ORIGINAL ARTICLE

Association of Laterality of Benign Paroxysmal Positional Vertigo with Preferred Sleeping Side: A Cross-Sectional Study at a Tertiary Care Hospital in Pakistan

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ABSTRACT

Objective: To assess the relationship between the laterality of Benign Paroxysmal Positional Vertigo and the preferred sleeping side.

Study Design: A descriptive cross-sectional study.

Place and Duration of Study: This study was conducted at the Department of ENT, Pak Emirates Military Hospital (PEMH), Rawalpindi, Pakistan, from 1st February 2022 to 31st January 2024.

Methods: A total of 160 individuals aged 18–60 years diagnosed with Benign paroxysmal positional vertigo (BPPV) were enrolled using non-probability consecutive sampling. Patients with a history of vestibular surgery, neurological conditions, irregular sleep patterns, or pregnancy were excluded. Data were collected via a structured questionnaire covering demographics, medical history, clinical symptoms, and sleep habits, followed by a comprehensive ear, nose, and throat examination, including the Dix-Hallpike test to confirm the diagnosis of BPPV and determine its laterality.

Results: Among 160 patients, 58 (36.3%) were male and 102 (63.8%) female, with a mean age of 41.98 ± 8.27 years. BPPV involved the right ear in 78 (48.8%) patients, the left ear in 62 (38.8%), and was bilateral in 20 (12.5%). Sleeping side preference was right in 83 (51.9%) and left in 77 (48.1%) patients. A significant association was found between sleeping side preference and BPPV laterality using the Pearson Chi-Square test ($\chi^2 = 30.821$, $P < 0.001$; Cramer's V = 0.439), with most patients affected on the same side as their preferred sleeping position.

Conclusion: We found a significant association between preferred sleeping side and BPPV laterality, with BPPV more frequently affecting the preferred sleeping side. Further studies are needed to determine whether sleeping position contributes to BPPV development.

Keywords: *Benign Paroxysmal Positional Vertigo, Posture, Sleep, Semicircular Canal, Vertigo*.

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Introduction

Benign paroxysmal positional vertigo (BPPV) was first acknowledged by Robert Bárány in 1921.[1] It is one of the most common causes of peripheral vertigo, accounting for approximately 26.6% of cases.[2] Of the 5.6 million annual U.S. clinic visits for dizziness, 17–42% of vertigo cases are attributed to BPPV.[3] BPPV occurs due to dislodged otoliths from the utricle, which float in the semicircular canals or attach to the cupula, making the labyrinth sensitive to gravity and causing brief vertigo with nystagmus triggered by head movements like turning, lying down, or rolling over.[4] The Dix-Hallpike test is considered the gold standard diagnostic assessment.[5] Although mostly idiopathic, trauma is the most common cause, with other notable risk factors including advanced age, female gender, osteoporosis, excessive carbohydrate or fat intake, and sleeping preference for one side.[6] The direction

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of nystagmus indicates the affected semicircular canal, with the posterior canal involved in up to 90% of cases.[7]

The exact mechanism behind otoconia dislodgement is not fully understood, but factors such as low vitamin D levels or altered glucocorticoid metabolism may affect bone turnover and otoconia mineralization, contributing to dislodgement.[8] About 75% of BPPV episodes occur during sleep or upon waking, supporting the theory that micro-otoconia gradually accumulate and, due to gravitational forces during sleep, slide into the semicircular canals, potentially linking sleep position to disease onset.[9] Diagnosing BPPV costs an average of $2000, and 86% of patients experience disruptions in daily activities and missed work due to vertigo symptoms.[10] This study explores the potential role of sleep position in the development of BPPV. Understanding this association could pave the way for tailored prevention and management strategies by incorporating sleep habit modifications into therapeutic approaches. Identifying sleep-related triggers may improve patient outcomes and reduce the recurrence of this debilitating condition.

