13.3	15	50.0	$\chi^{2=}$10.271	1	3.3	9	30.0	$\chi^2$12.000
	Sometimes	1	3.3	2	6.7		19	63.4	13	43.3	P=0.006*	8	26.7	12	40.0	P=0.002*
	No	0	0.0	0	0.0		7	23.3	2	6.7		21	70.0	9	30.0	

χ^2 (P): Chi-Square Test & P for χ^2 Test - *: Significant at P $\leq$0.05

Table (III): Regarding physical subscale of dizziness handicap inventory, there were no statistically significant differences between the study and control group in relation to all items of physical subscale at the first assessment, on the other hand, high significant differences were found between the study and control group in relation to all items of physical subscale at the second and third assessment. The same trend was observed in relation to emotional and functional subscales.

Table (IV): Frequency distribution and significance of differences according to total dizziness handicap inventory subscales among the study and control groups before and after intervention in patients with peripheral vestibular disorders. (n=60)

Dizziness Handicap Inventory subscales	1st assessment					2nd assessment					3rd assessment				
	Study group (n=30)		Control group (n=30)		Significance level	Study group (n=30)		Control group (n=30)		Significance level	Study group (n=30)		Control group (n=30)		Significance level
	No.	%	No.	%		No.	%	No.	%		No.	%	No.	%	
Physical subscale															
Mild handicap	0	0.0%	0	0.0%	FE=01.017 P=0.313	4	13.3%	0	0.0%	$\chi^{2=}$24.645 P=٠.001*	27	90.0%	0	0.0%	$\chi^{2=}$50.250 P=0.000*
Moderate handicap	0	0.0%	1	3.3%		20	66.7%	5	16.7%		3	10.0%	13	43.3%	
Severe handicap	30	100.0%	29	96.7%		6	20.0%	25	83.3%		0	0.0%	17	56.7%	
Emotional subscale															
Mild handicap	0	0.0%	0	0.0%	FE=01.017 P=0.313	3	10.05	0	0.0%	$\chi^{2=}$37.297 P=0.000*	16	53.3%	0	0.0%	$\chi^{2=}$28.500 P=0.000*
Moderate handicap	1	3.3%	0	0.0%		20	66.7%	0	0.0%		14	46.7%	18	60.0%	
Severe handicap	29	96.7%	30	100.0%		7	23.3%	30	100.0%		0	0.0%	12	40.0%	
Functional subscale															
Mild handicap	0	0.0%	0	0.0%	FE=2.914 P=0.143	4	13.3%	0	0.0%	$\chi^{2=}$29.929 P=0.000*	26	86.7%	1	3.3%	$\chi^{2=}$45.071 P=0.000*
Moderate handicap	0	0.0%	2	6.9%		20	66.7%	3	10.0%		4	13.3%	9	30.0%	
Severe handicap	30	100.0%	28	93.1%		6	20.0%	27	90.0%		0	0.0%	20	66.7%	

χ^2 (P): Chi-Square Test & P for χ^2 Test - FE : Fisher's Exact *: Significant at P ≤0.05

Table (V): As for physical subscale of dizziness handicap inventory during 1st assessment, all patients in the study group (100%) and (96.7%) had severe handicap. In relation to emotional subscale 96.7% and 100% of the study and control group respectively had severe handicap. 100% and 93.1 of the study and control group respectively had severe functional handicap. there were no statistically significant differences between the study and control group during 1st assessment in the three subscales. During 2nd assessment two thirds (66.7%) of the study group had moderate physical, emotional and functional handicap, while majority of the control had severe physical, emotional and functional handicap. there were statistically significant differences between the study and control group in physical, emotional and functional subscales (P=٠.001*, ٠.000* & ٠.000*) respectively. During 3rd assessment 90.0%, 53.3% and 86.7% of the study group had mild physical, emotional and functional handicap respectively., where as 56.7%, 40.0% & 66.7% of the control had severe physical, emotional and functional handicap respectively. there were statistically significant differences between the study and control group in physical, emotional and functional subscales (P=٠.000*).

