



**ORIGINAL RESEARCH PAPER**

**Otorhinolaryngology**

**STUDY OF DEMOGRAPHIC FEATURES, CLINICAL CHARACTERISTICS AND RISK FACTORS IN PATIENTS OF BENIGN PAROXYSMAL POSITIONAL VERTIGO (BPPV)**

**KEY WORDS:** Dizziness, BPPV, clinical and demographic features

<b>Dr.Prachi Patel</b>	3 <sup>rd</sup> Year Resident, ENT Department, GCSMCH and RC
<b>Dr.Drashti Patel</b>	2 <sup>nd</sup> Year Resident, ENT Department, GCSMCH and RC
<b>Dr.Zankar Solanki*</b>	1 <sup>st</sup> Year Resident, ENT Department, GCSMCH and RC*Corresponding Author
<b>Dr.Suktara Sharma</b>	Associate Professor, ENT Department, GCSMCH and RC

**ABSTRACT**

**Introduction** BPPV is the most common peripheral vertiginous disorder in the community. Due to overlapping clinical features, this condition may be misdiagnosed and erroneously treated. Clear understanding of the demographic characteristics and clinical features may help in correct diagnosis and optimal management. **Method** 100 diagnosed patients of BPPV were prospectively studied. Parameters studied and analysed were:- age group and gender, affected ear and Semi circular canal(SCC), clinical features, various diagnostic and therapeutic manoeuvres, associated comorbidities, treatment efficacy and recurrence rate. **Results** BPPV was most commonly seen in 4th decade with a significant female preponderance(M38/F62). Posterior-SCC (P-SCC) is most commonly involved(82%) followed by Horizontal-SCC (H-SCC)(17%) and Superior-SCC (S-SCC) (01%). Low serum vitamin-D3 was most commonly associated comorbidity(34%). 84% were primary BPPV while head trauma was the most common secondary cause. Remission rate on repositioning manoeuvre was 73%, recurrence rate 16% and failure rate was 11%. **Conclusion** Undiagnosed vertigo may significantly impacts the quality of life of a person. BPPV, in spite of being one of the commonest cause of vertigo is often misdiagnosed. If accurately diagnosed, BPPV repositioning manoeuvres have a high cure rate.

**INTRODUCTION**

Dizziness a common complaint that accounts for over three million emergency department visits annually, but is very vague and imprecise term.<sup>1</sup> Dizziness is traditionally divided into four categories based on the patient's history: vertigo, presyncope, disequilibrium, and light headedness.<sup>1</sup> Vertigo is the perception of motion in the absence of motion, which may be described as a sensation of swaying, tilting, spinning, or feeling being unbalanced. BPPV is the most common cause of peripheral vertigo presenting to primary care and specialist otolaryngology, neuro-otology, neurology and audiological clinics consisting of approximately 17%-24% of all cases of vertigo.<sup>2</sup>

The first clinical description of positional vertigo is attributed to Barany, who characterized vertigo and nystagmus associated with postural changes and linked it to the otolithic organs. In 1952, Dix and Hallpike, further described classic nystagmus and inner ear pathology and first described the provoking manoeuvres. They coined the term 'Benign paroxysmal positional vertigo' (BPPV) in view of the associated benign origin and momentary, paroxysmal bursts of intense vertigo upon head movements. BPPV is believed to be caused by otoconia dislocation from the utricle which senses linear head motion to the semicircular canals which detect rotational movement.<sup>3</sup> The cardinal symptom is sudden vertigo induced by a change in head position: turning over in bed, looking up, arising from bending position, stooping, getting into bed and assuming supine position or any sudden change in head position. Vertigo spells typically lasts for seconds and never more than a minute.

However, clinically patients with BPPV present with varied medical history and comorbidities, which may influence the etiology, type of manoeuvres used, recurrence rates and outcomes of treatment. Considering the wide variability of presenting symptoms and population involved, this prospective study was done to characterize diagnosed patients of BPPV on the basis of demographic characters such as age, gender, laterality of ear involved, canal involved, history of trauma and presence of comorbidities such as

hypertension, Diabetes mellitus, abnormal thyroid functions and vitamin D level.

