

Effect of Epley's Maneuver and Brandt-Daroff Exercises on Decreasing Severity and Recurrence of Benign Paroxysmal Positional Vertigo

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Abstract

Background The widely prevalent condition of the inner ear's vestibular system, which is essential for preserving balance, is known as Benign Paroxysmal Positional Vertigo (BPPV). Epley's manoeuvre and Brandt-Daroff exercises are the two extremely often used manoeuvres for the management of posterior canal BPPV. These maneuvers primarily serve to move debris from the canal to the utricle and to alleviate discomfort. **Objective:** To assess the effect of Epley's Maneuver and Brandt-Daroff Exercises on decreasing severity and recurrence of benign paroxysmal positional vertigo. **Method:** A quasi-experimental research design with a pretest-posttest control group was used. Otolaryngology clinic of Matrouh General Hospital, Egypt was the study setting. Eighty adults were randomized to the experimental group (n = 40) and the control group (n = 40). **Results:** 80 participants were analyzed; the Epley's maneuver and Brandt-Daroff exercises group showed a significantly greater improvement in on the duration and frequency of BPPV, overall vertigo handicap questionnaire in the study group at three weeks (p=0.002 * ,0.014*, 0.000 and 95% CI -5.048 to-1.202, -38.464 to-4.486 and -7.741 to -3.209) and at six weeks (p=0.000*, 0.001*, 0.000; and 95% CI 3.692 to1.658, 31.430 to -8.326 and11.946 to 6.504) respectively. **Conclusions:** Application of Epley's maneuver and Brandt-Daroff exercises is feasible and effective in alleviating duration, frequency, and severity of BPPV and its impact on physical activity, emotional wellbeing and social activities. **Recommendations:** To lessen the duration, frequency, and severity of BPPV, Epley's technique and Brandt-Daroff exercises must be incorporated into the therapeutic routine care.

Keywords: Epley's Maneuver, Brandt-Daroff Exercises and Benign Paroxysmal Positional Vertigo

Introduction:

The most important role when it comes to vestibular system is to control the orientation of the head and trunk in space in terms of gravity inertial forces. The vestibular system consists of the peripheral and vestibular system that process the sensory information involved with controlling eye movements and balance (Peterka., 2018). Thus, vestibular disorders will result from injury or disease that damages these processing areas. Benign paroxysmal positional vertigo is the most common type of vestibular disease with a lifetime incidence estimated at 2-4% in general population. It is frequently self confined, however can turn out be chronic and relapsing with substantial effects on patients quality of life (Davies et al., 2016).

Posterior, horizontal, and anterior semicircular canal are the three kinds of BPPV which depending on canal involvement.

Otoconia detached from the otolithic membrane started to accumulate in one of the three semicircular canals are the cause of BPPV. Both organic and inorganic elements make up otoconia. The interaction of these two components draws calcium carbonate and fails to mineralize it around the inorganic framework, resulting in calite crystals. Otolin-based fibrils are used to hold the otoconia in place. Aging and other disease processes have an impact on the structure of otoconia and the fibrils that keep them together, which can cause otoconia to fragment and separate from the otoconial membrane (Yetiser., 2020).

Subtype of BPPV is classified according to the involved semicircular canal and whether the underlying pathology is canalithiasis where the

detached otoconia become free floating in the affected canal or adherent to the cupula.

Canalithiasis is thought to be the common reason for BPPV. The most distressing BPPV symptom, vertigo (spinning sensation), is frequently cited as being brought on by changing head position with regard to gravity (Dong et al., 2020; Wang et al., 2020).

When moving turning over in bed, tilting their head back, out of bed, or bending forward, patients frequently experience vertigo. However, the manifestations of BPPV can differ from patient to patient and can include generalized drowsiness, lightheadedness, postural instability, and nausea. Vertigo caused by BPPV is frequently intermittent and position-dependent. Patients with BPPV have severe vertigo only when they get out of bed, not when they are performing their normal daily activities with an upright posture (Staab et al., 2017). Idiopathic BPPV has a highest occurrence among 50 to 70 years of age, however it occurs at any age group. A high prevalence is reported among women, BPPV often relapses after the first episodes, with recurrence rate of between 15% to 50% and the episode usually reoccurs within a few months (Neuhauser., 2016).

Many different abnormalities that affect the inner ear, such as cranial trauma and inner ear disorders like vestibular neuritis, labyrinthitis, and Meniere's disease, may be the primary or secondary causes of BPPV. It has been linked to giant-cell arteritis, hormone dysfunction, diabetes, and hyperuricemia, migraine and sudden sensorineural hearing loss (SNHL) (Sonu et al., 2015). A diagnosis of BPPV is based on the patient's medical history and the results of positional testing to determine which canal is affected. The side-lying test, Dix-Hallpike manoeuvre, and the roll test (During paroxysmal vertigo bouts, most patients complain of loss of balance and unbalanced walking.) (Campbell et al., 2020)

In this respect, BPPV is almost a self-remitting disorder and may resolve as time goes on without specific treatment. Management options for BPPV include destructive surgeries, repositioning maneuvers, vestibular sedatives, and habituation exercises. (Han., 2021). Posterior Canal BPPV is managed using Brandt-Daroff Exercise and Epley Maneuvers. Also, the Epley technique, which identified as the canalith repositioning procedure (CRP) is the most commonly employed therapy, has a success rate of up to 90%, and is thought to be the safest treatment option for BPPV patients.

