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Brandt-Daroff Exercise versus Standard Technique on Symptoms Experienced by Patients with Benign Paroxysmal Positional Vertigo in a tertiary Care hospital: A Comparative Study

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ABSTRACT

INTRODUCTION: Benign paroxysmal positional vertigo (BPPV) is one of the most common causes of vertigo. It's considered to be the most common cause of vertigo among the elderly, since 30% of the people reported to have suffered from it at least once in their lifetime.Several studies have indicated that physical therapy, including rehabilitative exercises and physical maneuvers, is an effective treatment for BPPV. Therefore, the objectives of the study was designed to compare Brandt-Daroff exercise versus standardized technique on symptoms experienced by patients with Benign paroxysmal positional vertigo (BPPV) in a selected hospital of Bangalore, India. **MATERIALS AND METHODS:** The post-test only group design was adopted for this study. The setting was ENT OPD of St. John's Medical College Hospital. A sample of 20 BPPV patients in each Group 1 and Group 2 were taken using purposive sampling technique. A dizziness handicap inventory scale, a visual analogue scale and a checklist was used to assess the symptoms of patients with BPPV. **RESULTS:** Median score of dizziness in group 1 was 37 and in group 2 was 16, the obtained Mann Whitney value was 13, which is statistically significant at $p<0.001$. Likewise, median score for nausea in group 1 was 3 and in group 2 was 0, the obtained Mann Whitney value was 108.5 which is statistically significant at $p<0.0001$. Further, finding depicts that there was no statistically significant difference of vomiting between group 1 and group 2. **CONCLUSIONS:** there was a substantial difference in the degree of nausea and dizziness between groups 1 and 2. Group 1 had higher median scores for nausea and dizziness when compared to group 2. However, the frequency of vomiting did not differ substantially between the two groups.

Keywords: BPPV; Brandt-Daroff exercise, Effectiveness; Standard technique

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INTRODUCTION

Vertigo is a common morbidity that adversely affects balance, activities of daily living and it causes injuries due to fall. It also leads body image disturbances [1. One of the most common causes of vertigo in adults is benign paroxysmal positional vertigo (BPPV). Benign paroxysmal positional vertigo is defined as vertigo induced by rapid extension of the head or lateral tilt of the head toward the affected ear [2]. Benign paroxysmal positional vertigo (BPPV) is one of the most common causes of vertigo, it is the sudden sensation that you're spinning or that the inside of your head is spinning. BPPV reported in a rate of 20 to 30% in specialized health clinics. It affects mostly women, especially after the 60 years of age, when the occurrence gets up to seven times greater, and with its peak level at 70 to 78 years. It's considered to be the most common cause of vertigo among the elderly, since 30% of the people reported to have suffered from it at least once in their lifetime [3]. Several studies have indicated that physical therapy, including rehabilitative exercises and physical manoeuvres, is an effective treatment for BPPV [4]. Vestibular rehabilitation exercises for BPPV includes Brandt Daroff exercise (exercises are very effective with 80% cure rate, Cawthrone-cooksey exercise is also a general intervention for vestibular problems and it is very low cost and often effective. Patients with benign paroxysmal positional vertigo (BPPV) often require

multiple appointments for treatment with Epley Maneuvers. Waiting times for medical follow up can be very long. To reduce waiting times and increase availability of ENT outpatient's appointments, a nurse-led dizziness clinic (NLDC) to follow up BPPV patients was established. This is acceptable to patients and is natural extension of the roles of ENT nurse practitioners which could be implemented in the other ENT departments [5]. Therefore, the objectives of the study was designed to compare Brandt-Daroff exercise versus standardized technique on symptoms experienced by patients with Benign paroxysmal positional vertigo (BPPV) in a selected hospital of Bangalore, India.

MATERIALS AND METHODS

Study design and setting

The post-test only group design was adopted for this study. The study was carried out at St. John Medical College Hospital (SJMCH) Sarjapur Road, Bangalore, India in the month of Jan-Feb 2021 at a tertiary care hospital with 1350 beds and an occupancy rate of 84% on average.