**MATERIALS AND METHODS**

This prospective and observational study was carried out in group of 100 patients diagnosed with BPPV at tertiary care centre, in INDIA for a period of one year from October 2021 to October 2022. All patients underwent a thorough general and systemic examination. Ear, Nose and throat examination of all patients was done. Patients with known history of squamous type of CSOM were excluded from the study. Diagnosis of BPPV was made on the basis of positive modified Dix-Hall pike test and supine roll over test and a definitive history suggestive of BPPV as per Bárány Society's diagnostic criteria<sup>4</sup> for BPPV. During provocative manoeuvres, some patients may experience vertigo without nystagmus. This is termed subjective BPPV and may be due to subclinical nystagmus, a fatigued response, and less severe BPPV that activates the sensation of vertigo but not the vestibulo ocular reflex.<sup>5</sup> Dix Hallpike test was considered positive for P-SCC, with nystagmus of short latency and brief duration that was upbeating with a torsional component with the fast phase towards the affected ear in the provoking position. P-SCC of both ears were separately tested. Nystagmus for lateral SCC as seen with supine roll over test, is mostly horizontal with shorter latency and stronger intensity. Direction of nystagmus and direction of roll that causes the greatest intensity identifies the affected side. Nystagmus for S-SCC was down beating and torsional. The type, latency, direction and duration of nystagmus were recorded for each patient. Age, Gender, associated comorbidities, most commonly affected ear, most common canal involved, type of treatment given, treatment efficacy and recurrence rate were noted. Secondary causes of BPPV were noted. Routine blood examination apart from thyroid function tests and Vit D3 levels were done in all patients.

All patients with positive Dix Hallpike underwent canal repositioning manoeuvre (CRM). Modified Epley manoeuvre for P- SCC and Gufoni manoeuvre for H-SCC BPPV were done. The therapeutic success was considered achieved if the

vertigo resolved after 1 hour of CRM. Repositioning manoeuvres were done after a week if symptoms persisted even after 1 hour of CRM. If patient still has complaint of vertigo even after 4 sets of manoeuvre (which were performed at an interval of 7 days); it is considered as treatment failure. If vertigo resolved after maximum 4 sets of manoeuvres but recurs after at least a month of symptom free period then, it is considered as recurrence.<sup>2</sup>

All patients were followed up for up to at least 12 months, mean 5.94± 1.72 months. Patients lost to follow up within 6 months were excluded from the study.

Ethics committee approval was obtained for the study and written informed consent was obtained from all patients.

**Inclusion criteria:**

- Sudden brief spells of severe whirling/ spinning vertigo associated with change in head position, such as rolling over in the bed, getting into bed and assuming a supine position, arising from bending position, extending the neck, turning rapidly.
- Vertigo spells lasts for seconds and never more than a minute.
- Bouts of vertigo clustered in time
- Positive Dix Hallpike or Supine Roll Over test

**Exclusion criteria:**

Vertigo due to

- Primary peripheral vestibular disorders other than BPPV
- Musculoskeletal (Cervical) vertigo
- Central Vestibular Disorders

**RESULT**

100 diagnosed patients of BPPV were prospectively studied. Age, gender distribution, semicircular canal involved and other demographic characteristics are outlined in table 1.

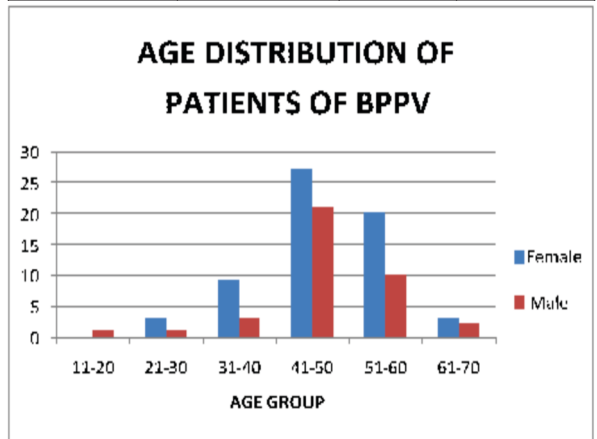
**Table 1: Base line characteristics of study population**