These maneuvers are intended to shift the canaliths in the semicircular canal at the proper angles so that they descend to the utricle and stop dizziness attacks by stopping them from causing endolymph movements. The Epley maneuver (Holmberg & Mahoney., 2017 & Mahrous et al., 2020).

Moreover, BPPV is frequently treated with vestibular rehabilitation exercises that work on training the brain to use different proprioceptive and visual cues to keep gait and balance. The BD exercise is a movement/habituation-based vestibular rehabilitation treatment that involves a series of quick lateral tilts to head and trunk that are serially repeated. Nystagmus, postural control, movement-induced vertigo, the capacity to carry out daily tasks on one's own, and distress levels have all been shown to improve with these exercises (Whitney et al., 2016).

While no one vestibular rehabilitation exercise has been shown to reduce BPPV symptoms, a treatment plan that includes self-administered gaze stabilization exercises, repositioning maneuvers, falls prevention training, and patient education may help to alleviate BPPV symptoms and ameliorate quality of life. The patient's symptoms were completely resolved, and she noticed a reduction in her subjective experience of vertigo (Bressi et al., 2017). The combination of the Epley manoeuvre and the Brandt Daroff exercise resulted in even more improvement and provided the patient with a technique to control and manage her symptoms on her own (Choi., 2020).

Significance of the study:

Although BPPV has been named a benign disease, a number of BPPV patients suffer recurrences and BPPV patients show 1 year recurrence rates of approximately 20% and 5 years recurrence rates of approximately 50%. In some patients experience severe difficulties in their daily lives due to frequent repetition of BPPV. This study was aimed to introduce the new technique Epley's maneuver and Brandt-Daroff exercises on decreasing severity and recurrence of benign paroxysmal positional vertigo; to create awareness about Epley's maneuver and Brandt-Daroff exercises among patients with benign paroxysmal positional vertigo.

Aim of the Study:

To assess the effect of Epley's maneuver and Brandt-Daroff exercises on decreasing severity and recurrence of benign paroxysmal positional vertigo.

Hypotheses of study:

It was hypothesized that:

H₀: Patients with benign paroxysmal positional vertigo who receive Epley's maneuver and Brandt-Daroff exercises exhibit the same vertigo severity and recurrence as those who don't receive it.

H₁: Patients with benign paroxysmal positional vertigo who receive Epley's maneuver and Brandt-Daroff exercises exhibit less vertigo severity and recurrence than those who don't receive it at 3 weeks follow up.

H₂: Patients with benign paroxysmal positional vertigo who receive Epley's maneuver and Brandt-Daroff exercises exhibit less vertigo severity and recurrence than those who don't receive it at 6 weeks follow up

Materials and Method:

Materials

Research design:

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

Setting:

The study was accomplished in otolaryngology clinic at Matrouh General Hospital, Egypt. It has one room and open 5 days per weeks from 8 am to 2 pm. This setting was selected because it had satisfactory flow rate of patients with Posterior Canal Benign Paroxysmal Positional Vertigo for the study aim

Subjects:

The study subjects were 80 adult patients a diagnosis of BPPV of posterior semicircular canal. The sample size was determined based on the primary comparison of vertigo scores among the study and control group. Based on an earlier study (Devangi et al., 2015), the study participants were estimated for both groups with type 1 error of 0.05 and a power of 95% using Gpower (version 3.1.9.7), the sample size was increased to 80 (Fig.1).

The patients were randomly divided to two groups, 40 in the study and 40 in the control group.

The control group (I): received the usual prescribed medication only.

The study group (II): received Epley's Maneuver and Brandt-Daroff exercises with prescribed medication. A patient was considered eligible to participate in the research if they met the following inclusion criteria:

- Aged from 21-60 years old.
- Who had diagnostic criteria of BPPV including: recurrent attacks of positional vertigo provoked by turning over in the supine position or lying down
- Symptoms suggestive BPPV and confirmed with positive Dix-Hallpike test by neuro-otologist.)
- Accepted to participate in the study.
- **Exclusion criteria:**
- Neck pain and cervical spine disease.
- Cerebral vascular disease , external or middle ear problems, and other neurological conditions
- Had no associated diseases such as; vertebrobasilar insufficiency, orthopedic or cardiac problems

Exclusion criteria:

- Peripheral neuropathy or vascular diseases of the lower limbs.
- Skin diseases including acute psoriasis or eczema.
- Recent fractures or lower limbs surgeries.
- Feet injuries including severe bruises, ulcers, open wounds or recent burns.
- Had no associated diseases such as; rheumatic arthritis; neurological disorders; cancer, tuberculosis, human immune deficiency syndrome (AIDS), chronic cardiac, vascular or hepatic illness.

