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To Identify the Clinical Parameters Suggestive of Stroke in Patients Presenting to Emergency Department with Vertigo

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ABSTRACT

Background and Purpose: Investigating every vertigo patient for central or peripheral MRI and other treatments is expensive and taxing for the system. Thus, emergency physicians must identify stroke patients and give immediate treatment to minimize disastrous results.

Methods: 500-bed BGS Global hospital prospective cohort research. Consecutive vertigo patients endure history, head impulse, nystagmus, skew deviation, and neurological symptoms such leg or truncal ataxia. Scheduled brain MRIs. MRI found strokes. Clinical assessment and normal MRI found peripheral lesions.

Results: Of the 102 acute vertigo patients, 70 were peripheral and 32 central (29 posterior circulation stroke, 2 anterior circulation, and 1 central venous thrombosis). Vertigo patients averaged 49.64706 ± 14.3931 (SD). 36 women, 66 males (64.3%). ED presentation averages 12.54902 ± 10.76355 (SD) hours. Central and peripheral causes were explored. Vomiting, hearing problems, headaches, and tinnitus did not discriminate central from peripheral causes ($p < 0.01$). Diplopia, Dysphagia, Dysarthria, Head impulse test, Nystagmus examination, Skew deviation test, and neurological indicators such limb or truncal ataxia separate central from peripheral causes ($p < 0.01$). Diplopia, Dysarthria, Dysphagia, Nystagmus, Skew deviation, and ataxia have poor sensitivity and high specificity. High-sensitivity, low-specificity head impulse test. This study shows that individual characteristics cannot distinguish central from peripheral vertigo. The study showed good sensitivity 92.31% (0.63 to 0.99) and specificity 100% (0.87 to 1). This test distinguishes central from peripheral vertigo.

Conclusions: Absence of Diplopia, Dysphagia, Dysarthria, abnormal head impulse test, No direction-changing Nystagmus, and absence of Skew deviation in the first clinical visit with vertigo can reliably exclude central cause and discharged home from ED safely without further investigations and imaging.

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INTRODUCTION

Patients presenting to the emergency department with vertigo pose a difficult problem to the physician. While most cases are of not serious etiology, there still remains a possibility that some of them may actually be manifestations of stroke and other central nervous system causes. Investigating every patient with vertigo with investigations like MRI imposes a huge burden on the system and is costly. Therefore, it becomes imperative for the emergency physician to identify the patients with possibility of stroke for further management in order to avoid serious consequences and to institute immediate appropriate treatment.

Some studies have addressed the question of clinical indicators to stroke in patients presenting with vertigo. However, they are not being applied commonly in the emergency room practice. Further, to our best knowledge, such studies have not been done in the Indian population.

Therefore, there is a need to do a study on the Indian population to identify clinical parameters which suggest stroke or stroke risk in patients presenting with vertigo.

AIMS AND OBJECTIVES

1. To identify the clinical parameters which suggest stroke or stroke risk in patients presenting with vertigo.
2. To develop a simple, rapidly performable clinical proforma for early identification of stroke or stroke risk in patients presenting with stroke.

MATERIALS AND METHODS

This is a prospective, cross-sectional study conducted after institutional ethics committee approval at a single urban, 500 bedded BGS Global hospital.

This study consists of 102 patients presented initially to the emergency department with the following inclusion and exclusion criteria

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This study consists of 102 patients presented initially to the emergency department with the following inclusion and exclusion criteria

Inclusion criteria:

1. Presenting symptom of vertigo.
2. Age above 18 yrs.

Exclusion criteria:

1. Unambiguous stroke.
2. History or evidence for any central nervous system or peripheral nervous system disorders including head injury, neurodegenerative disorder affecting the brain or prior brain surgery.
3. Patients presenting with cardiac arrhythmias, hypoglycemia, hypovolemia
4. Cardiac pace makers, other electronic implants, intracranial metallic particles.
5. History of seizures or epileptic activity.
6. Age below 18 yrs.

In the Emergency Department, Patients presenting with Acute onset vertigo, a careful and detailed history was recorded (like age sex, time to ED Presentation, nausea or vomiting, hearing abnormality, headache, tinnitus, diplopia, dysphagia, dysarthria), Clinical Examination (like head impulse test, Nystagmus examination, skew deviation test, and neurological signs like limb or truncal ataxia) was conducted, and All the patients underwent stroke protocol MRI after initial evaluation.

All quantitative data were analyzed using mean, median and standard deviation. All qualitative were analyzed using the chi-square test and p value of <0.01 was calculated for statistical significance. Sensitivity, Specificity and CIs were calculated with MedCalc (MedCalc Software, US).

REVIEW OF LITERATURE

Worldwide, stroke is the second most common cause of mortality and the third most common cause of disability[1]. Of all strokes, 80% are ischemic in nature[2]. Not all strokes present as classic triad of slurred speech, unilateral facial droop, and arm weakness[3]. Another presentation is acute vestibular syndrome (AVS), which is characterized by the rapid onset of vertigo, nausea/ vomiting, and gait unsteadiness in association with head motion intolerance and nystagmus[3]. In fact, 20% of ischemic strokes are known to involve the posterior circulation of the brain, and the most common associated symptom is dizziness or vertigo[4]. Studies show that less than half of AVS due to stroke presentations have limb ataxia, dysarthria, or other obvious neurological features[5].

More than 4 million emergency department (ED) visits per year in the United States are due to vertigo[6], and the most common causes of these symptoms are thought to be peripheral causes (70%) like, BPPV (32%), vertiginous migraine (16 -30%); vestibular neuritis and labarynthitis (both 27%); Meniere's disease (12%), superior canal dehiscence syndrome etc., [7]. Small observational studies suggest perhaps 25%of acute onset vertigo presentations to the emergency department represent posterior circulation infarctions[10].

Vertigo is defined as a pathologic illusion of movement[8]. Most commonly experienced as a spinning sensation, it arises from a pathologic imbalance in the peripheral or central vestibular system[8]. Patients will often merely report feeling dizzy, and further questioning is required to identify vertigo[18]. Caution is advised in classifying the dizzy patient[8]. The best way for a clinician to identify a vertigo syndrome is to realize that while most patients will report the classic rotational vertigo, approximately 17% will not and these patients may report episodic imbalance or dizziness that is made worse with head movement[8].