Variables	Total (n=100)	Male (n=38)	Female (n=62)
<b>Demographics</b>			
Age in years mean(SD)	48.08± 10.2	49.07± 10.7	47.46± 9.8
Ear involved (RT/LT)	54/46	21/17	33/29
<b>SCC involvement</b>			
P-SCC	82	32	50
H-SCC	17	5	12
S-SCC	01	1	00
<b>Type of BPPV</b>			
Primary BPPV	84	29	55
Secondary BPPV	16	09	07
Head trauma	14	08	06
Meniers disease	00	00	00
Vestibular neuronitis	02	01	01
<b>Associated Comorbidities</b>			
Hypertension	10	07	03
Diabetes Mellitus	05	03	02
Thyroid disorders	04	00	04
Low Vit D3	34	14	20
Diabetes, hypertension	07	05	02
Hypertension and Thyroid D/O	03	00	03
Hypertension and low Vit D3	02	01	01
Diabetes Mellitus and Low Vit D3	02	01	01
No Co Morbid condition	33	07	26

**Table:2 and Graph:1 :-**

Age range (years)	Total (n=100)	Male (n=38)	Female (n=62)
11-20	1	1	0
21-30	4	1	3
31-40	12	3	9
41-50	48	21	27

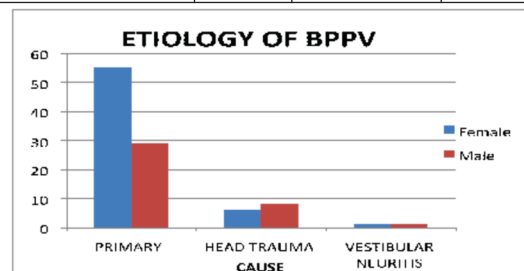
51-60	30	10	20
61-70	5	2	3



Age of the patients ranged from 11-70 years, mean 48.08 ± 10.02 years. Mean of age in male patients is 49.07 ± 10.07 years; while in female it is 47.46± 9.8 years. Peak incidence was seen in age group of 41-50 years in both genders.

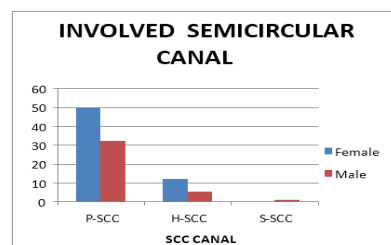
**Table:3 and Graph:2 :- Showing distribution of primary and secondary BPPV**

ETIOLOGY OF BPPV			
CAUSE	Female (n=62)	Male (n=38)	Total (n=100)
PRIMARY	55	29	84
SECONDARY	7	9	16
Head trauma	6	8	14
Vestibular neuritis	1	1	2



**Table:4 and Graph :3 :-**

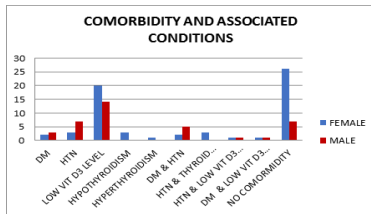
The most commonly involved canal was Posterior semicircular canal (P-SCC) involving 82 cases followed by 17 of Horizontal semicircular canal (H-SCC) and just a single case of Superior semicircular canal (S-SCC) BPPV.



**Table 5 and Graph 4 : Showing distribution of Co-morbid conditions in patients of BPPV**

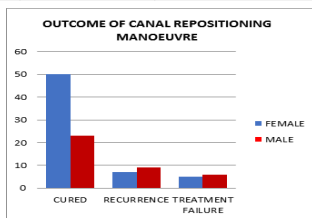
COMORBIDITY	Female (n=62)	Male (n=38)	Total (n=100)
Diabetes Mellitus	2	3	5
Hypertension	3	7	10
Low vit D3 level	20	14	34
Thyroid disorders	4	0	4
Hypothyroidism	3	0	3
Hyperthyroidism	1	0	1

Diabetes mellitus & Hypertension	2	5	7
Hypertension & Thyroid disorders	3	0	3
Hypertension & low Vit D3 level	1	1	2
Diabetes mellitus & low vit D3 level	1	1	2
No Co-Morbid condition	26	7	33



**Table : 6 and Graph : 5 :-Depicting outcome after CRM**

CRM OUTCOME	Female (n=62)	Male (n=38)	Total (n=100)
CURED	50	23	73
RECURRENCE	7	9	16
TREATMENT FAILURE	5	6	11



Out of 100 patients 73 had no complaint of positional vertigo after one repositioning manoeuvre. 16 patients had recurrence. 11 patients (failure) had no improvement in symptoms even after 4 sets of repositioning manoeuvres.