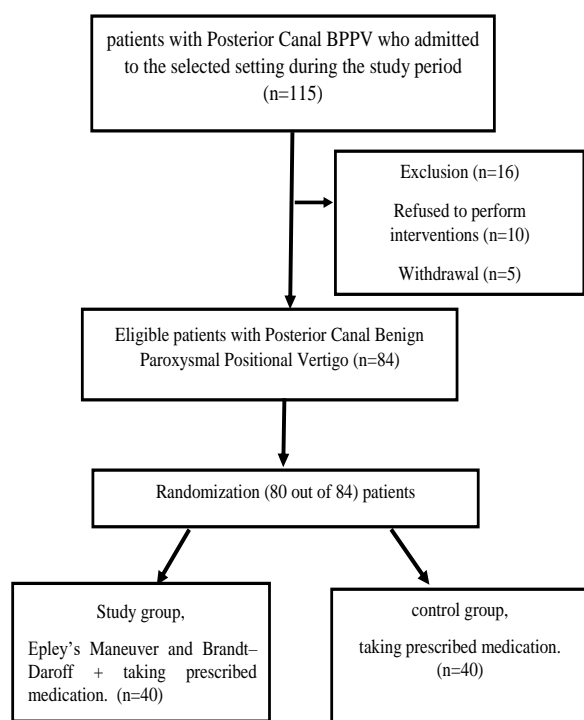


Figure-1: Flow chart of participants' recruitment process.

Tools for Outcome measurements

Two tools were utilized to collect the necessary data.

Tool I: Structured interview questionnaire: It was used to assess the patient's demographic, clinical data and vertigo attack assessment sheet. It was constructed by the researchers after reviewing most of the relevant literature (Breverna et al., 2015; Gupta et al., 2019) and it included two parts:

- **Part I: Patient's demographic data:** It included age, gender, level of education, marital status, occupation, residence area.
- **Part II: Patient's clinical data and vertigo attack assessment:** It included previous medical history and current medication, onset gradually or suddenly, associated manifestation, duration and frequency of vertigo.

These data were collected from patients' medical records and through their interviews.

Tool II: The Vertigo Handicap Questionnaire (VHQ):

The VHQ was adopted from (Yardley & Putam., 1992). It was used to measure vertigo severity by measuring the disabling consequences of vertigo. It includes 25 items. It divided into 3 domains; physical domain, emotional domain and social domain.

It is assessed on 5 points rating scale ranging from "zero" equal never, "one" equal occasionally, "two" equal Sometimes, "three" equal often and "four" equal Always. Total score for questions was estimated and transferred to mean score, high score or high mean indicated increase in vertigo severity

Physical domain: included 7 items related to vertigo effects on taking part in active leisure pursuits, finding active hobbies difficult, carrying on with whatever patient doing, walking long distances, carrying out everyday activities without difficulty, sitting down during vertigo attack and travelling without difficulty.

Emotional domain: included 9 items related to vertigo effects on feeling less confident, less happy to go out, get rather depressed, feel that there may be something seriously wrong with in the patient, feel worries, afraid of spoiling things for others, get embarrassed and frightening.

Social domain: included 9 items related to restrict patient socially, decrease patient participation in active leisure pursuits, restriction of family life, restriction of patient's friends reaction, avoid making plans in advance, carrying out everyday activities with difficulty, patient's friends or relations get impatient, patient's family takes the vertigo in its stride and people are understanding about the problems that causes the vertigo.

These tools were translated into the Arabic language for cultural adaptation, and then the Arabic versions were back-translated into English by two independent translators.

Method:

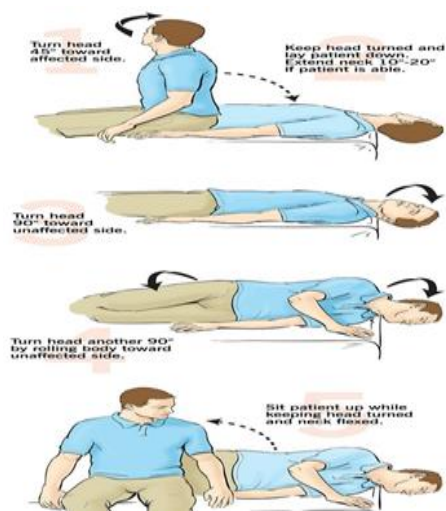
1. Ethics approval

- Before conduction of the study ethical approval was obtained from the Research Ethics Committee, Faculty of Medicine, Alexandria University, Egypt (IRB No.: 00012098, Serial No. 0305798).
- An official letter demonstrating the purpose of the study was delivered from the Faculty of Nursing, Alexandria University to the concerned personnel at Matrouh General Hospital to take their permission to collect data.
- Signed informed consent was taken from participants before participation in the study. All methods were carried out in accordance with relevant guidelines and regulations.

