

[ORIGINAL ARTICLE]**Prevalence of Benign Paroxysmal Positional Vertigo Among Individuals Of 35-55 Years - A Cross sectional Study**Rane Kalpita¹, Kalsait Ashwini², Patil Ashish³, Shaikh Danish⁴¹BPT Intern, ²Associate Professor, Dept. of Neurosciences, ³Assistant Professor, Dept. of Neurosciences⁴Assistant Professor, Dept. of Musculoskeletal Physiotherapy, Dr. Ulhas Patil College of Physiotherapy, Jalgaon.**ABSTRACT**

Background of study : Benign paroxysmal positional vertigo (BPPV) is the most common cause of peripheral vertigo. It occurs due to deposition and movement of otoconia crystals in the semicircular canal, which causes sensation of vertigo, dizziness, nausea, headache and can also be accompanied by nystagmus.

Aim : To study the Prevalence and Sex wise distribution of Benign Paroxysmal Positional Vertigo among individuals of 35-55 years.

Relevance of study : People between the ages of 35 and 55 years tends to overlook dizziness problems because of their hectic lifestyles and busy schedules. This issue might in some way disrupt their daily routine, but they might also go unnoticed. Early diagnosis of BPPV may help to improve the quality of life of patients and may reduce the risk of injury.

Methodology: In this cross-sectional study 105 participants experiencing dizziness were selected according to inclusion & exclusion criteria. Evaluation of dizziness was done using the Dizziness Handicap Inventory Scale and then Dix Hallpike Test was carried out.

Result : Among 105 participants suffering from dizziness, 13 were diagnosed with BPPV. The study concluded that 12.38% of individuals were prevalent for BPPV, of whom 8 were females (62%), and 5 were males (38%).

Conclusion : The prevalence of Benign Paroxysmal Positional Vertigo among individuals of 35-55 years is 12.38%. Females were more affected as compared to males.

Keywords : *Dizziness, BPPV, Dix Hallpike Test, Dizziness Handicap Inventory, Menopause*

Introduction

Benign paroxysmal positional vertigo (BPPV) is a disease characterized by a sensation of imbalance and nausea, with sudden dizziness in response to head movements.^[1] Benign paroxysmal positional vertigo (BPPV) is the most common cause of peripheral vertigo.^[2]

The three semicircular canals (SCCs) (horizontal, posterior [inferior], and anterior [superior]) respond to angular acceleration and are orthogonal (at right angles) with respect to one another.

The SCCs enlarge at one end to form the ampulla.

Within the ampulla lies the cupula, a gelatinous barrier that contains the sensory hair cells. The

kinocilia (mechanosensing cilia involved in the sense of movement) and stereocilia (mechanosensing organelles) of the hair cells are seated in the crista ampullaris (sensory organ of angular rotation).

The saccule and utricle make up the otolith organs of the membranous labyrinth and respond to linear acceleration and static head tilt. Otoconia, a calcium carbonate crystalline structure material encased in a gelatinous substance that protrudes from sensory hair cells, provides the inertial mass to the otolith organs.^[3]

There are two pathophysiologic mechanisms- Canalithiasis and Cupulolithiasis -

In the cupulolithiasis model, the particulate matter

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becomes adherent to the cupula itself. This cupular loading renders the system sensitive to gravitational forces, and the resulting alterations in cupular deflection led to pathological perceptions of motion.^[4]

Canalolithiasis Theory suggests that degenerative debris from the utricle are free floating in the long arm of the semicircular canal. Otoconia are more than twice the density of the endolymph within the semicircular canals. Therefore, a positional change of the canal with respect to gravity would result in movement of otoconia, which in turn would overcome the inertia of endolymph. This movement would deflect the cupula causing nystagmus and vertigo.^[7]

In females, follicle-stimulating hormone (FSH) rises and stays high while estrogen and progesterone start to fall prior to menopause and stay low after menopause. Women between the ages of 40 and 49 may be more susceptible to BPPV because to perimenopausal variations in estrogen levels rather than just low estrogen levels. Estrogen may also impact the ionic and anionic homeostasis of endolymph by controlling the production of ion and anion channels and pumps. This potential pathophysiology is connected to the estrogen receptors in the inner ear, namely the vestibular dark cells in the ampulla and utricle.^[5]

The Dix Hallpike Test, sometimes called Barany Maneuver or the Nylen Barany Maneuver, is considered a Gold Diagnostic test for diagnosis of posterior canal BPPV.