David E. Newman-Toker; Kattah et. al., showed that majority of patients with vertigo were males (65%) and over 65% were between the ages of 41 and 70 years. The mean age at presentation was 56.1 years. Only a very small number of patients were below the age of 20 years (0.7%) [10].

Eric Searls, MD; Louis R. Caplan, MD et.al., [12] discussed about the frequencies of symptoms collected from different surveys and were as follows: dizziness, 75%; unsteadiness, 65%; dysarthria, 64%; nausea or vomiting, 60%; limb weakness, 49%; tinnitus, 8%; dysphagia ,33%; diplopia, 28% especially with AICA stroke and altered mental status, 18% in the posterior circulation stroke[19]. In case of lateral medullary infarcts, high frequencies of the features like dizziness (52%-91%), nausea (48%-73%), and dysphagia (52%-61%).

Dysarthria (30%), diplopia (25%), headache (40%), hearing abnormality rare (<5%), and Nystagmus (60 to 90%)[12]. Pontine infarct (Middle territory) positively correlated with facial weakness and unilateral limb weakness, headache (33 to 40%), dysarthria (22%), and one patient had hearing abnormality[12]. Quadriparesis has long been thought to be the hallmark of bilateral pontine base infarction[12].

Christina Huang; Sophia Sundararajan et al from a systemic review shows that >50% of cerebellar strokes present with nausea and vomiting[14].

Peripheral causes of vertigo like BPPV, Vestibular Neuritis, labarynthitis, vestibular migraine, Meniere's disease share common features with posterior fossa stroke like nausea or vomiting, headache, tinnitus, diplopia etc., Similarly patients presenting with vestibular migraine mimics central lesion especially Basilar migraine[9].

Differentiating these conditions is a challenge for ED providers. It is estimated that cerebellar strokes missed on the initial ED visit may represent up to an 8-fold increase in mortlity[13]. David E. Newman-Toker, et al

drew attention to the enormity of the problem of missed diagnoses of stroke in acute vestibular syndrome when they estimated that 15,000 to 165,000 missed diagnosis of stroke occurred annually in the emergency departments of the US[9]. These misdiagnoses are largely due to the false-negative rate of advanced imaging, 20% in first 24 hours[9].

To avoid complications, such as missed opportunities for thrombolysis, delayed surgery for posterior fossa edema and initial minor infractions progressing to posterior fossa strokes[13], a set protocol must be implemented to heighten our suspicion for this confusing presentation. Investigating every patient with vertigo, like MRI imposes a huge burden on the system and is costly. Therefore, it becomes imperative for the emergency physician to identify the patients with possibility of stroke for further management in order to avoid serious consequences and to institute immediate appropriate treatment. Kattah, et al. showed that a three step bedside oculomotor examination was more sensitive that early DWI MRI in the diagnosis of stroke in acute vestibular syndrome[10]. Kothari, et al developed an out of hospital stroke scale for early recognition of stroke risk in patients with vertigo[11].

Some studies have addressed the question of clinical indicators to stroke in patients presenting with vertigo. However, they are not being applied commonly in the emergency room practice. Further, to our best knowledge, such studies have not been done in the Indian population.

Therefore, there is a need to do a study on the Indian population to identify clinical parameters which suggest stroke or stroke risk in patients presenting with vertigo.

RESULTS AND ANALYSIS:

1. Distribution of patients according to age:

Table 1: Age Distribution of Vertigo Patients in the Study Cohort

Age in years	No. of patients	%
18-30	9	8.8
31-40	23	22.5
41-50	23	22.5
51-60	18	17.7
61-70	26	25.6
71-80	3	2.9
Total	102	100.0

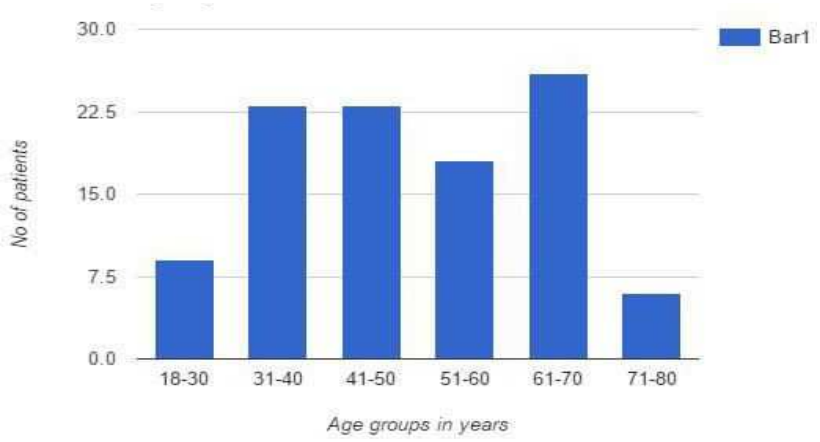

Fig 1: Age Distribution of Vertigo Patients: Bar Graph

Mean age of patients who presented with vertigo : 49.64706 ± 14.3931(SD)

2. Sex distribution:

Table 2: Gender Distribution of Vertigo Patients in the Study Cohort

Gender	No. of patients	Percentage
Female	36	35.3%
Male	66	64.7 %
Total	102	100.0 %

