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Research Article

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Prevalence of Age Induced Benign Paroxysmal Positional Vertigo among Various Categories of Elderly Population

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Abstract: Benign Paroxysmal Positional Vertigo (BPPV) is the most common and treatable vestibular disorder. It is commonly seen in the elderly population. BPPV is a type of vertigo that is brought on by change in position of the head with respect to gravity. The objective of this study was to find out the prevalence of appropriate age group of the individuals suffering from BPPV in elderly population. The study was an observational study. A total of 64 people were recruited for the study aged between 60-70 and 71-80yrs that were selected from Krishna hospital Karad through a simple random sampling method. Inclusion and exclusion criteria were used to select the individuals for the study. Individuals of age group between 60-80 years of both the sex were also considered for the study. The individuals who were not included in the study were those not willing to participate, individuals' history of acute trauma. Demographic data, assent and consent were taken from the individuals and the explanation of the study was given. The special tests like Dix-Hallpike positioning test, Horizontal roll test and Head pitch test were performed over the individuals. In this study the overall prevalence of age induced BPPV was evaluated according to Dix-Hallpike test it was found that out of 64 individuals 61% were positive for Dix-Hallpike test. Out of 45 males 26 were positive and 13 females from total 19 were indicated Dix-Hallpike test as positive. Thus, this result shows that females are more prone to develop BPPV. This study concluded that BPPV was common among the age group of 71-80 years than the age group of 60-70 years. The study revealed that the individuals in middle old age group are getting more affected by BPPV than the individuals in young old age group. Thus the societal impact which affects the individuals with BPPV can be reduced by making preventive strategies to improve the quality of life and to decrease the disability adjusted years.

Keywords: Benign paroxysmal positional vertigo, Dix-Hallpike positioning test, elderly population, Horizontal roll test and Head pitch test.

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1. INTRODUCTION

Benign Paroxysmal Positional Vertigo (BPPV) is one of the most common and treatable vestibular disorders seen in the elderly population.[1] It is a specific type of vertigo that is bought on by a change in position of the head with respect to gravity.[2] It is characterized by rotational vertigo because of changes in head positions in the plane of semi-circular canals. When the patient takes any position such as rolling over the bed, extending or turning the neck, getting up or lying down the attacks of vertigo gets provoked.[3] In 1921, Barany described the characteristic nystagmus and vertigo induced by position change and attributed these symptoms to a disorder of the otolithic organ.[4] In 1952, Dix and Hallpike described torsional vertical nystagmus provoked by a specific ear-down position with a latency of several seconds, in which the nystagmus lasted only for a less than 45 seconds, and completely disappearing when the head is moved to certain positions.[5] This disorder is mainly caused due to problems in the inner ear. In human ears, there are basically three semi-circular canals (posterior semi-circular canal, anterior semi-circular canal and lateral semi-circular canal) which help to detect angular acceleration which is positioned at right angles to each other. Each canal is filled with endolymph and has swelling at a base called ampulla. A gelatinous mass having the same density as endolymph is present inside the ampulla which is attached to polarized hair cells present inside the inner ear is termed as a cupula.[6,7] Now when an individual changes his/her position of head, endolymph causes movement of cupula because of this it causes either a stimulatory or inhibitory response inside the particular semi-circular canal and leads to vertigo. This is because the plane of the affected semi-circular canal is vertical and thus aligned with gravity, the human brain gets the confirmation that the head is indeed rotating via the vestibular apparatus present within each ear and those signals are being from the vestibular system to brain.[8] BPPV is caused by canalithiasis that is otoconial debris derived from the utricular macula that becomes tapped in the semi-circular canal.[9] If these calcium crystals present in Otoconia are dislodged from the labyrinth of the inner ear within the utricle they migrate into anyone's semi-circular canal which leads to BPPV.[6] Among these three semi-circular canals posterior semi-circular canal is most commonly affected due to its anatomical position.[10] BPPV is divided into two conditions Canalithiasis and Cupulolithiasis. In 1979, Hall proposed the concept of "canalolisthesis", which states that otolithic debris from the utricular macule migrates into the semi-circular canal via the non ampullary portion, causing vertigo and nystagmus by moving freely inside the semi-circular canal and inducing endolymph flow during positional changes.[11] The debris containing calcium carbonate crystals are freely floating in the endolymph of the semi-circular canal. When an individual moves his/her head in the opposite direction of gravity thisdebris moves to anyone dependent portion of the semi-circular canal. This movement of the debris causes the endolymph to move to cause the inertia to the central nervous system which indirectly leads to vertigo. In 1969, Schucknecht proposed the theory of "Cupulolithiasis" based on pathological studies that demonstrated otolithic debris attached to the cupula.[12] He discovered that those calcium particles present inside the inner ear are adherent to the cupula and these particles get rendered to gravity or impinging on the cupula. This produces nystagmus in the individual and explains dizziness when the individual tilts the head in a backward position. Vertigo (spinning sensation) is the main symptom of BPPV. It is mainly induced by a change in head position concerning gravity. If a patient suddenly gets out of the bed, rolls over the bed, tilts their head back then these positions typically lead to vertigo. The symptoms of BPPV may vary among the patient and may manifest with nausea, nonspecific dizziness, postural instability, light-headedness. [13,14] The diagnosis of BPPV is mainly done by using three tests as follows: Dix-hallpike positioning test, Horizontal roll test, Head pitch test or bow and lean test. The three semi-circular canals present in the inner ear are superior or anterior semi-circular canal, horizontal or lateral semi-circular canal and posterior semi-circular canal. A particular test is used for the assessment of BPPV. Dix-hall pike positioning test is used for assessing the posterior semi-circular canal. [15] For assessing anterior semi-circular canal horizontal roll test is used and for lateral semi-circular canal head pitch test is used. BPPV can be treated by using various manoeuvres like canalith repositioning procedure or Epley maneuver, Semont maneuver, Lampert maneuver and Gufoni maneuver. The canalith repositioning technique or Epley maneuver is an effective technique for BPPV.[16-17] This study is conducted with the ultimate aim of identifying the prevalence of appropriate age group of individuals between 60-70 and 71-80 years suffering from BPPV.

