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Recurrence Rates and Risk Factors for Benign Paroxysmal Positional Vertigo: Insights from a Large Single-Institution Epidemiological Study

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This study aimed to assess the recurrence rate of benign paroxysmal positional vertigo (BPPV) and identify risk factors for its recurrence at a major university hospital, which functions as a regional referral center. This study included patients diagnosed with BPPV who received treatment at Srinagarind Hospital, Khon Kaen University, Thailand between January 1, 2020, and January 1, 2022. This study evaluated the recurrence rate, and associated risk factors for BPPV recurrence in Thailand. A total of 376 patients met the inclusion criteria, with the majority being female (75.3%). The mean age of the patients was 58.09 ± 13.10 years. The most commonly affected site was the posterior semicircular canal. Recurrence of BPPV was observed in 33 patients (8.8%), with the highest recurrence rate (30.3%) occurring within the first 6 months. Risk factor analysis showed that older adults were 2.91 times more likely to experience recurrence within the first year compared to younger adults (95% CI: 1.12–7.59, P = 0.029). Further analysis revealed that patients experiencing recurrence within the first year were 5 times more likely to be older adults than younger adults (95% CI: 1.04–24.03, P = 0.045). Gender, along with comorbid conditions like diabetes, hypertension, and a history of head trauma, were not found to be significant risk factors for recurrence.

Keywords: Benign paroxysmal positional vertigo; Positional vertigo; Recurrence rate; Risk factor; Vertigo.

Benign Paroxysmal Positional Vertigo (BPPV) is the most common condition causing dizziness, with a reported prevalence of 17-42%.[1-3] This condition significantly impacts daily activities and the quality of life of affected patients.

Diagnosis can be made through history-taking and physical examination, specifically by observing nystagmus following specific head movements, such as the Dix-Hallpike manoeuvre or the Supine Roll Test. The primary treatment for BPPV involves a canalith repositioning procedure (CRP), where a clinician performs specific head movements to reposition the dislodged otoliths back into their original position.[2] Previous study reported that combining CRP with self-administered exercises, such as the Brandt-Daroff manoeuvre, is more effective than CRP alone, with a reported success rate of 100%.[1]

Literature reviews indicate that BPPV has a recurrence rate of 5-37%, with most recurrences occurring within 6 months to 1 year.[3-5] Vertigo can lead to falls, injuries, anxiety, and disruption

of daily life. Recurrent episodes often necessitate repeated medical consultations, highlighting the importance of identifying risk factors for BPPV recurrence.

Certain studies indicate that risk factors for BPPV recurrence may include being female, older age, and specific comorbidities such as diabetes, hypertension, dyslipidemia, osteoporosis, vitamin D deficiency, Ménière's disease, and migraine.[6-9] However, no definitive conclusions have been reached, and no studies to date have specifically investigated recurrence rates and risk factors in Thailand.

This study aimed to determine the recurrence rate of BPPV and to identify risk factors associated with its recurrence at a large referral center in Thailand.

MATERIALS AND METHODS

Study design

This study used a retrospective design to investigate patients diagnosed with benign paroxysmal positional vertigo (BPPV) who were treated at the Department of Otolaryngology, Srinagarind Hospital, Khon Kaen University, Thailand from January 1, 2020, to January 1, 2022.

Inclusion and exclusion criteria

Patients diagnosed with BPPV according to the American Academy of Otorhinolaryngology-Head and Neck Surgery guidelines, [2] who were older than 18 years and had achieved remission from BPPV, evidenced by the absence of nystagmus during their last physical examination by an otolaryngologist, were recruited.

Data Collection

Patient data were retrieved from electronic medical records and paper files of the hospital. General information obtained included date of birth, age, gender, and comorbidities. BPPV-specific information included the date of diagnosis, affected side, pathological site, date of recovery, and history of recurrence.

Data Analysis

Patient demographics, such as age, gender, and comorbidities, along with BPPV-related data, were presented as descriptive statistics, including frequency, percentage, mean, and standard deviation, based on the variable type. Statistical analyses were performed using SPSS. The variables were analyzed using the Chi-square test, and t-test. Risk factors for recurrence were assessed using odds ratio analysis. A P-value < 0.05 was considered statistically significant.