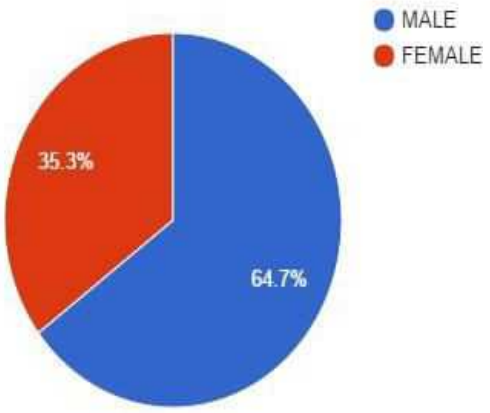

Fig 2a: Gender Distribution of Vertigo Patients

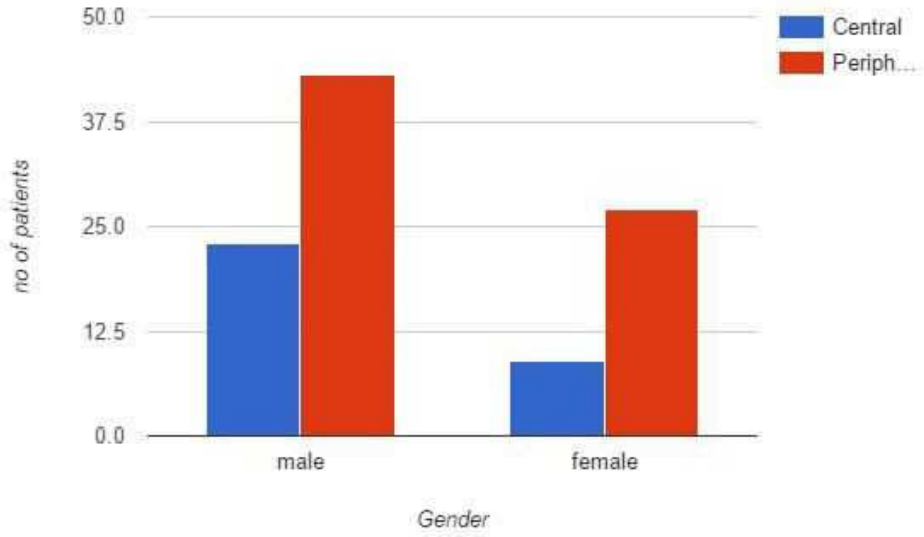

Fig 2b: Gender Distribution of Vertigo Patients

Report: Out of 102 patients with vertigo ,66 were males (64.3%) and 36 were females(35.7%).

3. Time to ED presentation:

Table 3: Time Interval to Emergency Department (ED) Arrival of Vertigo Patients

TIME IN HRS TO ED	NO OF PATIENTS
0 – 3	12
4 – 6	29
7 – 12	21
13 – 24	29
25 - 48	11

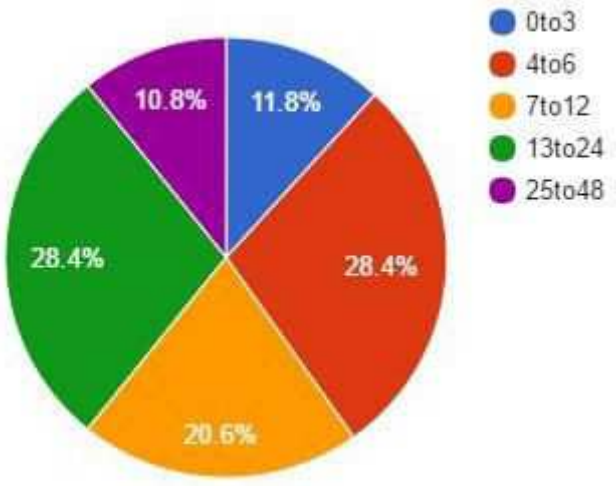

Fig 3: Vertigo Patients: Time Interval to Emergency Department (ED) Arrival – Pie Graph

Mean time to Emergency Department presentation(hrs) : 12.54902 ± 10.76355 (SD)

4. Activity at the time of onset:

Table 4: Activity Distribution of Vertigo Patients in the Study Cohort

Activity	**No: of patients**	**Percentage**
Sleeping	11	10.78%
Working	50	49.01%
Walking	26	25.49%
Bathing	5	4.90%
Cooking	7	6.86%
Sitting	3	2.94%

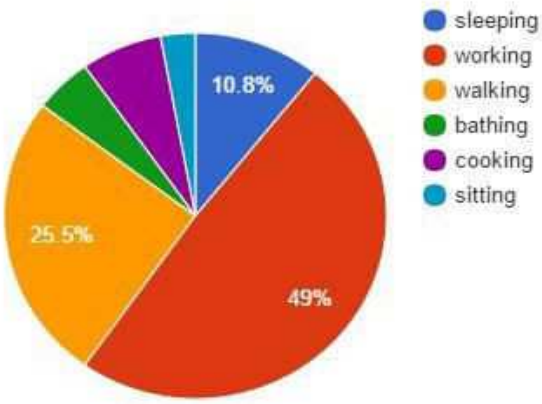

Fig 4 : Vertigo Patients: Distribution of Activities

Most people, who presented to Emergency Department are at work(49%), when they feel vertigo

5. Distribution of diagnosis:

Table 5: Diagnosis Distribution of Vertigo Patients in the Study Cohort

DIAGNOSIS	NO OF PATIENTS	PERCENTAGE
CENTRAL	32	31.4%
PERIPHERAL	70	68.6%
TOTAL	102	100

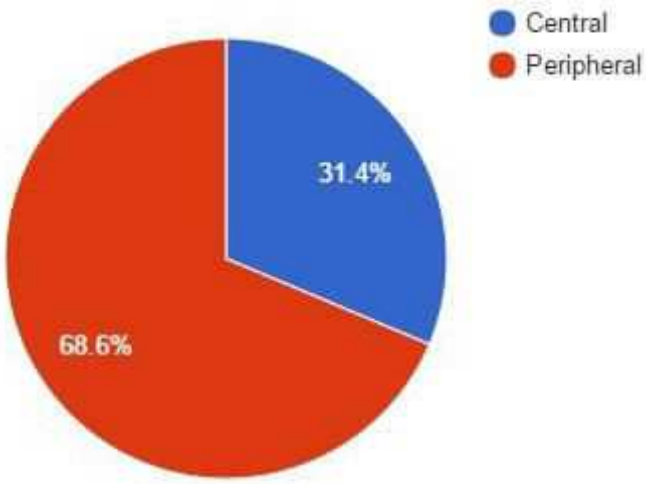

Fig 5: Vertigo Diagnosis: Central vs Peripheral – Pie Diagram

31.4% Patients with vertigo were diagnosed to have central cause and remaining 68.6% were due to peripheral origin