Participants, sample size and sampling technique

The study population for the present study consist patients with BPPV. In the present setting there were around 150 patients attending the ENT OPD per month with complaints of vertigo at St. John's Medical College Hospital Bangalore. The study participants were 40 for this study. Patients with benign paroxysmal positional vertigo between the ages of 30-55, without a history of ear or vision complaints, and with functional to normal ranges of motion in the neck and back were included in this study. Patients with Benign paroxysmal positional vertigo who had bilateral forms BPPV, Prior ear surgery, orthopedic disorder that impairs functional neck and trunk range of motion, vestibular suppressant medication, Central vestibular disorder, Head trauma, Bilateral vestibular disorder were excluded.

Based on power analysis and literature review, the sample size required to assess the effectiveness of Brandt-Daroff exercise on a group of patients compared to the Epley's Manouvre to observe a reduction of 32.8 on symptoms with standard deviation 22.35 and 18.94 respectively for experimental and control groups, at 95% power and 1% level of significance, the minimum sample size required is 20 in each group [6]. The investigator assigned 20 patients in each arm. The formula used for the calculation is as follows.

$$n = \frac{2s_p^2\left[z_{1-\alpha/2} + z_{1-\beta}\right]^2}{\mu_d^2}$$

$$s_p^2 = \frac{s_1^2 + s_2^2}{2}$$

Where,

s_1^2 : Standard deviation in the first group

s_2^2 : Standard deviation in the second group

μ_d^2 : Mean difference between the samples

α : Significance level

$1-\beta$: Power

Every day, 6 to 8 vertigo patients visited the ENT OPD. Therefore, participants were selected on alternate day by simple random sampling technique.

Data collection procedure and intervention

At first the ENT doctors specified the subjects to be assigned to group 1 and group 2. Group 1 received one session of standard technique at the hospital by the ENT doctors. Brandt-Daroff exercise taught to Group 2 followed by standard technique and asked to continue the same, 3 times a day at home. They asked to maintain a log. Post test was done on 15th days after the intervention with the DHI scale, VAS and Checklist. The OPD patients were met after specification. The investigator established rapport with the subjects. Subject information sheet was provided and informed consent was obtained. Baseline variables were obtained using Proforma. The performa was prepared and utilized to elicit the Baseline variables. Dizziness Handicap Inventory (DHI) Scale to assess Dizziness, Visual Analog Scale (VAS) to assess Nausea and Checklist to assess vomiting were used. The tool was translated into Kannada, Telugu and Hindi by language experts.

Statistical analysis and data management

The data were arranged in excel worksheet for tabulation and statistical analysis. The frequency and percentage distribution of subjects according to baseline variables were calculated Median, interquartile range were used to compare the symptoms experienced by patients with Benign Paroxysmal Positional vertigo (BPPV) between group 1 and group 2. Chi-square/Fisher exact test were used to find the association of symptoms experienced with selected baseline variables. P-value less than 0.05 considered as significant.

Ethical considerations

Approval from Institutional Ethics Committee was obtained before conduction of study. After obtaining formal administrative permission from the concerned authority study was conducted. Confidentiality was maintained.

RESULTS

Table 1 revealed that, with the exception of education, the majority of the variables was not significant, indicating that both groups were comparable.

Table 2 compares the symptoms experienced by patients between group 1 and group 2. Median score of dizziness in group 1 was 37 and in group 2 was 16, the obtained Mann Whitney value was 13, which is statistically significant at p<0.001. Likewise, median score for nausea in group 1 was 3 and in group 2 was 0, the obtained Mann Whitney value was 108.5 which is statistically significant at p<0.0001. Further, finding depicts that there was no statistically significant difference of vomiting between group 1 and group 2.

Figure 1 compares the domain of dizziness in group 1 and group 2. The physical domain in group 1 was 48.33% and in group 2 was 23.75%. The emotional domain in group 1 was 29.0% and in group 2 was 10.0%. The functional domain in group 1 was 40.0% and in group 2 was 14.0%. **Figure 2** shows the comparison of dizziness in group 1 and group 2. In group 1, none of participants had dizziness and in group 2, 45% had no dizziness. In group 1, 35% had mild dizziness where in group 2, 55% had mild dizziness. In group 1, 60% had moderate dizziness and in group 2 none of them had moderate dizziness. In group 1, 5% had severe dizziness and in group 2, none of them had severe dizziness.