- Privacy of the patients and confidentiality of the collected data and participants' right to withdraw at any time from the study was safeguarded by the researchers.
- The tools were translated into the Arabic language for cultural adaptation. The Arabic versions were back-translated into English by two independent translators.
- Face and content validity of the tools was tested for by five experts in medical surgical nursing to ensure their accuracy and relevance, and suggested modifications were done.
- A pilot study on 8 patients was conducted to test the simplicity, clarity and applicability of the tools and necessary modifications and corrections were made before collection of the research data. Cronbach's alpha coefficient was used to assess tools reliability; reliability coefficients was (0.852).
- Data collection starting from the beginning of October 2022 to the end of Jaunyary 2023.
- Patients meeting the inclusion criteria were divided randomly into two groups, as follow:
 - Control group (I): managed by prescribed medications only.
 - Study group (II): received Epley's Maneuver and Brandt-Daroff exercises with prescribed medication. Those patients were instructed to perform and practice the taught Maneuver and Brandt-Daroff exercises, throughout their scheduled sessions, 5–10 times, three sessions per day for 2 consecutive weeks.
- Before the research began, each patient in the study group received one of the 40 booklets that were printed.
- This booklet included simple illustrations and coloured images. It includes a description of BPPV, physiology, causes, manifestations, and advantages of Brandt Daroff's manoeuvre and Epley's manoeuvre and how to perform them. Consider safety concerns including keep a neutral position of your head, avoid looking upward or down, during washing your hair in the bathtub or putting on shoes and stay away from postures that tilt your head far back (e.g. at the hairdresser or dentist). For the next week, avoid head positions that have previously stimulate symptoms.
- Both Maneuvers were explained by the researchers and re-demonstrated by each patient in the study group as the following: firstly the environment must be safe before started the maneuver, a bowl should be accessible because vomiting might occur, and ideal bed or examination table that can be accessed from both sides and enables the patient's head to be positioned on the end of the table.
- The study group subjects were welcomed and instructed to empty their bladders, take off any restrictive clothing, sit comfortably with their legs uncrossed, and ideally close their eyes lightly.

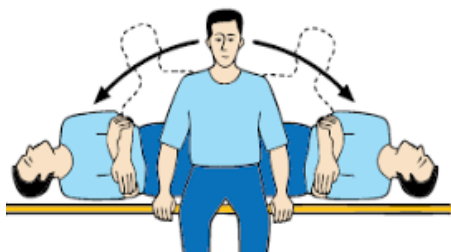
Interventions

- Data were collected for four months, starting in October 2022 .
 - Patients in the study and control groups were interviewed about 15 minutes by the researchers individually. Demographic characteristics, clinical data and the disabling consequences of vertigo were collected.
 - Each participants of the study group were had another interview for about 30-45 minutes to receive training session. The researchers used an Arabic educational handout booklet that developed by the researchers based on review of the relevant recent literature (**Bhattacharyya, et al., 2017, Picciottiet al., 2020 Sergi & De Corso., 2021,**) to support the given information.
 - The booklet was reviewed by a jury of five experts in the field of medical surgical nursing and four experts in otolaryngology medicine. The necessary modifications were then made.
- Epley's Maneuver:** The researchers instructed the patient to assume sitting at the edge of the bed, turn head 45 degrees toward affected side, to the right side if right ear affection or to the left side if left ear affection, (Picture 1) .
- Quickly recline your head, keeping your shoulders on the pillow. This will cause the debris to move even further towards the canal's exit, producing more vertigo and nystagmus.
 - Turn head 90 degrees toward unaffected side, without raising it, "head was looking 45 degrees toward unaffected side". Turn the body 90 degrees toward unaffected side, into the bed. Sit up on the unaffected side, while keeping head turned and neck flexed .
 - Each posture should be held for at least 30 seconds to 2 minutes, or until the vertigo and nystagmus that was triggered has subsided. The debris enters the utricle as the patient is finally set erect .



Picture 1: Epley's Maneuver (Cleveland clinic.2023)

Brandt–Daroff exercise: the researchers instructed the patient to assume sitting position on the rim of the examination table, the head/neck is rotated 45° toward the right and move rapidly into the left side lying position and maintain the head/neck rotation, sit up with the head slightly flexed forward (Picture 2). The patient repeated the same procedure for the other side, too. The patients performed these two procedures steps 5–10 times, three sessions per day (morning, afternoon and evening) with 3 repetitions in each session for two weeks.



Picture 2: Brandt–Daroff exercises (Yetiser & Salturk2022)

The researchers were available in the outpatients' clinics 3 days per week. Implementation of Epley's Maneuver and Brandt–Daroff exercises was followed and encouraged by daily telephone communication. Additionally, it was suggested that family members stand by the patients' sides as they conduct exercises. Data from the control group was collected and finished firstly to avoid contamination of data and they were managed by routine medical intervention including only taking prescribed medication.