This maneuver placed the posterior SCC of the down ear in the plane of the pull of gravity. Debris adhering to the cupula or free floating in the long arm of the canal will shift away from the cupula, resulting in vertigo and nystagmus.

In most cases of BPPV, nystagmus and vertigo occur within a few seconds of positional change, but occasionally the signs and symptoms will have a longer delay until onset, even as much as 30 seconds.^[6]

The benefit of the DHT is that it is a simple assessment that can be conducted in a few minutes with minimal equipment and will definitively determine the presence of BPPV. Following a positive response, BPPV may be treated with the Epley Maneuver which, in most cases, provides instantaneous relief from BPPV symptoms and their

associated impact on an individual's life (Von Brevern et al 2003).^[7]

The aim of this study was to find the Prevalence and Sex wise distribution of Benign Paroxysmal Positional Vertigo among individuals of 35-55 years. This significant study aims to ascertain the prevalence of BPPV in otherwise healthy people aged 35 to 55 years who are not currently seeking treatment for dizziness or balance problems. Due to their busy schedules and demanding lifestyles, people in this age group sometimes neglect dizzy issues. They may not be aware of this problem, but it may also interfere with their regular routine. These positive findings could indicate untreated or unidentified BPPV. Recognition of these symptoms is essential because treatment of BPPV is very risk-free, affordable, and highly effective, therefore recognizing these symptoms is crucial. If left untreated, BPPV can lead to persistent balance deficits and other disabling symptoms in the long term. As there is limited research related to prevalence of Benign Paroxysmal Positional Vertigo. So, the present was a study carried out.

Materials And Methods

This was a cross sectional study which was conducted at Dr. Ulhas Patil Medical College and Hospital, Jalgaon. Minimum sample size for the study was 93 which was calculated by the formula = $(Z^2 pq)/d^2$

$$n = ((1.96)^2 (0.81)(0.19)) / [(0.08)]^2$$

p = your guess of population

$$q = 1 - p$$

1- α = Confidence level set by you

Z = Z value associated with confidence

d = Absolute precision

n = Minimum Sample size

The duration of this study was 6 months. Materials used in the study were Chair, Plinth, Pen, Patient evaluation sheet, Dizziness Handicap Questionnaire.

Participants

A Cross sectional study was conducted on One Hundred Five participants with Dizziness at Dr. Ulhas Patil Medical College and Hospital, Jalgaon. Criteria for inclusion were 1. Individuals between the age group of 35-55 years. 2. Individuals having dizziness problems in the past 3 months and not seeking any treatment for it. 3. DHI score > 16.

Subjects excluded were 1. Secondary causes like vestibular migraine, Meniere's disease, labyrinthitis, and orthostatic hypotension. 2. Patients who have undergone any vestibular surgery. 3. Vestibular artery insufficiency 4. Head Injury 5. Comorbidities like DM, Hypertension. 6. Any ear infection-related dizziness which may result in a misdiagnosis or possibly the infection spreading.

Outcome measures were 1. Dizziness Handicap Inventory Scale, 2. Dix Hallpike Test. The statistical analysis of the data was done in MS Excel.

Procedure

Ethical clearance was obtained from the Institutional Ethical Committee of Dr. Ulhas Patil College of Physiotherapy. A written informed consent form was obtained from who were willing to participate. Subjects were screened according to inclusion and exclusion criteria. The aim of the study and its objective was explained to willing participants.

A detailed assessment of dizziness and addiction was taken of all the participants.

The menstrual history of all the female participants was taken, and the menopausal history of those females who had attained menopause was taken as menopause and perimenopausal variations in estrogen levels are shown to be a cause of BPPV in women.