Figure 3 depicted a comparison of nausea in groups 1 and 2. In group 1, 20% of participants reported no nausea, 40% reported mild nausea, 25% reported moderate nausea, and 15% reported severe nausea. In group 2, however, 55% of participants reported no nausea, 30% mild nausea, 15% moderate nausea, and none reported severe nausea.

Table 1 | Baseline characteristics of group 1 and group 2

Baseline variables	Group 1 [n=20; (%)]	Group 2 [n=20; (%)]	p-value
Age$			
30-39 years	5(25.0)	7(35.0)	0.43 N
40-49 years	10(50.0)	6(30.0)	
≥50 years	5(25.0)	7(35.0)	
Gender$			
Male	10(50.0)	7(35.0)	0.33
Female	10(50.0)	13(65.0)	
Education#			
Illiterate	5(25.0)	0(0.0)	0.03$
Primary	1(5.0)	5(25.0)	
Secondary & higher	9(45.0)	7(35.0)	
Graduation and above	5(25.0)	8(40.0)	
Occupation$			
Professional	6(30.0)	3(15.0)	0.94
Semi-professional	1(5.0)	1(5.0)	
Clerical, shop owner	2(10.0)	2(10.0)	
Skilled	1(5.0)	1(5.0)	
Unskilled	1(5.0)	1(5.0)	
Unemployed	9(10.0)	12(60.0)	
Frequency of vertigo attack$			
< 2times	6(30.0)	10(50.0)	0.33
≥2 times	14(70.0)	10(50.0)	
Duration of illness$			
< 1 month	8(40.0)	5(25.0)	0.75
1-2 months	6(30.0)	8(40.0)	
>12 months	6(30.0)	7(35.0)	
Whether on medication for BPPV$			
Yes	9(45.0)	10(50.0)	0.75
No	11(55.0)	10(50.0)	
Whether you were taught any Rehabilitation Exercise#			
Yes	2(10.0)	1(5.0)	1.00
No	18(90.0)	9(95.0)	
Co-morbidities$			
No	5(25.0)	5(25.0)	1.00
Diabetes	7(35.0)	7(35.0)	
Hypertension	8(40.0)	8(40.0)	

$ - Chi-square, # - Fisher-Freeman-Halton Exact Test

Table 2| Comparison of symptoms experienced by patients between group 1 and group 2 (n=40)

Symptoms	Groups	Maximum Score	Range	Median	IQR	Mann Whitney	p-value
Dizziness	Group 1	100	20-68	37	30.50-43.40	13.0	<0.001*
	Group 2	100	0-30	16	8-22		
Nausea	Group 1	10	0-9	3	2-5.75	108.5	<0.001*
	Group 2	10	0-5	0	0-3		
Vomiting		**Group 1**		**Group 2**		**Chi-square**	**p-value**
		n	**%**	**n**	**%**		
	Group 1	6	30.0	3	15.0	1.290	0.451
	Group 2	14	70.0	17	85.0		

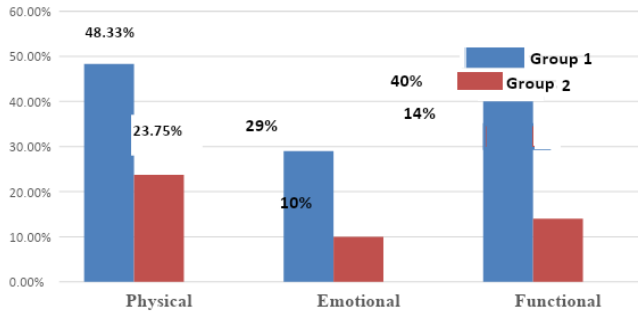

Figure 1|Bar diagram showing DHI scores in each domains Dimension between group 1 and group 2