Methods

This cross-sectional study was conducted at the Ear, Nose and Throat (ENT) Department over 23 months from 1st February 2022 to 31st January 2024, to explore the relationship between sleep habits and BPPV laterality. Adult patients aged 18–60 years with BPPV were included, while those with other vestibular disorders, recent vestibular surgery, neurological conditions, irregular sleep patterns, or pregnancy were excluded. A total of 160 participants were enrolled after approval from the Institutional Review Board of the hospital, vide letter no: A/28/ER/133/24, dated: 10th January 2022, and informed consent. We used a non-probability consecutive sampling technique. Data were collected using a structured questionnaire covering demographics, clinical history, and sleep habits, alongside clinical examination using the Dix-Hallpike test to confirm BPPV diagnosis and identify affected semicircular canals. Statistical analysis in SPSS Version 25 assessed associations between sleep patterns and BPPV laterality. A *P*-value was calculated <0.001 via the Pearson Chi-Square test and found statistically significant, and the effect size was calculated using Cramer's V. Descriptive analysis was done for all the categorical variables. The study followed the Declaration of Helsinki.

Results

The mean age of participants was 41.98 ± 8.27 years, with a female predominance (63.80%, n=102) over males (36.30%, n=58), as shown in Figure 1.

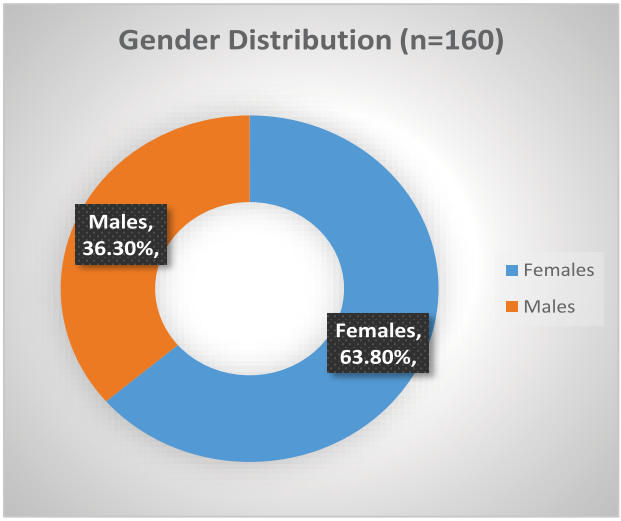

Fig.1: Gender distribution (n=160)

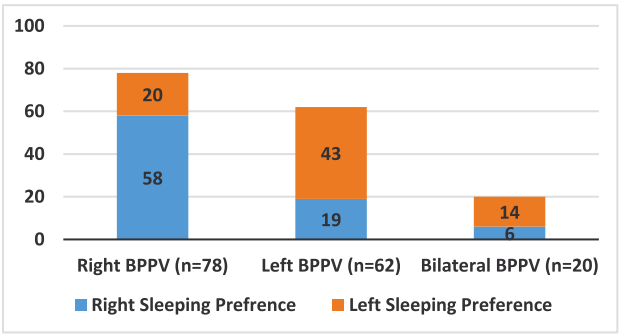

Fig.2: Distribution of BPPV ear laterality and preferred sleeping side (n=160)

Regarding BPPV laterality, 48.8% (n=78) had right ear involvement, 38.8% (n=62) had left ear involvement, and 12.5% (n=20) had bilateral involvement (Figure 2). Sleep side preference revealed 51.9% (n=83) preferred the right side, while 48.1% (n=77) preferred the left. Among right ear (n=78) BPPV patients, 74.35% (n=58) preferred sleeping on the right, while 25.64% (n=20) slept on the left. For left ear (n=62) BPPV, 30.64% (n=19) slept on the right side, and 69.35% (n=43) preferred the left. In bilateral (n=20) BPPV cases, 30% (n=6) preferred sleeping on the right side, and 70% (n=14) preferred the left side.

Table 1: Association of sleeping side with Laterality of Benign paroxysmal positional vertigo (n=160)

Laterality of BPPV	Sleeping Side Preference		*Pearson Chi-Square* test	Effect Size Cramer's V	*P*-value
	Right	Left			
Right Ear	58 (69.9%)	20 (26.0%)	30.821	0.439	<0.001
Left Ear	19 (22.9%)	43 (55.8%)			
Bilateral	6 (7.2%)	14 (18.2%)			

BPPV: Benign paroxysmal positional vertigo

We observed a significant association between sleeping side preference and BPPV laterality (Pearson $\chi^2 = 30.821$, $P < 0.001$). The effect size was moderate to large (Cramer's V = 0.439), suggesting a meaningful relationship between preferred sleeping side and the affected ear (Table1).