Participants were screened for dizziness using the Dizziness Handicap Inventory (DHI) scale to assess the impact of dizziness on the individual's quality of life. The score was noted and was classified according to the interpretation: -

16-34 Points (mild handicap)

36-52 Points (moderate handicap)

54+ Points (severe handicap)

Individuals having DHI score > 16 were included in the study.

For the diagnosis of Benign Paroxysmal Positional Vertigo, Dix Hallpike Test was carried out. It is the gold standard assessment test for the diagnosis of the vestibular disorder Benign Paroxysmal Positional Vertigo (BPPV).

The DHT (Dix & Hallpike 1952) consists of a series of head movements conducted in order to stimulate the movement of the debris in the posterior semicircular canal which is responsible for symptoms in 90% of cases.

The subject starts in a sitting position and their head is turned 45° towards the side to be tested. The

assessor then assists them to lie down quickly and extends their neck 30° over the end of the plinth, maintaining 45° rotation. The assessor should be able to see the patient's eyes and should observe for nystagmus and dizziness.

A) Dix Hallpike Test Demonstration



Fig 1 : Therapist rotating the participant's head 45° in sitting position.



Fig 2 : Therapist extending neck beyond 30° while maintain 45° rotation.

Result

A total of 105 participants were included in the study. The data was obtained from the participants and statistically analysed in MS Excel.