**DISCUSSION**

BPPV is the most common peripheral vestibular end-organ disease. Aberrant signals from SCC create an illusion of motion which results in vertigo. Symptoms are provoked by positional changes of the head with respect to gravity and can range in severity from mild dizziness to debilitating episodes that may induce nausea or vomiting and significantly hinder daily functioning. In vast majority of cases, diagnosis is straightforward, and the condition is generally amenable to in-office treatments.<sup>6</sup>

The mean age group in patients of BPPV in our study is 48 years which is consistent with most reported studies wherein the age range for BPPV was 40-60 years<sup>6,7</sup>. Younger age in BPPV patients is most commonly associated with head trauma. A significant female preponderance was also noted in our patients (62F/38M) with a female to male ratio of 1.63. Estrogen deficiency causing disturbances in the internal structure of the otoconia has been reported as a cause of higher incidence in females as reported by several studies, though few studies (Lakkas et al<sup>8</sup> and Lee SH et al<sup>9</sup>) show no laterality in gender distribution.

Interestingly, during the course of our study several pediatric referrals for vertigo were evaluated and one patient fitted into the description of BPPV on a positive modified DixHallpike test that completely resolved by CRM with no recurrence for at least up to 6 months follow up. Though BPPV has been reported to exist in children, the existence of debris in the vestibular system is suggestive of either degenerative effects associated with aging or trauma. Hence many believe that BPPV in children is most likely related to migraine and should be treated as a migrainous disorder, or considered a complex

combination of BPPV and migraine. Further research in this area would help in formulating guidelines for evaluation of children with vertigo.<sup>10,11,12</sup>

Both right and left ears were found almost equally involved with no significant laterality.

In present study BPPV of P- SCC involvement was most common (82%) followed by horizontal (17%) and rare involvement of S-SCC (1%). Multiple canal involvement was not detected in any patient. Similar findings are reported in multiple studies on BPPV. Free-floating endolymph debris tends to gravitate to P-SCC, being the most gravity-dependent part of the vestibular labyrinth in both the upright and supine positions explains the commonest P-SCC involvement. Once debris enters the posterior canal, the cupular barrier at the shorter, more dependent end of the canal blocks the exit of the debris. In contrast, because of the orientation of the horizontal canal and superior canal any particles from the utricle is unlikely to pass on to the H-SCC and S-SCC through natural head movements alone, and thus they represent only 10% to 20% and 3% of cases respectively.<sup>7,13,14</sup>

84% patients had primary BPPV while rest of the 16% patients had secondary BPPV with identifiable triggering factors, most common being head trauma (14%) and vestibular neuronitis (2%). Caruso G et al<sup>15</sup> reported primary BPPV in 50-97% of cases. Head Trauma, Meniere disease, vestibular neuritis, prolonged recumbent position at a dentist's office or hair salon, and various otology, oral and maxillofacial surgeries found to be secondary cause of positional vertigo.<sup>16</sup>

In our study, 33% of patients had no any associated comorbidities. Amongst the rest of 67%, low vitamin D<sub>3</sub> level was the most common (34%) associated comorbidity and that was more commonly seen in females perhaps explaining the high incidence seen in females. Hypertension, thyroid disorders and diabetes were other associated comorbidities seen in present study (Table 5). Study done by Sheikzahed et al<sup>17</sup> demonstrated a significant decrease in the intensity of BPPV two months after treatment with vit D<sub>3</sub> in all groups irrespective to serum 25-OHD status. Hypertension, hyperlipidemia, diabetes, estrogen levels, calcium and phosphorus metabolism were found to be risk factors in BPPV patients in study done by Von brevern M et al<sup>18</sup>, Zhang N et al<sup>19</sup> and Zhan YM et al<sup>20</sup>. Theoretically, both hypertension and hyperlipidaemia can lead to vascular damage to the inner ear and thus leads to BPPV.

In our study out of 100 patients 73 patients completely cured after one attempt of canal repositioning manoeuvre. 16 patients had recurrence. 11 patients had treatment failure. In Kim et al's<sup>21</sup> report, the rate of remission after a single treatment was 61.5% (48 of 78). BPPV is relapsing and remitting kind of disorder, with spontaneous resolution taking months to occur.<sup>22,23</sup>

**CONCLUSION**

Untreated BPPV can have a considerable impact on quality of life. Studying clinical features and various demographic aspects of BPPV helps clinicians tackle this common affliction in a better way. It is significantly related to low Vit D<sub>3</sub> levels and supplementation may help prevent recurrence. Identification of the canal involved and appropriate CRM has a high cure rate.

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