Outcomes evaluation:

The researchers evaluate the effect of interventions during patients routine hospital follow up, three and six weeks interview with the participating patients. They were held to improve patient compliance and to motivate patients to regularly perform the Brandt–Daroff and Epley's Maneuver exercises. Patients were urged to progressively increase the number of exercises during follow-up visits in accordance with each patient's capacity, according to researchers. The effectiveness of the of Epley's Maneuver and Brandt–Daroff exercises on Frequency, episodes' duration and severity of vertigo of patient with BPPV was identified by making comparisons between the two groups.

Statistical Analysis:

- Data will be gathered, fed into a computer, and analysed using IBM Statistical Package for Social Sciences (SPSS) version 20 after gathering (Armonk, NY: IBM Corp).
- To compare categorical factors between the control and study groups chi-square test was used. When anticipated count was less than 5 in more than 20% of the cells Fisher's Exact test or Monte Carlo correction were used to correct for chi-square.
- Pearson coefficient used to determine the correlation between two quantitative factors with normal distributions. To evaluate the reliability of the data Cronbach's Alpha test was used. The comparison between the control and research groups for normally distributed quantitative variables was examined using the Student t-test. At the 5% level, significance of the findings was determined. To evaluate means within the same group, the paired t-test was employed. In all testes, $p < 0.05$ was regarded as significant.

Results:

Table (1); presented that the mean age of the BPPV patients in the study and control group were (44.18 ± 11.93 and 40.78 ± 12.77) years respectively. Regarding gender, more than half (52.5% and 57.5%) of both study and control groups were female; respectively. As regards the level of education, nearly half (45%) of the study group and nearly one third (35%) of the control group patients were basic education. Regarding marital status, more than half (52.5% and 57.5%) of both study and control groups were married. As for residence area; the majority (75%, 80%) respectively of both study and control groups were from urban areas.

Finally, nearly one third (32.5%) of both groups were Manual work. There is no statistical significance differences were found between both groups in relation to their sociodemographic.

Table (2); As regards clinical data, there was no statistically significant difference between the study and control groups. In relation to the comorbidity diseases of studied patients in both groups, about one third of them (35% and 37.5 %) of the study and control respectively were suffering from hypertension. Duration of vertigo was less than six to nine months in around two thirds (67.5% and 65%); with mean duration of vertigo (7.45 ± 2.24 and 7.60 ± 2.30) months of the both study and control group, respectively. Furthermore, more than two thirds (72.5%) of the study group patients and 60% of the control group patients, reported their cause of BPPV that was idiopathic causes. More than two thirds (70%) of the study group and slightly more than half (55%) of the control group patients was reported sudden onset of vertigo. Regarding associated manifestation with BPPV more than half (52%, 67.5%) of study and control groups were suffering from nausea respectively .

Table (3) ;Clarifies that there was no statistically significant difference among the study and control group patients regarding frequency and duration of BPPV in the Base line data. Whereas, at the 3rd and 6th weeks assessment there was statistically significant difference in the study group over the control group related to effect of Epley's Maneuver and Brandt-Daroff Exercises on frequency of BPPV ($p=0.002$ * , 0.000 * and 95% CI-5.048 to1.202, -3.692 to1.658). In addition, this table depicts that the BPPV duration had significant improvement in favor of the study group ($p = 0.014$ and 0.001 ; 95% CI-38.464 to4.486 and 31.430 to 8.326).

Table(4);Showed that there were no statistically significant differences between all domains of vertigo handicap questionnaire namely; physical, social, and emotional domains between the study and control group in the base line data, (P value at 0.409, 0.067, and 0.271; and 95% CI 0.710 to1.725, 0.055 to1.605 and 0.397to 1.397) respectively. Whereas, at 3rd weeks assessment, the study group showed significantly better improvement in all domains, physical, social and emotional, of vertigo handicap score post implementation of Epley's Maneuver and Brandt-Daroff Exercises ($P=0.026$ * , 0.000 * & 0.000 *; 95% CI 2.714 to 0.179, 2.488 to 0.812 and 3.450to 1.400).

The table showed significant improvement in favor of the study group after 6th weeks assessment ($P=0.004$ * 0.017 and 0.000 * and 95% CI 3.077 to -.599, -3.637 to -0.363 and(-6.568 to -4.332) respectively in physical, social, and emotional domains of vertigo handicap questionnaire score. Moreover, within-group comparison for physical, social, and emotional domains of vertigo handicap questionnaire score showed statistically significant improvements for both groups 3rdweeks and 6th weeks follow up.

Table (5); Clarifies that total vertigo handicap questionnaire score had statistically significant improvement in favour of the study group ($P=0.000$; 95% CI = 7.741 to 3.209 and 11.946 to 6.504) after 3 and 6 weeks post implementation of Epley's Maneuver and Brandt-Daroff Exercises Quantitative data were described using mean and standard deviation .Significance of the obtained results was judged at the 5% level.