Discussion

In this study, a higher proportion of females (63.8%) was noted compared to males (36.3%). This gender distribution is consistent with research conducted by Smith PE et al. They reported a higher incidence of BPPV in females, suggesting that hormonal factors or other gender-specific factors may contribute to this increased susceptibility.[11] The mean age of our study participants was 41.98 ± 8.27 years (range: 18 to 60), comparing with the Laurent G et al. they in their review, highlighted that while age-related data is variable, BPPV predominantly affects middle-aged individuals.[12]

Regarding laterality, this study found that 48.8% of patients had right ear involvement and 38.8% had left ear involvement. In their study, Ichijo H et al. found no significant gender-based difference in BPPV occurrence and observed a higher prevalence of right-sided BPPV (56.6% in males versus 59% in females), but the most common sleeping position among participants was supine.[13]

Bilateral BPPV, though less common, was present in 12.5% of our study population. In comparison, Haripriya GR et al. reported bilateral involvement in up to 3.13% of BPPV cases.[14]

The authors reviewed the literature from the past five years and found no studies indicating a higher prevalence of left-sided canal involvement.

Regarding sleep position preference, our study found that 51.9% of patients preferred sleeping on their right side, while 48.1% preferred sleeping on their left side. Specifically, a higher proportion of patients with right ear BPPV (69.9%) preferred sleeping on their right side, while 55.8% of patients with left ear BPPV preferred sleeping on their left side.

Liu Y et al. found right-sided BPPV in 53.8% and left-sided in 46.2% of cases, with right lateral sleeping common in right BPPV (71.7%) and left decubitus sleeping in left BPPV (78.1%), while multicanal involvement was rare (3%) and variable sleep patterns were observed in these cases.[15] Similarly, Shim DB et al. documented that 81.3% of right BPPV patients preferred sleeping on the right side, while 73.3% of left BPPV patients preferred sleeping on the left side, further supporting the association between sleep position and BPPV laterality.[16]

Yousovich R et al. in their study stated that no differences were seen in right versus left posterior canal BPPV among patients who did not prefer any specific sleep position.[17]

Gimmon Y et al. in their study verified that in patients who did not prefer any specific sleep position, right versus left canal involvement was seen as almost even.[18]

The mechanism linking sleep position and BPPV is thought to involve the higher density of otoconia, which accumulate in the lowest semicircular canal when the head is positioned on the same side during sleep.[19] Changing sleep positions may help prevent the accumulation of otoconia, reducing the risk of developing BPPV.[20,21] A higher rate of recurrent BPPV is noted when patients continue sleeping on the affected side, and unilateral sensorineural hearing loss may arise in the dependent ear due to constant debris accumulation leading to ischemic damage.[22,23]

The right-sided sleep preference seen among our patients aligns with other research indicating that right-sided sleeping is more common in the general population, particularly among older individuals, who often prefer this position for its cardiovascular benefits.[24]

This study supports the hypothesis that sleep position may influence BPPV laterality. The association between preferred sleep side and the affected ear in BPPV patients provides further evidence for the role of sleep habits in the development and progression of BPPV. The study's limitations included data collection at a single time point and a lack of follow-up. This limits the ability to assess the long-term implications of the observed association. Future research with larger sample sizes and longitudinal designs will help confirm these findings and further investigate the patho-physiological mechanisms underlying this relationship.

Conclusion

A statistically meaningful association exists between preferred sleeping side and BPPV laterality, with right-sided sleeping and right-ear BPPV being the most common presentations. These findings support a gravity-dependent mechanism of otoconial accumulation, suggesting that sleep habits are an important clinical consideration.

Future prospective longitudinal studies are needed to investigate whether sleep position modification reduces recurrence risk.

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Ethical Approval and Consent: Institutional Review Board letter, reference no: A/28/ER/133/24, and informed written consent were obtained from all the participants

Availability of Data: The data supporting the findings of this study are available from the corresponding author upon reasonable request

Conflict of Interest: The authors declare no conflict of interest

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Author Contributions

TA: Conception, design of the work, and approval for final submission

ZH: Manuscript writing for methodology design, investigation, and approval for final submission

SA: Data acquisition, curation, statistical analysis, and approval for final submission

FA: Validation of data, interpretation, write-up of results, and approval for final submission

MA: Revising, editing, supervising for intellectual content, and approval for final submission

HA: Writing the original draft, proofreading, and approval for final submission

TA is the nominated guarantor and takes full responsibility for the overall content and integrity of the work

Note: All authors have accessed/verified the data reported in this manuscript, and all authors accept responsibility for this submission

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