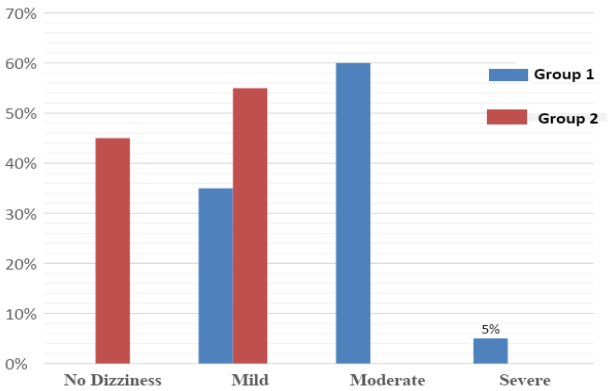

Figure 2|Comparison of dizziness between group 1 and group 2

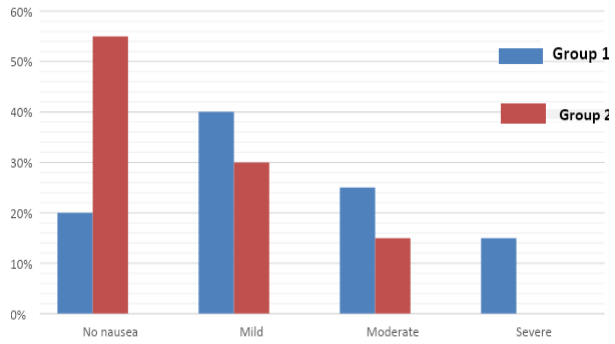

Figure 3|Comparison of Nausea between group 1 and group 2

DISCUSSION

In the present study, there are 25% of patients in group 1 between the age group of 30-39, 50% between the age group of 40-49, 25% are ≥50 where as in group 2, 35% between the age group of 30-39, 30%between the age group of 40-49, 35% are ≥50. These findings were similar to a study done in Kolkata regarding peripheral vertigo showing that about 81% of cases were between the age group of 21 to 70. The vertigo was less common above 5o years and very rare below 20 years of age [7]. In the present study, regarding the gender of the subjects, 50 % of subjects in the Group 1 were males and 50% were females. In Group 2, 35 % were males and 65 % were females. These findings were similar to a study done in Thiruvananthapuram which showed that out of the 392 patients who presented with vertigo, 125 were female and male to female ratio was 1:2.1 [8]. This was similar to another study done in India in which 61.8% were females and 38.2% were males [9]. In the present study, there are 25% of subjects in the group 1 are illiterate, 5% have primary education,55% have high school & higher secondary education, 25% have graduation and above education. In group 2 none of the subjects are illiterate, 25% have primary education, 35% have high school education & higher secondary education and 40% have graduation and above education. These findings were similar to a study done in Indian patients who showed that out of 290 patients, about 2.4% patients were less secondary, 12.1% were secondary and 67.6% were graduate, 10.7% were Diploma and 7.2 % were post graduate [10]. In the present study, 30% of the subjects in group 1 are professional, 5% are semi professional, 10% are clerical, shop owner, 5% are skilled worker, 5% are unskilled worker and 45% are unemployed. 8(40%) are skilled. In group 2 3(15%) of subjects are professional, 1(5%) are semi-professional, 2(10%) are clerical, shop owner, 1(5%) skilled worker, 1 (5%) are unskilled worker and 12(60%) are unemployed. These findings were similar to study conducted in Germany which showed that among 4,294 subjects 69.8% had reduced their workload, 63.3% had lost working days, and 4.6% had changed their jobs. 5.7% had quit their jobs. In the present study, there are 30% of subjects in group 1 who have frequency of vertigo <2 times in a day and 70% have ≥2 times in a day. In group 2 10(50%) have frequency of vertigo <2 times a day, 10(50%) ≥2 times in a day. These findings were similar to a study done in Germany on 20 patients regarding effectiveness of vestibular rehabilitation exercises shows that 60% of patient had frequency of vertigo more than once in a day [11]. Regarding the duration of vertigo 40% of subjects in the group 1 had duration of disease <1 month, 30% of subjects had 1 to 12 months and 30% had >12 months. 25% of subjects in Group 2 had duration of illness <1 month, 40% of subjects had 1 to 12 months and 35% had > 12 months. These findings were supported by another study conducted in Germany, which shows that 4,869 adults who were screened for moderate or severe dizziness found a prevalence of 22.9% for dizziness/vertigo in