Table 1 : Age wise Distribution of Participants

Age Group	No. of Participants	Mean Age
35-45	49	45
46-55	56	

Graph 1 : Age wise Distribution of Participants

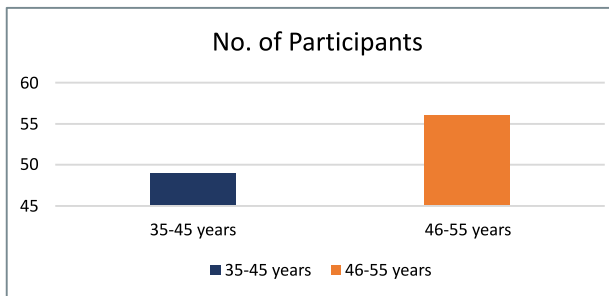


Table 2 : Gender wise Distribution of Participants

Gender	No. of Participants	Percentage (%)
Males	51	49
Females	54	51

Graph 2 : Gender wise Distribution of Participants

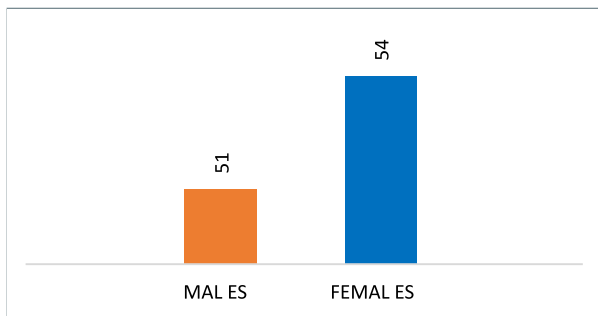


Table 3 : Dizziness Handicap Inventory Scale

Interpretation	Score
16-34	100
36-52	14
54+	1

Graph 3 : Dizziness Handicap Inventory Scale

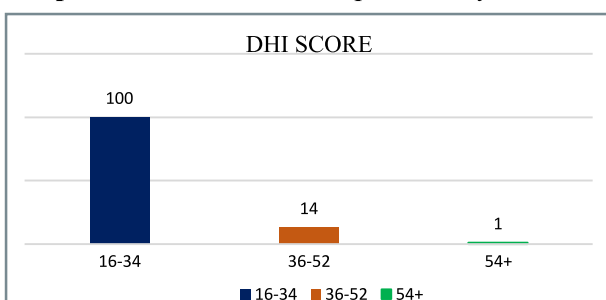


Table 4 : Dix Hallpike Test Result-

Positive	Negative
13	92

Graph 4 : Dix Hallpike Test Result

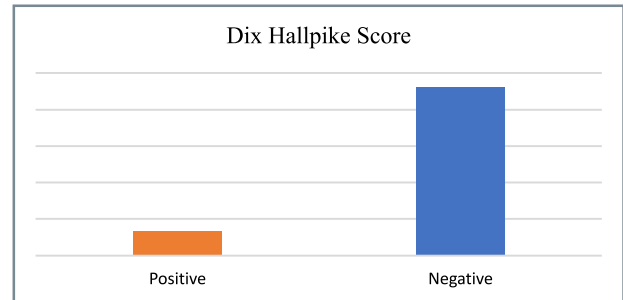
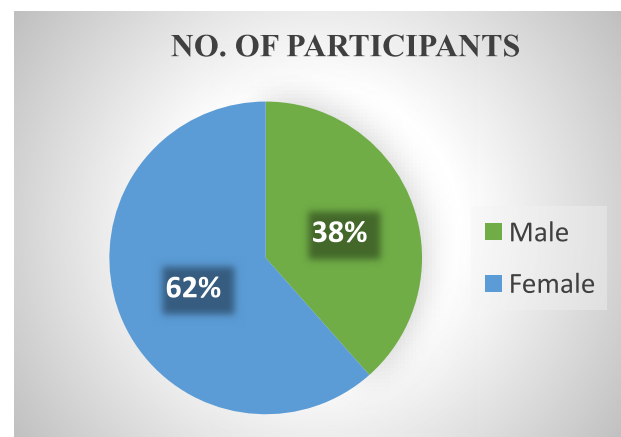


Table 5 : Prevalence of BPPV among Males and Females

		Percentage
Males	5	38%
Females	8	62%

Pie Chart : Showing Prevalence of BPPV among Males and Females



Discussion

The aim of the present study was to find out the prevalence of Benign Paroxysmal Positional Vertigo among individuals of 35-55 years.

The study concluded that 12.38% of individuals were prevalent for BPPV. Out of 105 participants, 13 were positive for BPPV. 8 were females (62%) and 5 were males (38%), which showed that females were more affected than males.

The posterior canal BPPV is more common. This may be due to the spatial position of the posterior semicircular canal which is most dependent when in an upright position for the migration of otoconia

from the utricle due to the effect of gravity.

This leads to movement of the otoconia provoked by positional head movements in the posterior semicircular canal and is responsible for BPPV.^[8]

A study conducted by Santosh Kumar Swain et al in 2019 to evaluate the prevalence, incidence, clinical presentation of benign paroxysmal positional vertigo (BPPV) at a tertiary care hospital of India concluded that BPPV is a commonly found peripheral vestibular disorder leading to significant morbidity, psychosocial impact, medical costs and burden to family. BPPV is more prevalent over the age of 45 years and more among female patients. Most cases are with idiopathic etiology, which coincides with present study.^[8]

Research stated that Idiopathic BPPV constitutes of about 50-70% cases and is the most common cause of posterior benign paroxysmal positional vertigo.^[9]

A study conducted by Anirban Ghosh and Srinivas Dorasala in 2023 to evaluate the incidence of BPPV among all vertigo patients at a tertiary vertigo center concluded that BPPV constitutes of 26% of all vertigo cases at the tertiary center, among which most of the cases were idiopathic in origin, which coincides with present study.^[10]

There were 8 BPPV prevalent female participants in the present study, all participants have attained menopause which is said to be a cause of declining estrogen level responsible for otoconia degeneration and dislocation.^[11]

A study conducted by Oluwaseye Ayoola Ogun, Bela Bu'ki et al in 2014 to examine the age and sex distribution and the effects of menopause in a large cohort of participants diagnosed with benign paroxysmal positional vertigo (BPPV) concluded that that hormonal fluctuations (especially during menopause) may increase the tendency to develop BPPV which coincides with present study.^[13]

A study conducted by Seong-Hae Jeong in 2020 to examine the risk factors of BPPV in perimenopausal women concluded that sudden decrease in estrogen can lead to the disturbance of otoconial metabolism, which can increase the prevalence of BPPV in postmenopausal women which coincides with present study.^[13]

In the present study, the positive results could be undiagnosed or untreated BPPV, a diagnosis that is frequently disregarded in this younger age range. Recognition of these symptoms is essential because

treatment of BPPV is relatively risk free, inexpensive, and very effective. It can be treated with repositioning maneuvers like Epley's maneuver, Brandt Daroff exercise, Semont Maneuver.