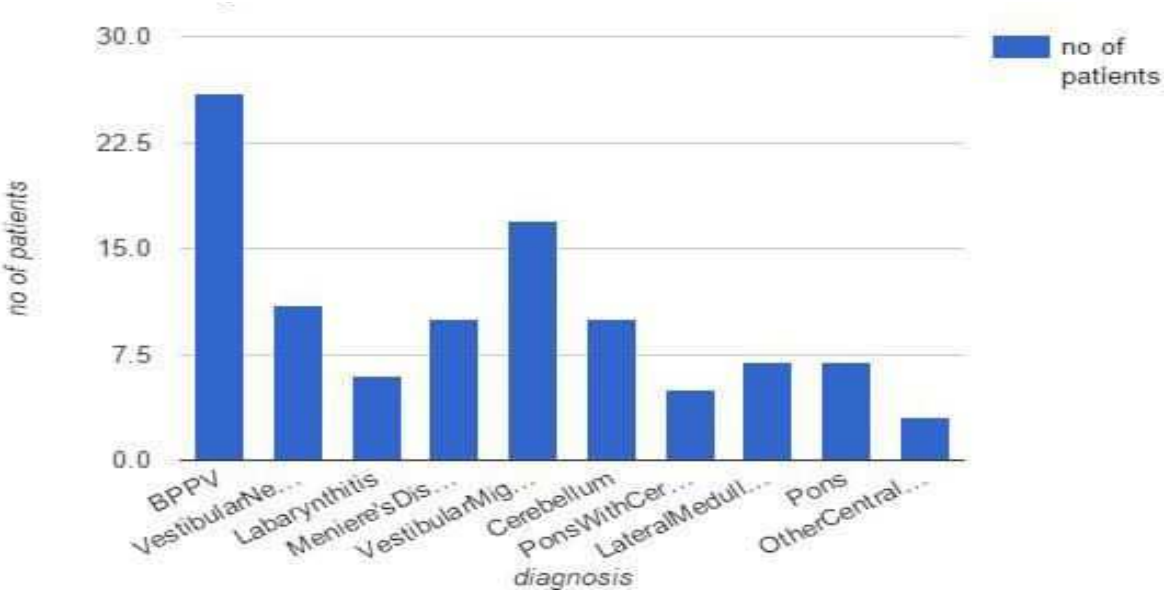

Fig 6: Distribution of Diagnoses in Vertigo Patients: Central vs Peripheral

6. Distribution of symptoms according to diagnosis:

Table 6: Vertigo Patients: Diagnosis, Symptom, and Percentage Distribution

	TOTAL	N/V(%)	HEARING LOSS	TINNITUS	DIPLOPIA	HEADACH	DYSPHAGIA	DYSARTHRIA
Peripheral	70 (68.6)	41(40.2)	22(21.56)	19(18.6)	3(2.9)	17(16.6)	2(1.9)	1(0.98)
BPPV	26 (25.5)	15(14.7)	1(0.98)	0(0.0)	1(0.98)	6(5.9)	0(0.0)	0(0.0)
Vestibular neuritis	11(10.8)	10(9.8)	0(0.0)	0(0.0)	0(0.0)	1(0.98)	0(0.0)	0(0.0)
labyrynthitis	6(5.9)	5(4.9)	6(5.9)	6(5.9)	0(0.0)	0(0.0)	0(0.0)	0(0.0)
meniere's disease	10(9.8)	1(0.98)	10(9.8)	10(9.8)	0(0.0)	2(1.9)	0(0.0)	0(0.0)
vestibular migraine	17(16.6)	10(9.8)	5(4.9)	3(2.9)	2(1.9)	8(7.84)	2(1.9)	1(0.98)
Central	32(31.3)	12(11.76)	8(7.84)	4(3.9)	12(11.76)	15(14.7)	14(13.72)	16(15.68)
Cerebellum	10(9.8)	6(5.9)	4(3.9)	1(0.98)	6(5.9)	3(2.9)	7(6.8)	7(6.8)
pons with cerebellum	5(4.9)	2(1.9)	2(1.9)	2(1.9)	3(2.9)	3(2.9)	3(2.9)	3(2.9)
lateral medullary syndrome	7(6.8)	2(1.9)	2(1.9)	0(0.0)	2(1.9)	3(2.9)	4(3.9)	4(3.9)
Pons	7(6.8)	0(0.0)	0(0.0)	1(0.98)	0(0.0)	4(3.9)	0(0.0)	2(1.9)
others	3(2.9)	2(1.9)	0(0.0)	0(0.0)	1(0.98)	2(1.9)	0(0.0)	0(0.0)
Total	102(100)	53(51.96)	30(29.4)	23(22.54)	15(14.7)	32(31.3)	16(15.68)	17(16.6)
p value (<0.05)		0.04811	0.508505	0.100591	0.00011	0.022	0.00001	0.00001