The sample size was determined using the formula for a one-group proportion.[10] The recurrence rate was based on Luryit , who reported a recurrence rate of 37%. With a confidence level of 95% and a significance level (P-value) of 0.05, the required sample size was calculated to be 359 participants.

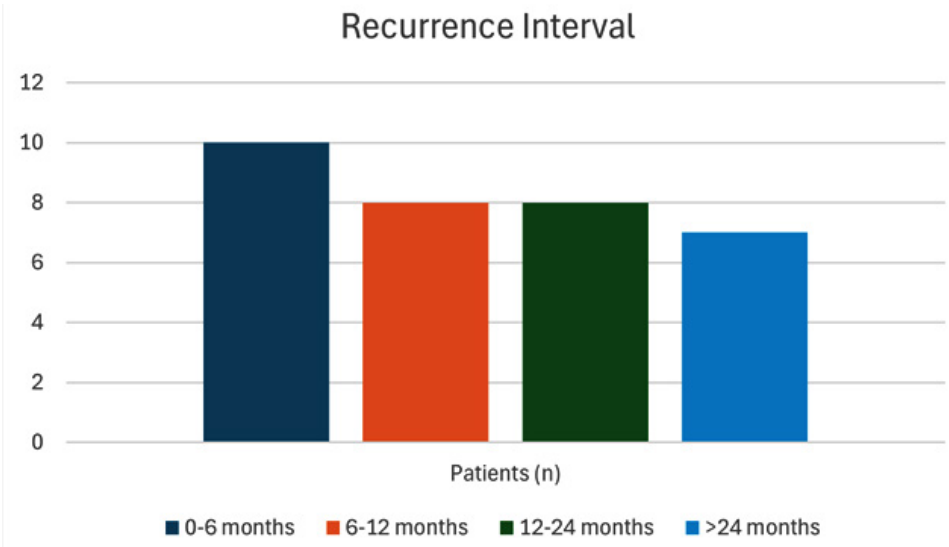

Fig. 1. Recurrence Interval of BPPV

Ethical Considerations

This study received approval from the Human Research Ethics Committee of Khon Kaen University, under project number HE651430.

RESULTS

From a retrospective review of 925 medical records, 376 patients met the inclusion criteria. As indicated in Table 1, 283 patients (75.3%) were female, and 93 patients (24.7%) were male. The male-to-female ratio was 1:3. The patients' ages ranged from 21 to 89 years, with a mean age of 58.09 ± 13.10 years.

The affected side was the right ear in 185 patients (49.2%) and the left ear in 147 patients (39.1%), while 44 patients (11.7%) had an unspecified side. The most commonly affected site was the posterior semicircular canal, found in 275 patients (73.1%), followed by the lateral semicircular canal in 101 patients (26.9%). No cases involved the anterior semicircular canal. Five patients required hospital admission due to severe vertigo. (Table 1)

A total of 33 patients (8.8%) experienced BPPV recurrence, as shown in Figure 1. The median time to recurrence was 361 days. When categorized by recurrence intervals, the highest