Table (V): Comparison between both studied groups according to levels of physical functioning balance in patients with peripheral vestibular disorders before and after interventions. (n=60)

Level of physical functioning balance	Study group (N=30)						Control group (N=30)						Significance test		
	1st assessment		2nd assessment		3rd assessment		1st assessment		2nd assessment		3rd assessment				
	No	%	No	%	No	%	No	%	No	%	No	%	P1	P2	P3
▪ **High**	0	0.0	4	13.3	20	66.7	0	0.0	0	0.0	4	13.3	χ^2=0.130 P=0.717	χ^2=10.420 P= 0.005*	χ^2=20.500 P=< 0.001*
▪ **Moderate**	4	13.3	19	63.3	9	30.0	5	16.7	12	40.0	15	50.0			
▪ **Low**	26	86.7	7	23.3	1	3.3	25	83.3	18	60.0	11	36.7			
Significance test within group	P=< 0.001*						P= 0.081								

(χ^2): Chi-Square- *Significant difference at P level ≤ 0.05.- P1=p value comparing between both group patients on the 1st assessment.
P2=p value comparing between both group patients on the 2ed assessment. -P3=p value comparing between both group patients on the 3th assessment.
p value for Post Hoc Test (Dunn's) for Friedman test for comparing between pre and post intervention within group

Table (V):It was noticed that the majority of study and control group patients (86.7%, 83.3%) had low levels of physical functioning balance at the 1st assessment , moderate levels of physical functioning balance (63.3%,40%) at the 2nd assessment ,and at the 3rd assessment high levels of physical functioning balance was the most level of physical functioning balance encountered among the study group patients (66.7%) and Moderate levels of physical functioning balance was the most level of physical functioning balance encountered among the control group patient (50.0%), with statistical significant differences among the study group patients only (P=< 0.001*).Additionally there were statistically significant differences between both group patients at the second and third assessment(P=0.005*&=< 0.001*).

Discussion

There are no specific nursing practice guidelines for the management of peripheral vestibular hypofunction. The Cochrane review of the management of vestibular hypofunction 2015 included causes such as benign paroxysmal positional vertigo, for which there are already clinical practice guidelines from the American Academy of Neurology and the American Academy of Otolaryngology–Head and Neck Surgery Foundation. It was decided that a clinical practice guideline to classify vestibular exercise options for use with patients with unilateral and bilateral peripheral vestibular hypofunction was appropriate **(Courtney et al.; 2016)**

Uncompensated peripheral vestibular hypofunction results in dizziness and/or imbalance. Nursing interventions include patient's education and vestibular exercise is effective in enhancing recovery of function in patient with peripheral unilateral or bilateral vestibular disorders. Nursing intervention should offer certain exercises include: voluntary saccadic, smooth-pursuit eye movements and head movement as specific exercises for gaze stability to decrease functional limitation and increase balance ability **(Porciuncula, Johnson and Glickman; 2012)**.

Several studies have reported the impact of nursing intervention and exercises on dizziness and imbalance for patients with peripheral vestibular disorders.

The results of the present study revealed that there were no statistically significant differences in demographic and clinical data between the study and control groups which included age, gender, level of education, marital status, occupation, monthly, medical history, current diagnosis and current medication. These findings roll out the extraneous factors that might confuse the effect of nursing intervention on the management of dizziness and imbalance.

The present study revealed that, there was no statistical significant difference between the study and control groups at the first assessment in all dizziness handicap inventory subscales items including: physical, emotional and functional subscale items and the majority of patients' dizziness increase with these activities. This may be endorsed to all peripheral disorders cause vestibular system hypofunction including: hypofunction in eye reflex movements (vestibulo-ocular reflex), posture and balance of head and neck which results in dizziness **(Strupp, Mandalà and Jose, 2019)**. The results of the current study is also similar to the results of **(Lucieer et al.; 2018)** their systematic review found that; chronic dizziness affected 62% or more of patients with vestibulopathy. Also the results of this study are in accordance with **(Vaduva, Sanchez, Sanz-Fernandez and Martín-Sanz, 2018)** who stated that residual dizziness and anxiety are common findings in vestibular hypofunction patients that increase with physical, emotional and functional activities.

The results of the present study revealed that, there was a statistical significance improvement in the study group over the control in all dizziness handicap inventory subscales including physical, emotional and functional items; in the 2nd assessment after 3 weeks and 3rd assessment after 6 weeks of nursing education and gaze stability exercises. This may be explained by that gaze stability exercises improve patient's postural stability and visual acuity during head movements, additionally these exercises improve one's central or brain's compensation for abnormalities within the vestibular or balance system which in-turn decrease dizziness.

These findings were in line with (**Horak, Rycewicz, Black and Cook, 2019**) who found in their study that patient with dizziness who practice home exercises including eye-head coordination for gaze stabilization, experienced improvement of dizziness-related disability and mobility in favor of the intervention group at the first post-intervention follow-up after 3 weeks and at the second post-intervention follow-up after 6 weeks. These findings also were in line with **(Richard, 2010)** who study the effect of vestibular habituation and gaze-stability exercises on symptomatic head positions and movements, and other symptoms of dizziness. He found that gaze-stability exercises enhance the recovery and had a

positive effect on dizziness-related disability at the first post-intervention follow-up. The findings include different factors of functioning covered in the Dizziness Handicap Inventory scale like emotional functioning and sharing in social life, certain activities/ movements that provoke dizziness and/or unsteadiness, and self-perceived walking ability and postural stability.