the prior 12 months. These findings were also similar to a study conducted in Thiruvanthapuram, India which showed that 8.7% had duration of >1month, 23.9% had duration between 1 to 2 months, 31.5% had duration between 2-3 months,16.3 % had duration between 3-4 months, 13 % of patient had duration between 4-5 months and 6.5% had duration between 5-6 months [12]. Regarding medication for BPPV in Group 1, 45% of subjects were taking medication for BPPV and 55% of subjects were not on medications. Where as in Group 2, 50 % of subjects were taking medication for BPPV in and 50% of them were not on any medications. These findings were similar to the study conducted in Midwestern US city, 198 young adults (99 men and 99 women), and aged 18–34 years, who were not being treated for dizziness or balance problems [11]. Regarding rehabilitation exercise 10% of subjects were taught rehabilitation exercise in Group 1 and 90 % were not taught any exercises. In Group 2, 5% were taught rehabilitation exercise and 95% of subjects were not taught any rehabilitation exercises. These findings were similar to study conducted in Europe, Vestibular rehabilitation exercise was reported as hard/very hard to access by 48%, with the main barriers to access identified as lack of knowledge of health care professionals (particularly family physicians), lack of trained therapists, and lack of local services [16].

Regarding the co-morbidities 25 % of subjects did not had any co-morbidities in Group 1 and 35 % of subjects had diabetes and 40% of subjects had hypertension. In Group 2, 25 % of subjects did not had any comorbidities, 25% of subjects had diabetes and 40 % of subjects had Hypertension. The findings were similar to a study conducted in Kottayam, Kerala Older age-group has an increased risk of BPPV and recurrence of symptoms. About 45.1% of the patients with BPPV who were detected to have symptoms of hypertension were also more common with hypertensive. Diabetes mellitus was found to have an increased risk of BPPV and its recurrence. The presence of other comorbidities, such as abnormal thyroid function test (9%), sensorineural hearing loss (14%), hypercholesterolemia (46%), and vitamin D deficiency (79%) didn't show any significant risk for recurrence [14]. Dizziness and Nausea showed a significant difference between Group 1 and Group 2, where as vomiting showed there is no significant difference between group 1 and group 2.These findings were supported by another study conducted to assess the efficacy of Epley's Maneuver in treating BPPV patients [15]. Cases and controls were studied for the associated symptoms which may be variable factor among the two groups influencing the results. (38%) patients had associated symptoms of nausea and vomiting. These finding were similar to an integrative perspective Midwestern US city showed Common characteristics of BPPV include rotational vertigo (in 86%), oscillopsia (31%), nausea (33%), vomiting (14%), imbalance (49%), fear of falling (36%), and falls (1%) . Another supportive study conducted in School of Allied Health Professions, Medical College of Virginia, shows that after a 17-year history of positional vertigo, episodes of vertigo with neck extension were resolved after performing an individualized treatment program including Brandt/Daroffexercises [11]. Another study conducted in Vadodara, Gujarat, India to compare the role of modified Epley's maneuver and brandt-daroff exercises in treatment of posterior canal BPPV showed highly significant improvement in dizziness and found better improvement in group 2 after 1 week and in group 1 after 1 month of treatment [16]. The study conclude that both treatment approaches are effective in reducing symptoms and improving independence level but combined approaches can give better result. However, the study has some limitations as compliance of the exercises was calculated only on by subjective data i.e., on the basis of 95% data in the log which patients should maintain at home. Study cannot be generalized in larger population.

CONCLUSIONS

Based on the study findings, there was a substantial difference in the degree of nausea and dizziness between groups 1 and 2. Group 1 had higher median scores for nausea and dizziness when compared to group 2. However, the frequency of vomiting did not differ substantially between the two groups. These findings suggest that the Brandt-Daroff exercise intervention used in group 2 may be more effective in reducing symptoms like dizziness and nausea among patients with BPPV than the standard technique exercises used in group 1. Additional research with a larger sample size and in various settings is required to compare interventions and investigate patient experiences related to BPPV symptoms.

ADDITIONAL INFORMATION AND DECLARATIONS

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Author Contributions: Concept and design: RKS and MW; data collection, analysis, reviewed and writes up of final manuscript: RKS. RKS, MW, NP, and ACR. Analysis, interpretation of results: RKS, MW, NP, and ACR. Revision of the manuscripts: RKS. RKS,MW, NP, and ACR. All authors have read and agreed with the contents of the final manuscript.

Data Availability: Data will be available upon request to corresponding authors after valid reason.

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