Table 1. Patient Characteristics

Variable	No Recurrence (n = 343)	Recurrence (n = 33)	P-value
Gender			
• Female	256 (90.5%)	27 (9.5%)	0.361
• Male	87 (93.5%)	6 (6.5%)	
Age (years)			
• 20 – 64	240 (92.3%)	20 (7.7%)	0.266
• ≥ 65	103 (88.8%)	13 (11.2%)	0.496
Comorbidities			
• No comorbidities	76 (91.6%)	7 (8.4%)	0.900
• Hypertension	80 (94.1%)	5 (5.9%)	0.284
• Dyslipidemia	64 (97.0%)	2 (3.0%)	0.069
• Diabetes mellitus	44 (95.7%)	2 (4.3%)	0.403
• Liver disease	32 (94.1%)	2 (5.9%)	0.754
• Spinal disorders	27 (90.0%)	3 (10.0%)	0.738
• Allergies	25 (100.0%)	0 (0.0%)	0.149
• Breast disorders	18 (85.7%)	3 (14.3%)	0.414
• Thyroid disorders	19 (95.0%)	1 (5.0%)	1.000
• Heart disease	16 (84.2%)	3 (15.8%)	0.227
• Cerebrovascular disease	19 (100.0%)	0 (0.0%)	0.394
• Kidney disorders	13 (81.3%)	3 (18.8%)	0.157
• Sensorineural hearing loss	14 (93.3%)	1 (6.7%)	1.000
• Osteopenia/Osteoporosis	11 (78.6%)	3 (21.4%)	0.115
• Chronic kidney disease	10 (90.9%)	1 (9.1%)	1.000
• GERD/Gastritis	9 (81.8%)	2 (18.2%)	0.250
• Head trauma	10 (90.9%)	1 (9.1%)	1.000
Affected Ear			
• Right	167 (90.3%)	18 (9.7%)	0.783
• Left	135 (91.8%)	12 (8.2%)	0.736
• Unspecified	41 (93.2%)	3 (6.8%)	0.625
Pathological Site			
• Posterior semicircular canal	252 (91.6%)	23 (8.4%)	0.641
• Lateral semicircular canal	91 (90.1%)	10 (9.9%)	0.641
• Anterior semicircular canal	0 (0.0%)	0 (0.0%)	1.000

recurrence rate (30.3%) occurred within the first 6 months.

Additionally, three patients experienced BPPV recurrence three times, one patient had four recurrences, and one patient experienced the highest recurrence frequency with seven episodes. These results indicate that while the overall recurrence rate was 8.8%. The highest recurrence rate was recorded in the first six months following the first episode of vertigo, emphasizing the need for early monitoring and follow-up in BPPV management.

A risk factor analysis comparing patients with BPPV recurrence within the first year to those without recurrence revealed that older adults were 2.91 times more likely to experience recurrence within the first year compared to younger adults (95% CI: 1.12–7.59, P = 0.029). This finding suggests that advanced age is a significant predictor for early BPPV recurrence. (Table 2)

A comparison between patients with BPPV recurrence within the first year and those with recurrence after one year revealed that older adults (more than 65 years old) more likely to experience recurrence within the first year compared to younger adults (OR 5.00, 95% CI: 1.04–24.03, P = 0.045). This finding highlights advanced age as a significant risk factor for early recurrence of BPPV. (Table 3)

DISCUSSION

This study identified 33 patients (8.8%) with BPPV recurrence, which aligns with previous

Table 2. Risk Factor Analysis for BPPV Recurrence Within the First Year

Variable	Recurrence in the First Year (n, %)	No Recurrence (n, %)	Odds Ratio (OR)	95% CI	P-value
Gender					
• Female	17 (6.2%)	256 (93.8%)	5.78	0.76 – 44.05	0.091
• Male	1 (1.1%)	87 (98.9%)	-		
Age					
• 20 – 64	8 (3.2%)	240 (96.8%)	2.91	1.12 – 7.59	0.029*
• ≥ 65	10 (8.8%)	103 (91.2%)	-		
Comorbidities					
• No	4 (5.0%)	76 (95.0%)	0.99	0.32 – 3.12	0.995
• Yes	14 (5.0%)	267 (95.0%)	-		

* - Statistical Significance

Table 3. Risk Factor Analysis for BPPV Recurrence Within First Year vs. After First Year

Variable	Recurrence Within 1 Year (n, %)	Recurrence After 1 Year (n, %)	Odds Ratio (OR)	95% CI	P-value
Gender					
• Female	17 (63.0%)	10 (37.0%)	8.50	0.87 – 83.49	0.066
• Male	1 (16.7%)	5 (83.3%)	-		
Age					
• 20 – 64	8 (40.0%)	12 (60.0%)	5.00	1.04 – 24.03	0.045*
• ≥ 65	10 (76.9%)	3 (23.1%)	-		
Comorbidities					
• No	4 (57.1%)	3 (42.9%)	0.88	0.16 – 4.71	0.876
• Yes	14 (53.8%)	12 (46.2%)	-		

* - Statistical Significance

studies reporting recurrence rates between 5% and 45%.[1,4,5] These findings confirm the variability of recurrence rates observed in earlier research.