2. MATERIALS AND METHODS

2.1 Ethics and other Permissions

The Institutional Ethics Committee of Krishna Institute of Medical Sciences has hereby given permission to initiate the research project Ref. No. KIMSDU/IEC/06/2019.

2.2 Participant's selection

The type of study was observational cross sectional study. Total 64 participants aged between 60-80 years were included. The selection was based on simple random sampling method from outpatient department of Krishna hospital Karad. Participants were included according to inclusion and exclusion criteria.

2.3 Inclusion criteria

- Participants of age group 60-80 years
- Gender both male and female

2.4 Exclusion criteria

- Individuals with a history of acute trauma
- Individuals not willing to participate

2.5 Sampling

Sample size was calculated by using formula $n= 4pq/L^2$
n= sample size
p= prevalence of BPPV in elderly = 80
q= asymptomatic individuals for BPPV =100-p = 100-80 = 20
L= allowable error of 95% confidence interval= 10%
n= 4 The procedure for assessing special test was explained to the participants. The demographic data of the participant was collected and consent form was taken from the participants. The data was collected by using special tests.

3. STATISTICAL ANALYSIS

Data were analysed using SPSS version 20. The results were expressed in terms of descriptive statistics and graphical representation. Significance in difference between variable was calculated expressed in terms of mean standard deviation and percentage respectively.

3.1 Tests performed were

3.1.1 Dix-Hallpike positioning test

The patient was asked to sit in a high sitting position on the plinth. The therapist stands on the side which is to be tested. The patient was asked to look straight while the therapist holds the subject's head with his two hands and turns subject's head to 45 degrees to the side being tested. Then maintaining that position, the therapist quickly moves patient's head from seated to supine position with the head declined 30 degrees below the trunk. The test should be done quickly so that there is a displacement of the endolymph in the inner ear. The therapist should observe the eyes for nystagmus and ask the patient if vertigo is been experienced.[15] (Fig A).

Fig A : Dix-hallpike positioning test.