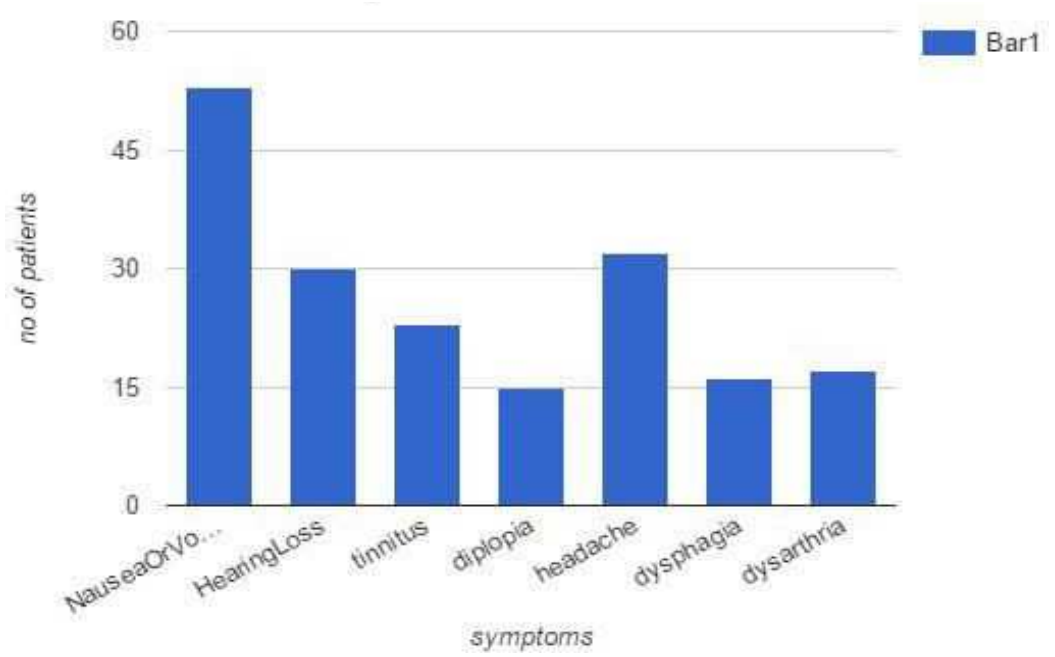

Fig 6: Vertigo Patients: Distribution of Symptoms - Bar Graph

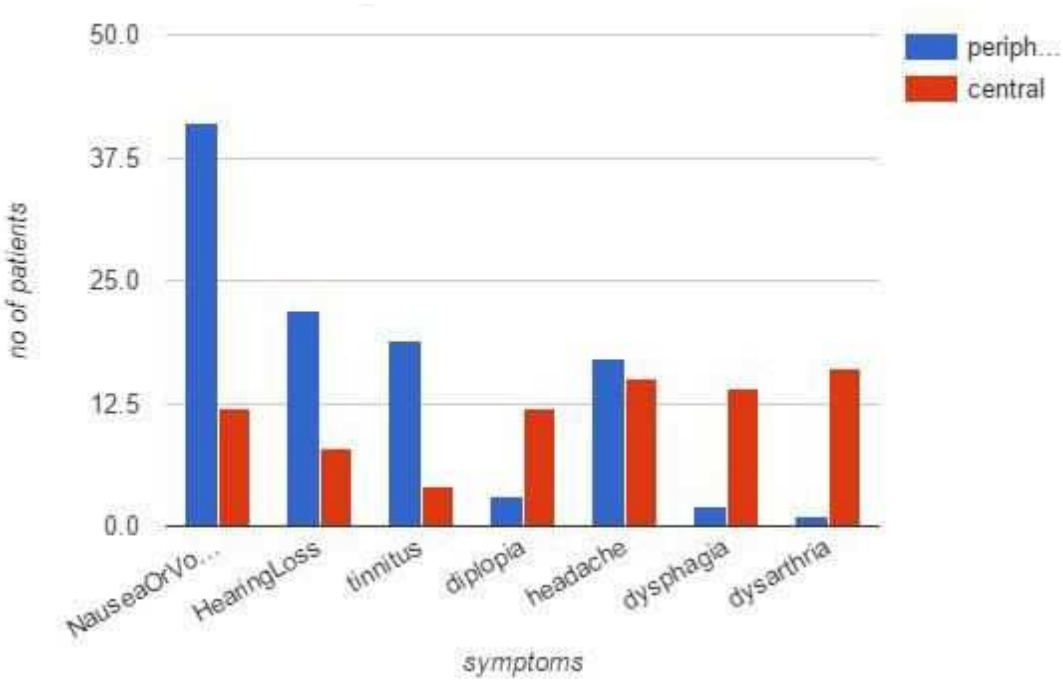

Fig 7: Symptom Distribution in Central and Peripheral Vertigo Patients

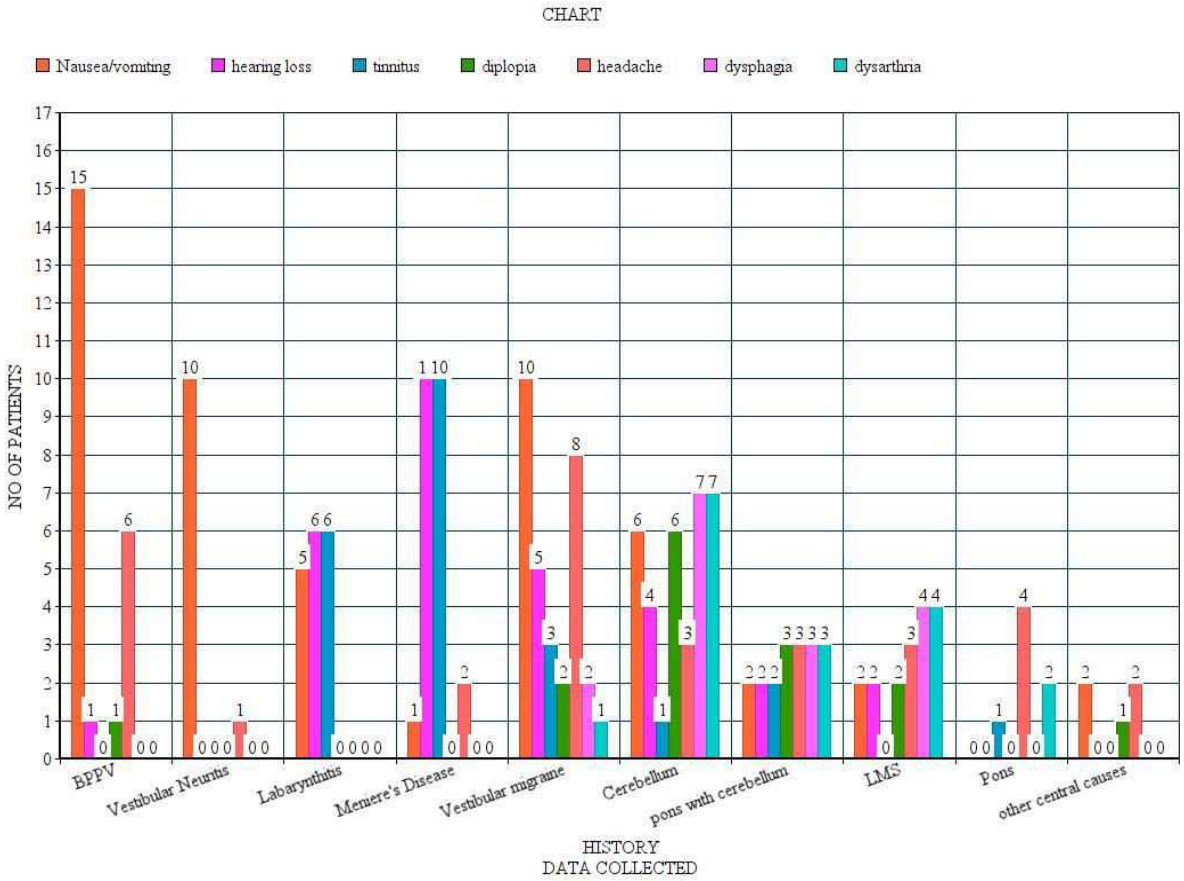

Fig 8: Distribution of Symptoms in Central and Peripheral Vertigo Patients: Nausea/Vomiting, Hearing Abnormality, Tinnitus, Diplopia, Headache, Dysphagia, Dysarthria