The highest recurrence interval occurred within the first 6 months (30.3%), consistent with the study by Paz Pérez,[5] which reported a 50% recurrence rate within the first 6 months. This is likely due to the instability of canaliths, which can migrate back into the semicircular canal. This highlights the critical need for close follow-up and monitoring during the early post-treatment period to prevent complications and ensure timely management.

Our analysis revealed that older adults were 2.91 times more likely to experience BPPV recurrence within the first year compared to younger adults. Additionally, patients aged e" 65 were 5 times more likely to have early recurrence (within 1 year) compared to later recurrence (after 1 year). These findings are consistent with the study by Chung-Lan Kao, who conducted a retrospective analysis involving 218 Taiwanese patients and found that patients over 65 had a 1.7-fold increased recurrence risk compared to younger patients.[11]

Similar results were reported in studies by Shichang Li and Sreenivas V, supporting the hypothesis that age-related degeneration contributes to BPPV recurrence.[8,9] The proposed mechanism in previous studies includes a reduction in otolith mass, weakening the fibrous connections between otoliths due to mineral resorption, and a decrease in calcium carbonate crystals, which causes otoconia detachment from the otolith membrane. Moreover, pH changes in the endolymph further compromise inner ear function, exacerbating BPPV symptoms.[12,13]

These findings suggest that age-related physiological changes play a critical role in the pathogenesis and recurrence of BPPV, emphasizing the need for proactive monitoring and management in elderly patients. Moreover, cerebrovascular injuries usually can present as stroke, with acute dizziness.[14]

The analysis showed that gender and comorbidities such as diabetes mellitus, hypertension, and head trauma were not significant risk factors for BPPV recurrence. These findings align with previous studies, which also found no consistent association between these variables and increased recurrence rates.[1]

The lack of statistical significance suggests that systemic conditions and external injuries may play a less direct role in the recurrence of BPPV compared to age-related inner ear changes. This underscores the importance of focusing on age-related degeneration as a primary factor in BPPV recurrence while considering individual patient profiles during clinical evaluations.

Several studies have identified potential risk factors for BPPV recurrence, including female gender, hypertension, diabetes mellitus, dyslipidemia, osteopenia, vitamin D deficiency, Ménière's disease, cervical spondylosis, head trauma, middle ear infections, micronutrients and migraine disorders.[15-18] These findings suggest a multifactorial etiology for BPPV recurrence, driven by both systemic and otological conditions.

In this study, female patients were more than males, though the statistical analysis did not reveal a significant association between gender and recurrence risk. This discrepancy may be attributed to the limitations of retrospective data collection, where incomplete or missing records on patient comorbidities may have reduced the statistical power needed to detect significant associations.

These findings highlight the need for prospective studies with more comprehensive data collection to better evaluate the impact of comorbid conditions and gender on BPPV recurrence.

CONCLUSION

The recurrence rate of BPPV was 8.8%, with the highest recurrence (30.3%) occurring within the first 6 months after treatment. Older adults were 2.91 times more likely to experience recurrence within the first year compared to younger adults. In contrast, gender and comorbid conditions were not significant risk factors for BPPV recurrence. These findings emphasize the importance of early monitoring and follow-up, particularly in older patients.

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Conflict of Interest

The author(s) do not have any conflict of interest.

Data Availability Statement

This statement does not apply to this article.

Ethics Statement

This study received approval from the Human Research Ethics Committee of Khon Kaen University, under project number HE651430

Informed Consent Statement

This study did not involve human participants, and therefore, informed consent was not required.

Clinical Trial Registration

This research does not involve any clinical trials

Author Contributions

Wathanya Jongwarothai: drafted the protocol, collected data, performed data analysis, interpreted results, and drafted the manuscript; Somchai Srirompotong: supervised the study, revised the manuscript; Patorn Piromchai: conceptualized, designed, and supervised the study, interpreted results, and revised the manuscript; All authors contributed to the interpretation and discussion of the results and read and approved the final manuscript

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