3.1.2 *Horizontal roll test*

The patient was asked to be in a supine position. The therapist flexes the cervical spine of the patient for about 20-30 degrees. Then the therapist quickly rotates the head of the patient to the side which is to be assessed for about 45 degrees, the therapist holds this position for 30 seconds until patient show any symptoms such as nystagmus and vertigo. Then the therapist slowly returns patient's head to the midline position. The therapist should observe the eyes for nystagmus and ask the patient if vertigo is been experienced.[18] (Fig B)

Fig B: Horizontal roll test

3.1.3 Head pitch test

The patient was asked to sit in a high sitting position on the plinth. The therapist stands in front of the patient and bends the patient's head forward to 30 degrees. The therapist assesses for nystagmus. Then the examiner bends the patient head to 60 degrees and reassesses for nystagmus. (Fig C)

Fig C: Head pitch test.

4. RESULT

The prevalence of age induced BPPV was obtained by using special tests such as Dix-Hallpike test, Horizontal roll test, Head pitch test as an outcome measure. The total sample size was 64 with mean age of 69.68 and standard deviation 5.79. Out of total sample of 64 individuals 45 were male and 19 were female. The mean age of male participants was 69.84±6.01 and the mean age of female participants was 69.31±5.36. The individuals were divided into two groups 60-70 and 71-80 years.

Table 1: Demographic Characteristics Of The Participants

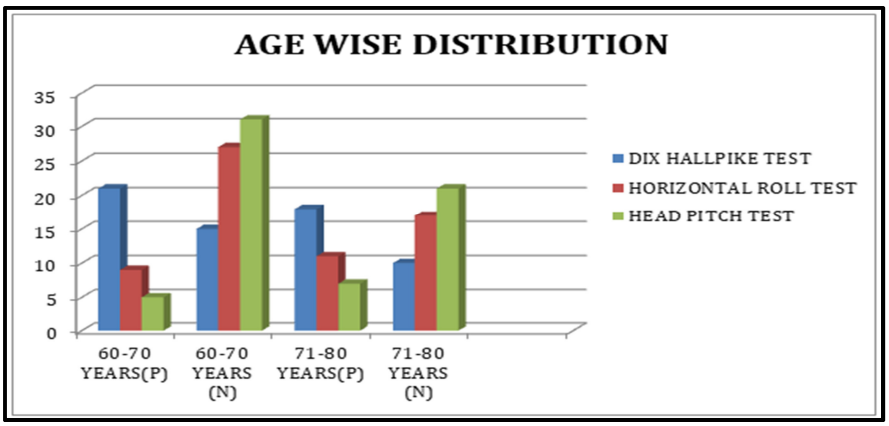
Age (In Years)		Gender	
60-70	71-80	MALE	FEMALE
36	28	45	19

Table 2: Age Wise Distribution

Test	Age							
	60-70 Years				71-80 Years			
	Positive		Negative		Positive		Negative	
	F	%	F	%	F	%	F	%
Dix Hallpike Test	21	58%	15	42%	18	64%	10	36%
Horizontal Roll Test	9	25%	27	75%	11	39%	17	61%
Head Pitch Test	5	14%	31	82%	7	29%	21	71%

(F = Frequency, % = Percentage)

The overall result evaluated that in the age group of 60-70 years 58% individuals showed positive signs for Dix-Hallpike test, 25% individuals were positive for Horizontal roll test and 14% individuals showed positive signs for Head pitch test. When this data was compared with the age group of 71-80 years 64% individuals showed positive signs for Dix-Hallpike test, 39% individuals were positive for Horizontal roll test and 29% individuals showed positive signs for Head pitch test. This data evaluates that BPPV was more common in individuals of age group 71-80 years.