1. 53(51.9%) of 102 patients had Nausea or vomiting. Even though the incidence of nausea or vomiting in peripheral cause of vertigo(41;58.5%) is higher than central cause of vertigo(12;37.5%), it does not show statistical significance(p value 0.048 at p <0.01) to differentiate central from peripheral causes of vertigo
2. 30(29.4%) of 102 patients had hearing abnormality. Even though the incidence of hearing abnormality in peripheral cause of vertigo(22(31.4%)) is higher than central cause of vertigo(8(25%)), it does not show statistical significance (p value 0.58 at p <0.01) to differentiate central from peripheral causes of vertigo
3. 23(22.54%) of 102 patients had tinnitus. Even though the incidence of tinnitus in peripheral cause of vertigo(19(27.1%)) is higher than central cause of vertigo(4(12.5%)), it does not show statistical significance (p value 0.1005 at p <0.01) to differentiate central from peripheral causes of vertigo
4. 15(14.7%) of 102 patients had diplopia. Even though the incidence of diplopia in peripheral cause of vertigo (3(4.2%)) is lower than central cause of vertigo (12(37.5%)), it shows statistical significance (p value 0.0001 at p <0.01) to differentiate central from peripheral causes of vertigo
5. 32(31.3%) of 102 patients had headache. Even though the incidence of headache in peripheral cause of vertigo (17(24.2%)) is lower than central cause of vertigo (15(46.8%)), it does not show statistical significance (p value 0.022 at p <0.01) to differentiate central from peripheral causes of vertigo
6. 16(15.68%) of 102 patients had dysphagia.

Even though the incidence of dysphagia in peripheral cause of vertigo (2(2.8%)) is lower than in central cause of vertigo (14(43.7%)), it shows statistical significance (p value 0.0001 at p <0.01) to differentiate central from peripheral causes of vertigo

7. 17(16.60%) of 102 patients had dysarthria. Even though the incidence of dysarthria in peripheral cause of vertigo (1(1.4%)) is lower than in central cause of vertigo (16(50%)), it shows statistical significance (p value 0.00001 at p <0.01) to differentiate central from peripheral causes of vertigo

7) Habits:

Table 7: Association of Alcohol and Smoking with Peripheral and Central Vertigo: Total, Alcohol Consumption, and Smoking Status

	TOTAL	ALCOHOL	SMOKER
Peripheral	70 (68.6)	13(12.74)	15(14.7)
BPPV	26 (25.5)	6(5.9)	6(5.9)
Vestibular neuritis	11(10.8)	3(2.9)	4(3.9)
labyrynthitis	6(5.9)	0(0.0)	0(0.0)
meniere's disease	10(9.8)	2(1.9)	1(0.98)
vestibular migraine	17(16.6)	2(1.9)	4(3.9)
Central	32(31.3)	8(7.84)	8(7.84)
Cerebellum	10(9.8)	1(0.98)	1(0.98)
pons with cerebellum	5(4.9)	2(1.9)	2(1.9)
lateral medullary syndrome	e7(6.8)	1(0.98)	3(2.9)
Pons	7(6.8)	3(2.9)	2(1.9)
others	3(2.9)	1(0.98)	1(0.98)
Total	102(100)	21(20.58)	23(22.54)
p value (<0.05)		0.456	0.688

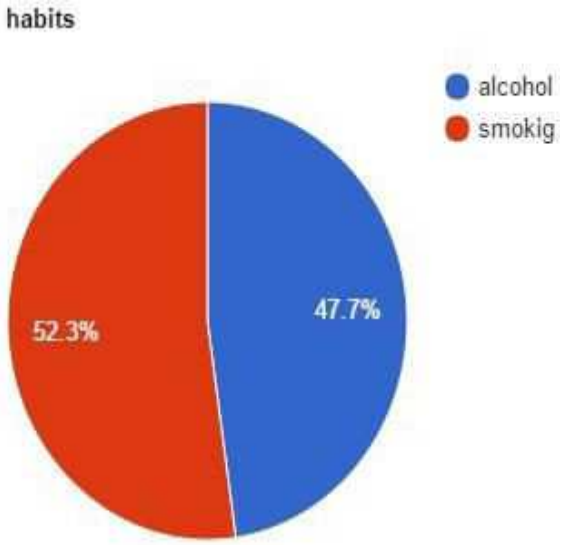

Fig 9a: Association of Alcohol Consumption and Smoking Status with Peripheral and Central Vertigo