Table (1): Distribution of Sociodemographic data of the study and control groups among BPPV Patients (n=80)

Socio-demographic characteristics	Groups				Test of Significance
	Study (n=40)		Control (n=40)		
	No.	%	No.	%	
Age (years)					
Mean (SD)	44.18 ±11.93		40.78 ±12.77		t= 1.228(0.223)
Gender					
Male	19	47.5	17	42.5	X ² = 0.202 (0.653)
Female	21	52.5	23	57.5	
Level of education					
Basic education	18	45.0	14	35.0	X ² = 0.297 (0.862)
Secondary education	14	35.0	13	32.5	
University or higher	8	20.0	13	32.5	
Marital status					
Single	7	17.5	8	20.0	X ² =0.648 (0.885)
Married	21	52.5	23	57.5	
Divorced	6	15.0	4	10.0	
Widowed	6	15.0	5	12.5	
Residence area					
Urban	30	75.0	32	80.0	X ² =0.287 (0.592)
Rural	10	25.0	8	20.0	
Occupation					
Housewife	8	20.0	11	27.5	X ² = 1.850 (0.604)
Manual work	13	32.5	13	32.5	
Official	11	27.5	12	30.0	
Not work	8	20.0	4	10.0	

- χ^2 : Chi-Square test - t : independent t-test**Table (2): Distribution of clinical data of the study and control groups among BPPV Patients (n=80)**

Clinical data	Groups				Test of Significance
	Study (n=40)		Control (n=40)		
	No.	%	No.	%	
Comorbidity Disease					
Diabetes mellitus	9	22.5	10	25.0	X ² = 1.452 (0.737)
Hypertension	14	35.0	15	37.5	
Cardiac disease	8	20.0	10	25.0	
No medical history	9	22.5	5	12.5	
Duration of vertigo					
< 6-9 months	27	67.5	26	65.0	X ² =0.362 (0.835)
> 9-12 months	9	22.5	11	27.5	
>12 months	4	10.0	3	7.5	
Mean (SD)	7.45 ±2.24		7.60 ±2.30		t= -0.295 (0.769)
Diagnosed cause fo vertigo					
Idiopathic	29	72.5	24	60.0	FE = 1.526 (0.749)
Traumatic	3	7.5	4	10.0	
Infection	2	5.0	3	7.5	
Miscellaneous	6	15.0	9	22.5	
Onset of vertigo					
Gradual	12	30.0	18	45.0	X ² =1.920 (0.166)
Sudden	28	70.0	22	55.0	
Associated manifestation					
Nausea	21	52.5	27	67.5	X ² =1.875 (0.171)
Vomiting	19	47.5	13	32.5	

Multiple answers were allowed - FE: Fisher's Exact test - χ^2 : Chi-Square test . - t= independent t-test

Table 3: Effect of Epley's Maneuver and Brandt-Daroff Exercises on frequency and duration among patients with BPPV

Frequency and Episodes duration	Study group (n=40)	Control group (n=40)	Significance between groups	(95% CI)
	Mean (SD)	Mean (SD)		
Frequency				
- Base line data	17.65 ±4.50	17.75 ±4.64	t=-0.098 (0.922)	(2.137 to 1.937)
- After 3 weeks	11.82 ±4.30	14.95 ±4.33	t=-3.235 (0.002)*	(5.048 to 1.202)
Significance within group t=23.509(0.000)* t=12.821(0.000)*				
- After 6 weeks	4.20±2.57	6.88±1.95	t=-5.239 (0.000)*	(3.692 to 1.658)
Significance within group t=27.327(0.000)* t=19.318(0.000)*				
Episodes duration (in seconds)				
- Base line data	122.25 ± 54.08	129.50 ± 55.92	t= - 0.589 (0.557)	(31.741 to 17.241)
- After 3 weeks	77.02±31.33	98.50±43.94	t= -2.517 (0.014)*	(38.464 to 4.486)
Significance within group t=8.802(0.000)* t=8.457(0.002)*				
- After 6 weeks	44.87±18.19	64.75±31.45	t=-3.427 (0.001)*	(31.430 to 8.326)
Significance within group t=12.054(0.000)* t= 13.085(0.000)*				

95% CI confidence interval of the difference, t independent t-test, t paired t-test, level of significance $p \leq 0.05$

Table 4: Effect of Epley's Maneuver and Brandt-Daroff Exercises on VHQ among patients with BPPV

Vertigo Handicap domains	Study group (n=40)	Control group (n=40)	Significance between groups	(95% CI)
	Mean (SD)	Mean (SD)		
Physical domain				
- Base line data	24.31 ± 2.77	23.80 ± 2.66	t=-0.830 (0.409)	(0.710 to 1.725)
- After 3 weeks	19.13 ± 2.94	20.58 ± 2.70	t= -2.273 (0.026)*	(2.714 to 0.179)
Significance within group	t=23.509 (0.000)*	t=12.821 (0.000)*		
- After 6 weeks	11.49 ± 2.99	13.32 ± 2.51	t= -2.954 (0.004)*	(3.077 to .599)
Significance within group t=27.327(0.000)* t=19.318(0.000)*				
Social domain				
- Base line data	29.70 ± 1.84	28.92 ± 1.88	t= 1.859 (0.067)	(0.055 to 1.605)
- After 3 weeks	21.92 ± 1.84	23.58 ± 1.92	t= -3.919 (0.000)*	(2.488 to 0.812)
Significance within group	t= 32.556 (0.000)*	t= 32.961 (0.002)*		
- After 6 weeks	12.65 ± 3.76	14.65 ± 3.58	t= -2.433 (0.017)*	(3.637 to 0.363)
Significance within group t= 28.062 (0.000)* t= 29.392 (0.000)*				