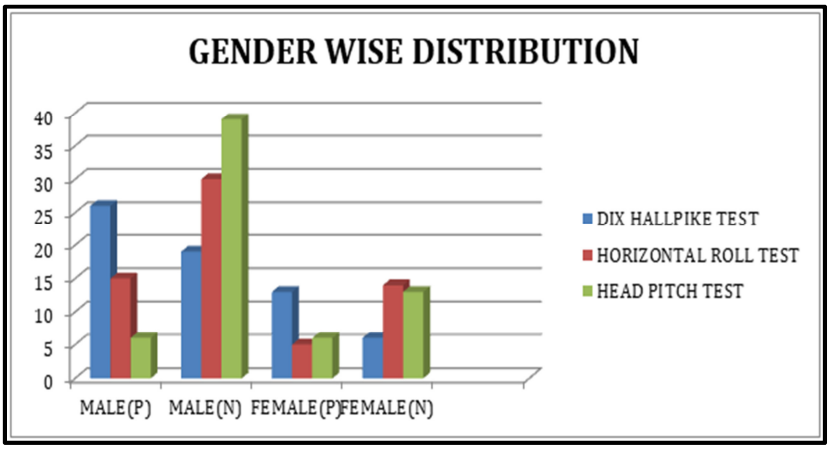
P= Positive, N= Negative.

Fig 1: Age Wise Distribution

Table 3: Gender Wise Distribution								
Test	Gender							
	Male				Female			
	Positive		Negative		Positive		Negative	
	F	%	F	%	F	%	F	%
Dix Hallpike Test	26	42%	19	58%	13	68%	6	32%
Horizontal Roll Test	15	33%	30	67%	5	26%	14	74%
Head Pitch Test	6	13%	39	87%	6	32%	13	68%

(F = Frequency, % = Percentage)

When the results of males and females was compared 42% males showed positive signs for Dix-Hallpike test, 33% males showed positive for Horizontal roll test and 13% males showed positive signs for Head pitch test. In females, 68% showed positive signs for Dix-Hallpike test, 26% females showed positive signs for Horizontal roll test and 32% females showed positive signs for Head pitch test.



P= Positive, N= Negative.

Fig 2: Gender Wise Distribution

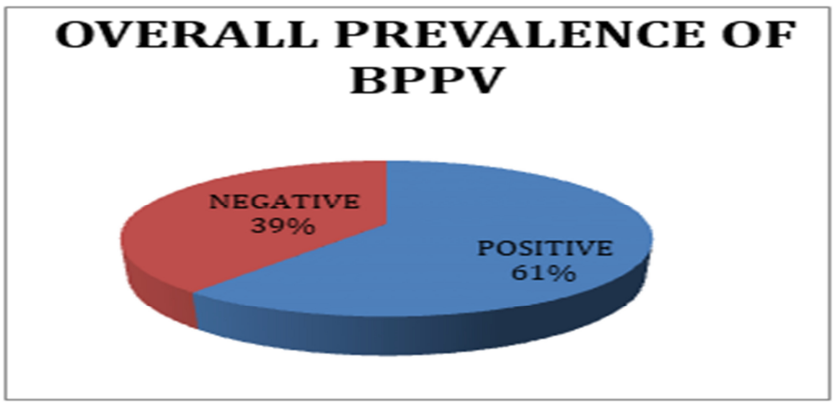


Fig 3: Overall prevalence of age induced BPPV.

Figure 3 shows that out of 64 individuals 61% were positive for Dix-Hallpike test. Out of 45 males 26 were positive for Dix-Hallpike test and 13 females from total 19 were indicated Dix-Hallpike test as positive. Thus this result shows that females are more prone to develop BPPV after 60 years of age.

5. DISCUSSION

The previous studies show that the prevalence of vertigo and dizziness in people aged more than 60 years reaches 30% while raising to 50% beyond 85 years.[19] Also in one article it was examined that the prevalence of vertigo and dizziness in people aged more than 60 years reaches 30%, and due to aging of world population, the number of patients is rapidly increasing.[20]Katsarkas examined the prevalence of benign paroxysmal positional vertigo in the elderly population attending a specialized dizziness clinic and identified BPPV in 40% of patients above 70 years.[21] Gamiz and Lopez-Escamez examined the health-related quality of life in BPPV in patients above 60 and found that BPPV has a high impact on quality of life and functioning, which improves after BPPV has been treated.[22] M.von Brevern et.al examined the lifetime prevalence of BPPV in the individuals aged 28-82 years it was about 2.4% and the 1 year prevalence was 1.6%. The 1 year prevalence of BPPV in the group of participants older than 60 years was almost seven times higher compared with that of age group 18-39 years. [23] In a German study, the 12-month prevalence of vertigo in the general population was 5% with an incidence of 1.4% in adults overall. For individuals aged 60-