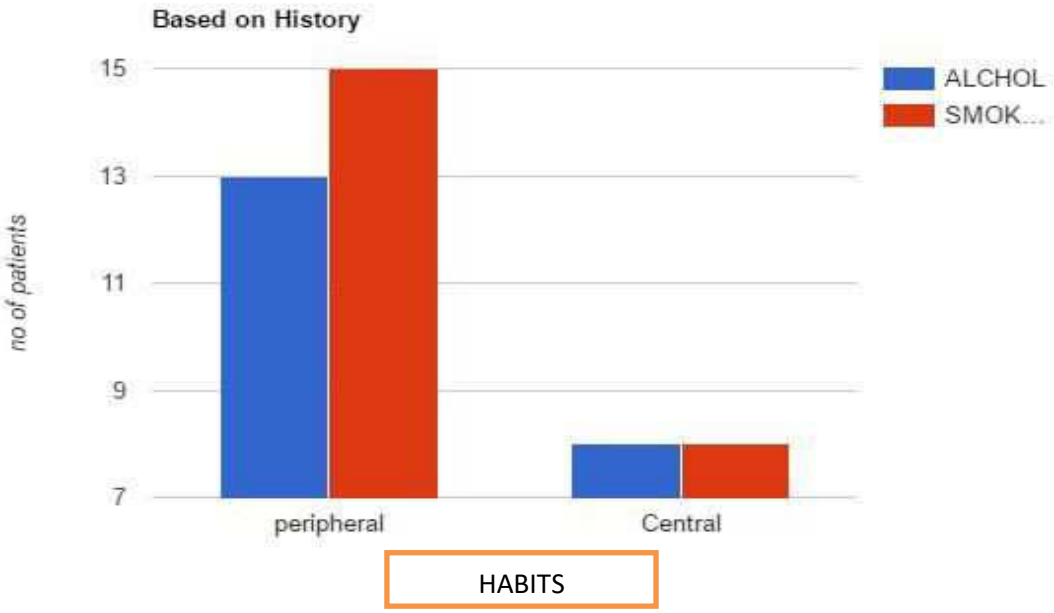

Fig 9b: Association habit Status with Peripheral and Central Vertigo: Bar Graph

1. 21(20.58%) of 102 patients were alcoholic. The distribution of alcoholics in peripheral cause of vertigo was 14(20%) and central cause of vertigo was 8(25%). it did not show statistical significance (p value 0.456 at p <0.01) to differentiate central from peripheral causes of vertigo
2. 23(22.5%) of 102 patients were smokers. The distribution of smokers in peripheral cause of vertigo was 15(21.4%) and central cause of vertigo was 8(25%). it did not show statistical significance (p value 0.688 at p <0.01) to differentiate central from peripheral causes of vertigo

8) Comorbidities:

Table 8: Comorbidities in Vertigo Patients: Diabetes Mellitus (DM) and Hypertension (HTN) Distribution

	TOTAL	DM	HTN
Peripheral	70 (68.6)	30(29.4)	15(14.7)
BPPV	26 (25.5)	7(6.8)	4(3.92)
Vestibular neuritis	11(10.8)	5(4.9)	3(2.9)
labyrynthitis	6(5.9)	2(1.9)	1(0.98)
meniere's disease	10(9.8)	8(7.84)	5(4.9)
vestibular migraine	17(16.6)	8(7.84)	2(1.9)
Central	32(31.3)	14(13.72)	14(13.72)
Cerebellum	10(9.8)	5(4.9)	4(3.9)
pons with cerebellum	5(4.9)	2(1.9)	1(0.98)
lateral medullary syndrome	e7(6.8)	3(2.9)	6(5.9)
Pons	7(6.8)	3(2.9)	2(1.9)
others	3(2.9)	1(0.98)	1(0.98)
Total	102(100)	44(43.13)	29(28.43)
p value (<0.05)		0.923	0.02

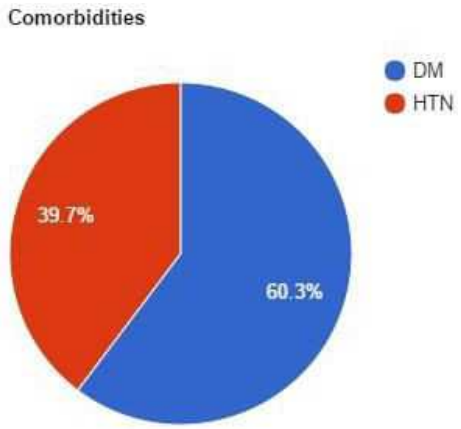

Fig 10a: Comorbidities in Vertigo Patients

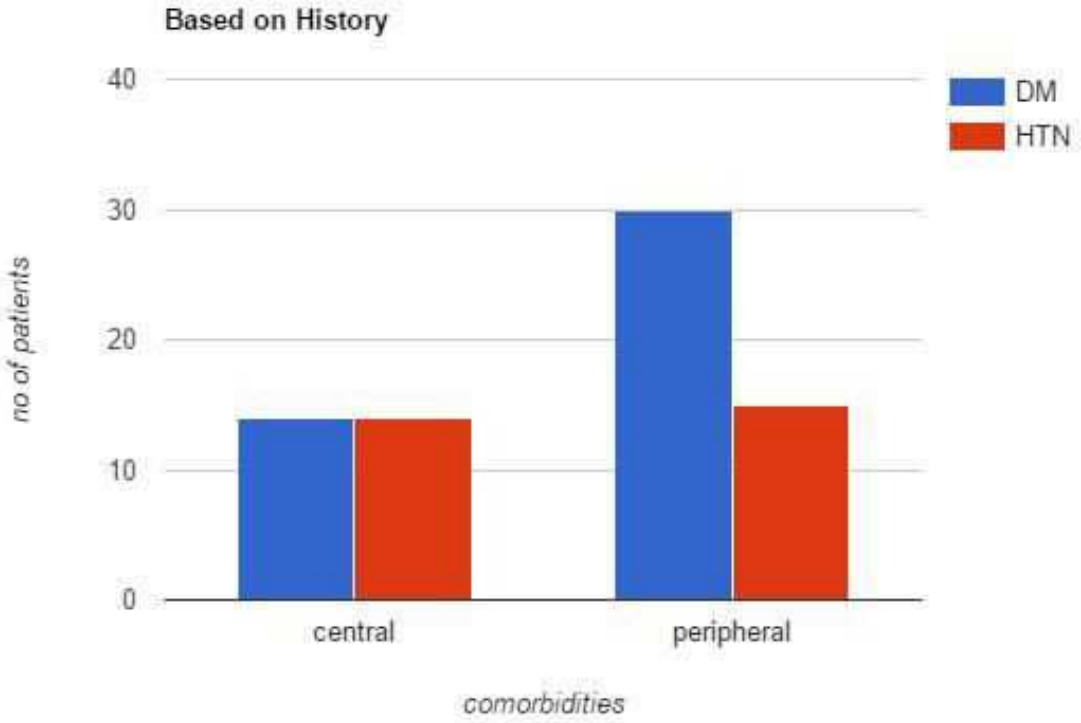

Fig 10b: Comorbidities in Vertigo central and peripheral

1. 44(43.13%) of 102 patients were diabetic. The distribution in peripheral cause of vertigo was 30(42.8%) and central cause of vertigo was 14(43.75%). it did not show statistical significance (p value 0.983 at p <0.01) to differentiate central from peripheral causes of vertigo
2. 29(28.43%) of 102 patients were hypertensive. The distribution in peripheral cause of vertigo was 15(21.4%) and central cause of vertigo was 14(43.75%). it did not show statistical significance (p value 0.02 at p <0.01) to be used to differentiate central from peripheral causes of vertigo

9) Examination :

Table 9: Vertigo Examination Findings: Abnormal Head Impulse Test, Nystagmus, Skew Deviation, and Ataxia