Emotional domain				
- Base line data	26.70 ±2.07	26.20±1.95	t= 1.110 (0.271)	(0.397to 1.397)
- After 3 weeks	19.92± 2.04	22.35±2.53	t= -4.708 (0.000)	(3.450 to1.400)
Significance within group t= 38.237(0.000)* t= 16.484(0.000)*				
-After 6 weeks	13.82±2.09	19.28±2.86	t=- 9.707(0.000)	(-6.568 to -4.332)
Significance within group t=63.380(0.000)* t=21.707 (0.000)*				

95% CI confidence interval of the difference, t independent t-test, t paired t-test, level of significance $p \leq 0.05$.

Table 5: Effect of Epley's Maneuver and Brandt-Daroff Exercises on total VHQ score among patients with BPPV.

Handicap Questionnaire	Study group (n=40)	Control group (n=40)	Significance between groups	(95% CI)
	Mean (SD)	Mean (SD)		
- Base line data	80.80 ± 5.48	78.92 ± 4.64	t= 1.651 (0.103)	(0.387to 4.137)
- After 3 weeks	61.02 ± 5.29	66.50 ± 4.87	t= -4.810 (0.000)*	(7.741 to 3.209)
- After 6 weeks	13.82± 2.09	19.28± 2.86	t= -6.749 (0.000)	(11.946 to 6.504)

95% CI confidence interval of the difference, t independent t-test, level of significance $p \leq 0.05$

Discussion:

The furthestmost prevalent peripheral vestibular disorder is BPPV. It is a condition that manifests suddenly, is brought on by a specific head, lasts only a few seconds, and is characterized by recurrent vertigo and nystagmus attacks. Rotatory nystagmus typically appears after a brief latent period and gradually worsens with repetitive motions, depending on the semicircular canal that is affected. It results in a clinical picture that includes nausea, sometimes vomiting, postural instability, vertigo in peripheral rotation, and nausea (Murat & ALTINTAŞ., 2020; Vadlamani et al., 2022).

After the underlying physiopathology is identified, it is stated that proper maneuvers or exercises are the most effective therapies for BPPV. As a result, research other than our study have been undertaken to explore the efficacy of maneuvers or exercise therapy to reduce BPPV symptoms (Murat & ALTINTAŞ., 2020; Mandalà et al., 2019). Epley's maneuver, Brandt-Daroff exercises work on the principal of central compensation or spontaneous resolution of positional vertigo which can be accomplished at home (Salman et al., 2022).

Consequently the present study intended to assess the effect of Epley's maneuver and Brandt-Daroff exercises on decreasing severity and recurrence of BPPV.

The findings of the present research shown that there were no statistical significant differences between the study and control group concerning sociodemographic data and clinical data. In addition, the highest proportion of whole studied patients with BPPV were aged from 40-44 years of age, females, married, have basic education, live in urban, with a manual work. They also had hypertension, idiopathic sudden BPPV, that lasting from 3-6 months, and associated with nausea. In the present study, there was no significant difference among both groups in all items of vertigo initial assessment in relation to duration, severity and its impact on social, physical or emotional domain. This may be accredited to the point that patients on both groups are quite similar in diagnosis, cause, associated medical diseases, and plan of care. Additionally it considered as a strength point to validate the study results.

Regarding the influence of Epley's maneuver and Brandt-Daroff exercises on the duration and frequency of BPPV, the results shows a noteworthy decrease in the duration and frequency for the benefit of study group within 3 weeks and 6 weeks of follow up assessment. On the same line, significant improvement in holistic vertigo handicap questionnaire and its specific domains including physical, social and emotional domain in the study group after three and six weeks of complying the exercise training. This improvement may be owed to that these maneuvers transfer free floating particles from the posterior semicircular canal back into utricle, therefore decreasing the symptoms of vertigo (**Gupta & Solanki., 2021**).

The findings of the present study are reliable with **Salman et al.,** study's from 2022, which compared the effects of Semont's and the Modified Epley's Manoeuvre (mEpley) on benign paroxysmal positional vertigo with or without the use of Betahistine medication. Both treatments have been seen to be successful in easing BPPV symptoms and raising quality of life. The outcome also demonstrated that behistine had no further impact on vertigo and quality of life when used in conjunction with Semont's and modified Epley's procedure. Furthermore, numerous studies have demonstrated that positioning techniques, such as Epleys, considerably reduce the symptoms of BPPV. These techniques are safe, simple to use, and may be performed at home. (**Steenerson et al., 2015; Möhwald et al., 2020**).