The result of the present study also revealed that, physical functioning balance was improved after implementing nursing rehabilitation program including nursing education and 3 times per day home based gaze stability exercises during 2nd assessment and 3rd assessment, and such improvement not found in the control group. This may be attributed to the effect of nursing education and 3 times per day home based gaze stability exercises on decreasing dizziness increase patient's ability to perform physical functioning with high level of balance. In addition to gaze stability exercises improve postural stability, improve balance and subjective confidence to carry out the activities of daily life. Furthermore, these exercises have influence on the alignment of the head, resulting on improvements in the overall perception of balance, expanding the limits of stability.

This finding is in harmony with **(Courtney, Ronald and Herdman, 2010)** who stated that, improvements of symptoms and postural stability in study group, decrease dizziness, increase balance and greater reduction in fall risk; after implementing vestibular-specific gaze stability exercises and giving patients health teaching to prevent complications. This finding is supported by **(Pimenta, Correia, Alves and Virella, 2017)** who stated that stated that application of home based culomotor and gaze stability exercises twice a day for three weeks improving the balance impairment. The finding of the present study is consistent with **(Roh and Lee, 2019)** revealed that 4 weeks of performing gaze stability exercises all outcome measures were significantly improved including cognitive function, dynamic postural ability and balance confidence. This result also is in line with **(Courtney et al.; 2016)** who expressed that there was a statistically significant improvement in vestibular hypofunction symptoms including dizziness and imbalance, after two supervised sessions for giving the study participants information about peripheral vestibular disorders and training about home-based gaze stability exercises. In addition to 4-6 weeks 3 times per day home based gaze stability exercises.

It is clear from the forgoing discussion that; patients with peripheral vestibular disorders and suffering from dizziness and imbalance and managed with nursing education and home based gaze stability exercises had high level of physical functioning balance and decrease dizziness related handicap and disabilities of physical, emotional and functional activities.

Conclusion:

Nursing rehabilitation program includes patient education about peripheral vestibular disorders, individualized nursing demonstration and redemonstration for gaze stability exercises. significantly improve dizziness and imbalance in patients with peripheral vestibular disorders.

Recommendations

Based on the findings of present study, the following recommendations are suggested:

1. Patient education and homebased gaze stability exercises can utilize as an viable management for treating dizziness and imbalance for patients with peripheral vestibular exercises.
2. Inservice training programs for nurses about the application of gaze stability exercises for management of dizziness and imbalance.
3. The developed booklet with its straightforward instructions and illustrations should be utilized in hospitals as a teaching aid for patient with peripheral vestibular disorders.
4. Replication of the present study under dissimilar circumstances (sampling, setting, measurement, duration of management) is recommended to confirm its results.

References

Alghadir A., Iqbal Z. and Whitney S. (2013). An update on vestibular physical therapy. Journal of Chinese Medical Association; 76(1):1-8.

Ator G. (2010). Vertigo—Evaluation and Treatment in the Elderly. Available at: www2.kumc.edu/otolaryngology/ otology/VertEldTalk.htm. Accessed May 20, 2010.

Che P., Hsieh W., Wei S., Kao C. (2012). Interactive wiimote gaze stabilization exercise training system for patients with vestibular hypofunction. Journal of Neuro-Engineering and Rehabilitation; 9(1):77.

Clendaniel R. (2010). The effects of habituation and gaze-stability exercises in the treatment of unilateral vestibular hypofunction- preliminary results. Journal of Neurologic Physical Therapy;34(2):111- 116.

Cohen H. (2019). A review on screening tests for vestibular disorders. Journal of Neurophysiology; 122(1):81-92.

Courtney D., Ronald J. and Herdman S. (2010). Efficacy of gaze stability exercises in older adults with dizziness. Journal of Neurologic Physical Therapy; 34(2):64-9.

Courtney D., Susan J., Susan L., Stephen P., Richard A., Terry D., Joseph M., Thomas S. , Joel A., Neil T. and Sheelah N. (2016). Vestibular Rehabilitation for Peripheral Vestibular Hypofunction: An Evidence-Based Clinical Practice Guideline: from the american physical therapy association neurology section. Journal of Neurologic Physical Therapy;40(2):124-55.