Conclusion

The prevalence of Benign Paroxysmal Positional Vertigo among individuals of 35-55 years is 12.38%. Females were more affected as compared to males.

Limitation

Limitations of the study was that more attention was given to dizziness than balance disturbance in our questionnaire.

Therefore, patients with BPPV who presented with balance disturbances only were possibly missed.

Clinical Implication

The percentage of Benign Paroxysmal Positional Vertigo in the adult population is lower as compared to older population, but should be treated to reduce the risk of further complications like balance deficits.

Treatment of Benign Paroxysmal Positional Vertigo with repositioning maneuvers has been shown to be safe and effective in resolving the symptoms of BPPV.

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Conflict Of Interest

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References

1. von Brevern M, Radtke A, Lezius F, Feldmann M, Ziese T, Lempert T, Neuhauser H. Epidemiology of benign paroxysmal positional vertigo: a population-based study. *J Neurol Neurosurg Psychiatry*.2007;78(7):710-715.

2. Neuhauser HK, Von Brevern M, Radtke A, Lezius F, Feldmann M, Ziese T, Lempert T. Epidemiology of vestibular vertigo: a neurotologic survey of the general population. *Neurology*. 2005 Sep 27;65(6):898-904.
3. Susan B.O'Sullivan, Thomas J. Schmitz, George D. Fulk. *Physical Rehabilitation*. Philadelphia. F.A. Davis Company; 2014.
4. Parnes LS, Agrawal SK, Atlas J. Diagnosis and management of benign paroxysmal positional vertigo (BPPV). *CMAJ* 2003;169(7):681-693.
5. Ding HL, Chia HK, Chia TW, Ch CC, Tzeng JC, De KH, and Chung LK. Age-Related Increases in Benign Paroxysmal Positional Vertigo Are Reversed in Women Taking Estrogen Replacement Therapy: A Population-Based Study in Taiwan. *Front. Aging Neurosci*. 2017 December 12. Vol-9. Article 404.
6. Susan J. Herdman, Richard A. Clendaniel. *Vestibular Rehabilitation*. Philadelphia. F.A. Davis Company; 2014.
7. Sumner A. The dix-Hallpike test. *Journal of Physiotherapy*. 2012 Jan 1;58(2):131.
8. Swain SK, Behera IC, Das A, Sahu MC. Prevalence of Benign Paroxysmal Positional Vertigo: Our experiences at a tertiary care hospital of India. *EJENTAS*. 2018 November. Volume 19(3), Article 2, Page 87-92.
9. Palmeri R and Kumar A. *Benign Paroxysmal Positional Vertigo*. National Library of Medicine. 2017.
10. Ghosh A, Dorasala S. Epidemiology of benign paroxysmal positional vertigo (BPPV) and risk factors for secondary BPPV: a population-based study. *The Egyptian Journal of Otolaryngology*. 2023 Jun 6;39(1):93.
11. Yang L, Xu Y, Zhang Y, Vijayakumar S, Jones SM and Lundberg YW. Mechanism Underlying the Effects of Estrogen Deficiency on Otoconia. *J Assoc Res Otolaryngol*. 2018 Aug; 19 (4): 353-362.
12. Ogun OA, Bu'ki B, Cohn ED, Janky KL, and Lundberg YW. Menopause and benign paroxysmal positional vertigo. *Menopause: The Journal of The North American Menopause Society*. 2014 August . Vol. 21(8), pp. 886-889.
13. Jeong SH. Benign paroxysmal positional vertigo risk factors unique to perimenopausal women. *Frontiers in Neurology*. 2020 Oct 16;11:589605.