Within this context, **Steenerson et al., 2015** performed a retrospective study on 923 patients complaining from benign paroxysmal positional vertigo. The patients were treated by positioning manoeuvres, liberatory along and log roll methods for 6 months. The results revealed that 94% of patients suffering from posterior canal BPPV were cured by positioning manoeuvres and 98 % by liberatory manoeuvres and 100% by log roll methods. The findings of this research support and recommend the treatment that used in current study which were both the repositioning Epley's Maneuver and Brandt-Daroff Exercises.

For trying to appreciate on exercise over other; **Ranju et al., 2022** conducted a study to compare the effectiveness of a home-based particle repositioning procedure (HBPRP) (Brantdroff exercises) with the standard Epley's maneuver in managing patients suffering from posterior canal BPPV.

A prospective non blinded randomized study was completed and establish that both groups of patients had significant enhancement of manifestations at the end of the study. A comparison of both groups at second and third visits displayed no differences in rate of vertigo, reduction in vertigo scale and duration of nystagmus following Dix-Hallpike test among both groups. HBPRP is a safe and effective procedure and can be taught as a home-based management for patients diagnosed with posterior canal BPPV.

An inevitable aspect that has been overlooked of the BPPV is its influence on all aspects of quality of life including physical, social, physiological and mental aspect, daily activity. This issue is not neglected to be assessed in the present study as we found a significant improvement after achieving these maneuvers. **Gupta, & Solanki (2021)** used Dizziness Handicap Inventory (DHI) for determining the effect of Epley's manoeuvre in improving the quality of life of patients complaining from BPPV. It involved of a questionnaire covering the emotional, physical, and functional aspects. It was conducted before and after the maneuvers and a significant improvement in scoring was found viewing that Epley's maneuvers has an essential role in improving patients' quality of life. These results are supported by our study as we found a significant improvement in the exercise group in holistic and detailed aspects of vertigo handicap domains. It also had a positive impact on decreasing BPPV in patients with multiple sclerosis as Epley manoeuvre is simple and quick vestibular management that outcomes in weighty changes in benign paroxysmal positional vertigo in a short period of time (**García-Muñoz et al., 2021**).

On the other hand, **Khafari et al., 2021** intended to compare the usefulness of the half somersault maneuver (HSM) as a treatment to that of the Epley maneuver (EM) as a clinical-based management of posterior canal Benign Paroxysmal Positional Vertigo (PC-BPPV) patients. They found that the two maneuvers are expressively operative in the treatment of PC-BPPV, subjects in the HSM group conveyed more improvement in terms of psychometric symptoms and residual dizziness paralleled to the EM group. This results may explained as the study participants were limited to be suffering from posterior canal BPPV.

According to **Gan et al., 2021**, canalith repositioning techniques resembling Epley's are most effective and time saving technique in handling the BPPV patients and also found to have lesser frequency. **Gopinath, S., & Vinod K (2020)**. done a systemic review to appraise the value of the Epley maneuver compared with vestibular rehabilitation on patient suffering from BPPV. It was established that there is moderate-quality evidence that the Epley maneuver is more effective in managing BPPV than vestibular rehabilitation with regard to patient-reported symptom relief. Furthermost studies recommend that the Epley maneuver and vestibular rehabilitation are similarly effective at first month follow-up. The authors recommend to manage patients with the Epley maneuver & vestibular rehabilitation in patients who do not tolerate the Epley maneuver or who do not respond to treatment with the Epley maneuver.

Finally, it is unblemished from the preceding discussion that application of Epley's Maneuver in combination with Brandt-Daroff Exercises was superior to decrease severity and recurrence of benign paroxysmal positional vertigo. It is the time that health care organizations should be aware to the effect of those safe exercises with the right technique to perform it and maximize its impact on a large group of patients and add this article to be as a corner stone and an evidence-based on BPPV management.

Conclusion and Recommendations:

Based on the present study findings, it can be concluded that H1 is accepted while; H0 is rejected where patients with Epley's Maneuver in combination with Brandt-Daroff Exercises exhibit less vertigo severity and recurrence both in 3 and 6 weeks of follow up. Based on the findings of the study, the researcher suggested the following recommendations:

1. Awareness of the community and clinicians concerning referral of these patients to the ENT specialists.
2. Incorporate the technique of Epley's Maneuver with Brandt-Daroff Exercises in clinical nursing curricula, so that students will be trained to use it as an fundamental aspect of the care of patients with BPPV.
3. Evaluate the effects Epley's Maneuver with Brandt-Daroff Exercises on other type of vertigo.

4. In service training programs for nurses to mastering the exercises and apply this.

Study limitations

- Limitations of this study include that the vertigo severity measured by subjective evaluation scales with absence of objective evidence to confirm the effect of the interventions. Thus the researchers suggest using more objective scales on further study as Dix-Hallpike test. .
- Another study limitation was that some patients refused to participate in the study and others patients were excluded by the researchers as they were unable to perform interventions by themselves.

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