69 the 12-month prevalence was found to be 7.2% and individuals 70 years of age or older 8.9%.[24] In this study, the objective was to find out the age group of individuals with BPPV in elderly population. The prevalence of age induced BPPV was obtained by using special tests such as Dix-Hallpike test, Horizontal roll test and Head pitch test as an outcome measure. Out of total sample of 64 individuals 45 were males and 19 were females. The individuals were divided into two groups 60-70 and 71-80 years. When the overall result was evaluated in the age group of 60-70 years, 58% individuals showed positive signs for Dix-Hallpike test, 25% individuals were positive for Horizontal roll test and only 14% individuals showed positive signs for Head pitch test. When this data was compared with the age group of 71-80 years 64% individual showed positive signs for Dix-Hallpike test, 39% individuals were positive for Horizontal roll test and only 29% individuals showed positive signs for Head pitch test. This data evaluates that BPPV was more common in individuals of age group 71-80 years. When the results of males and females was compared 42% males showed positive signs for Dix-Hallpike test, 33% males showed positive signs for Horizontal roll test and 13% males showed positive signs for Head pitch test. In females 68% showed positive signs for Dix-Hallpike test, 26% females showed positive signs for Horizontal roll test and 32% females showed positive signs for Head pitch test. According to Talmud JD et al. Dix Hall-Pike maneuver is a powerful tool in the physician's resources.[25] According to Summer A. the Dix-Hallpike test is considered the gold standard assessment for diagnosis of vestibular disorder BPPV.[26] In this study when overall prevalence of age induced BPPV was evaluated according to Dix-Hallpike test it was found that out of 64 individuals 61% were positive for Dix-Hallpike test. Out of 45 males 26 were positive and 13 females from total 19 were indicated Dix-Hallpike test as positive. Thus, this result shows that females are more prone to develop BPPV. K. Mizukoshi et al. in his study examined that the ratio of BPPV was hugher in female than male patients.[27] Seong-Hae Jeong in her article explained that BPPV is an important health problem affecting women's and men's in ratio of 2-3.2:1.[28] Also Vibert D examined Benign Paroxysmal Positional Vertigo in older women may be related to osteoporosis and osteopenia.[29] A detailed age and sex distribution analysis of BPPV onset showed that aging had a profound impact on BPPV occurrence in both deses and that perimenopausal women were especially susceptible to BPPV (3.2:1 female-to-male ratio).[30] Furthermore, our research suggest that the elderly population is the primary factor for BPPV with affecting the societal impact of BPPV in the elderly population and also age-induced symptoms are impacted for policy, practice and research purposes.

6. CONCLUSION

Thus this study concludes that about 61% individuals were positive for Dix-Hallpike test. Out of 45 males 26 were positive and 13 females from total 19 were indicated positive for Dix-Hallpike test and therefore, result shows that the prevalence of BPPV is more common in females than in males.Also, the study revealed that the individuals in middle old age group are getting more affected by BPPV than the individuals in young old age group. Thus, the societal impact which affects the individuals with BPPV can be reduced by making preventive strategies such as treating BPPV with canalith repositioning technique or Epley maneuver to improve the quality of life and to decrease the disability adjusted years.

7. AUTHORS CONTRIBUTION STATEMENT

Author Dhanashri A. Yadav designed the project and was directed under the guidance of author Dr. Namrata Kadam. Author Dhanashri A. Yadav performed the experiment and the data was analysed with the help of author Dr. Namrata Kadam. The theoretical framework was developed by author Dhanashri A. Yadav. All authors discussed the results and commented on the manuscript. The article then was written by author Dhanashri A. Yadav.

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9. CONFLICTS OF INTEREST

Conflict of interest declared none.

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