Giray M, Kirazli Y, Karapolat H, Celebisoy N, Bilgen C, Kirazli T. (2009). Short-Term Effects of Vestibular Rehabilitation in Patients With Chronic Unilateral Vestibular Dysfunction: A Randomized Controlled Study. Arch Phys Med Rehabil. 2009;90(8):1325-31.

Horak F., Rycewicz C., Black F. and Cook A. (2019). Effects of Vestibular Rehabilitation on Dizziness and Imbalance. Otolaryngology Head and Neck Surgery 106(2):175-80.

Jacobson G. and Newman C (1990). The development of the Dizziness Handicap Inventory. Otolaryngology - Head and Neck Surgery Journal;116: 424-427

Kattah J. (2018). Use of HINTS in the acute vestibular syndrome. An Overview. Stroke Vascular Neurology Journal;3(4):190-6.

Lui F., Lisa A., Willner K. and Tadi P. (2020). Central Vertigo. StatPearls Journal; ID: NBK441861

Lucieer F., Duijn S., Rompaey V., Fornos A., Guinand N., Guyot J., Herman-Kingma H. and Berg R. (2018). Full Spectrum of Reported Symptoms of Bilateral Vestibulopathy Needs Further Investigation—A Systematic Review. Frontiers Neurology Journal; 9:352.

Lajoie Y. (2004). Predicting falls within the elderly community: comparison of postural sway, reaction time, the Berg balance scale and ABC scale for comparing fallers and non-fallers. Archives of Gerontology and Geriatrics. 2004; 38:11-26.

Mansour O. (2013). Practical approach to the management of dizzy patients. The Egyptian Journal of Otolaryngology; 29: 49-55.

Petri M., Chirilă M., Sorana D. and Cosgarea M. (2017). Health-related quality of life and disability in patients with acute unilateral peripheral vestibular disorders. Otorhinolaryngology Journal; 83(6).

Murdin L. and Davies R. (2008). Dizziness. Medicine Journal, 36(10): 535-9.

Myers M. (1998). Discriminative and evaluative properties of the ABC Scale. Journals of Gerontology and Medical Sciences; 53:287-94.

Neuhauser H, Radtke A and von Brevern M. (2008). Burden of dizziness and vertigo in the community. Arch Intern Med;168(19):2118–2124.

Pimenta C., Correia A. , Alves M. and Daniel Virella D. (2017). Effects of oculomotor and gaze stability exercises on balance after stroke: Clinical trial protocol. BioMed Research International Journal; 2(3):76-80.

Porciuncula F., Johnson C. and Glickman L. (2012). The effect of vestibular rehabilitation on adults with bilateral vestibular hypofunction: a systematic review. Journal Vestibular Research;22(5–6):283–298.

Renga V. (2019). Clinical Evaluation of Patients with Vestibular Dysfunction. Neurology Research International; ID 931548.

Ricci N., Aratani M., Dona F., Macedo C., Caovilla H. et al.;. (2010). A systematic review about the effects of the vestibular rehabilitation in middle-age and older adults. Revista Brasileira de Fisioterapia;14:361-71.

Ricci N., Aratani M., Caovilla H. and Ganança F. (2012). Effects of conventional versus multimodal vestibular rehabilitation on functional capacity and balance control in older people with chronic dizziness from vestibular disorders: Design of a Randomized Clinical Trial;13 (246): 1745-6215-13-246.

Richard A. (2010). The effects of habituation and gaze-stability exercises in the treatment of unilateral vestibular hypofunction – preliminary results. Journal of Neurologic Physical Therapy; 34(2):111-6.

Roh M. and Lee E., (2019). Effects of gaze stability exercises on cognitive function, dynamic postural ability, balance confidence, and subjective health status in old people with mild cognitive impairment. Journal of Exercise Rehabilitation 15(2):270-274.

Strupp M.,Mandalà M. and Jose A. (2019). Peripheral vestibular disorders. Current Opinion in Neurology Journal; 32(1):165-73.

Timothy L. and Amede R. (2009). Vertigo: A Review of Common Peripheral and Central Vestibular Disorders. Ochsner Journal; 9(1): 20 - 26.

Vaduva C., Sanchez J., Sanz-Fernandez R. and Martín-Sanz E. (2018). Prevalence and management of post-BPPV residual symptoms. European Archives of Oto-Rhino-Laryngology Journal; 275(10).

Walker H., Hall W., Hurst J., Clinical Methods: The History, Physical, and Laboratory Examinations, Chapter 212 Dizziness. 3rd edition. Available at. https://www.ncbi.nlm.nih.gov/books/NBK325/. Retrieved in January 2021.