	TOTAL	ABNORMAL HIT	NO VERTICAL OR DIRECTION CHANGING NYSTAGMUS	ABSENT SKEW DEVIATION	ATAXIA ABSENT
Peripheral	70 (68.6)	27(26.4)	66(64.7)	67(65.68)	67(65.68)
BPPV	26 (25.5)	0(0.0)	26 (25.5)	23(22.54)	24(23.52)
Vestibular neuritis	11(10.8)	11(10.8)	11(10.8)	11(10.8)	10(9.8)
labyrynthitis	6(5.9)	6(5.9)	6(5.9)	6(5.9)	6(5.9)
meniere's disease	10(9.8)	10(9.8)	10(9.8)	10(9.8)	10(9.8)
vestibular migraine	17(16.6)	0(0.0)	13(12.74)	17(16.6)	17(16.6)
Central	32(31.3)	3(2.9)	5(4.9)	8(7.84)	8(7.84)
Cerebellum	10(9.8)	0(0.0)	0(0.0)	3(2.9)	4(3.9)
pons with cerebellum	5(4.9)	0(0.0)	0(0.0)	0(0.0)	0(0.0)
lateral medullary syndrome	7(6.8)	0(0.0)	0(0.0)	0(0.0)	1(0.98)
Pons	7(6.8)	0(0.0)	3(2.9)	2(1.9)	1(0.98)
Others	3(2.9)	3(2.9)	2(1.9)	3(2.9)	2(1.9)
Total	102(100)	30(29.4)	71(69.6)	75(73.52)	75(73.52)
p value (<0.05)		0.002	0.0001	0.0001	0.0001

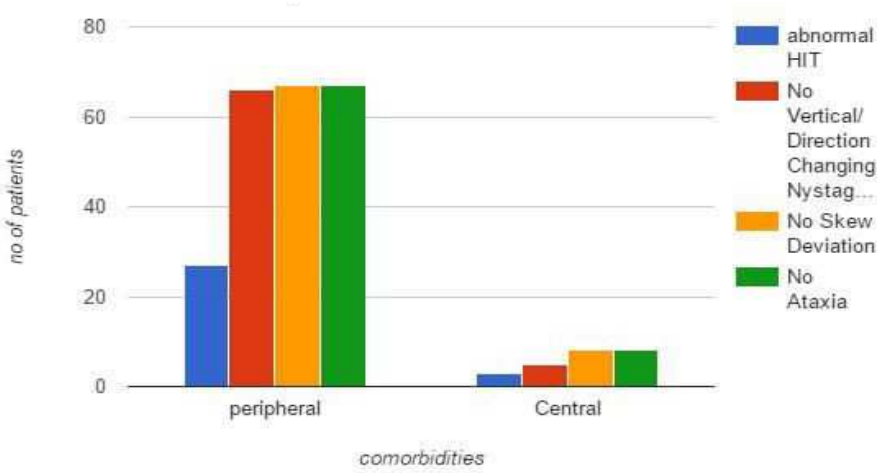

Fig 11: Vertigo Examination Findings

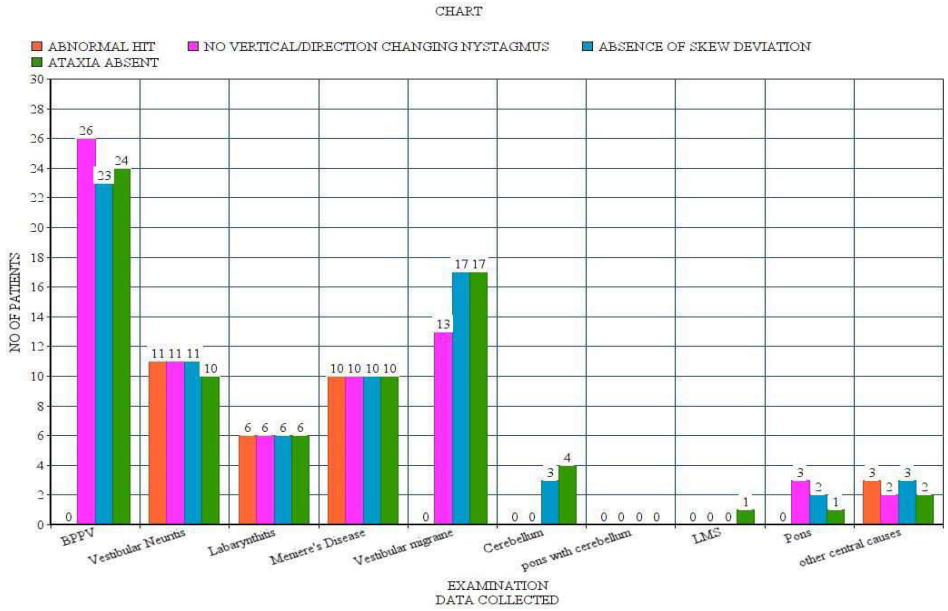

Fig 12: Bar Diagram: Vertigo Examination Findings

Table 10: Vertigo Examination Findings: HIT, Nystagmus, Skew Deviation, Ataxia

	TOTAL	normal HIT	Vertical/Direction Changing Nystagmus	PRESENCE OF SK	ataxia present
Peripheral	70 (68.6)	43(61.4)	4(3.9)	3(2.9)	3(2.9)
BPPV	26 (25.5)	26 (25.5)	0(0.0)	3(2.9)	2(1.9)
Vestibular neuritis	11(10.8)	0(0.0)	0(0.0)	0(0.0)	1(0.98)
labyrynthitis	6(5.9)	0(0.0)	0(0.0)	0(0.0)	0(0.0)
meniere's disease	10(9.8)	0(0.0)	0(0.0)	0(0.0)	0(0.0)
vestibular migraine	17(16.6)	17(16.6)	4(3.9)	0(0.0)	0(0.0)
Central	32(31.3)	29(28.4)	27(26.4)	24(23.5)	24(23.5)
Cerebellum	10(9.8)	10(9.8)	10(9.8)	7(6.8)	6(5.9)
pons with cerebellum	5(4.9)	5(4.9)	5(4.9)	5(4.9)	5(4.9)
lateral medullary syndrome	7(6.8)	7(6.8)	7(6.8)	7(6.8)	6(5.9)
Pons	7(6.8)	7(6.8)	4(3.9)	5(4.9)	6(5.9)
others	3(2.9)	0(0.0)	1(0.98)	0(0.0)	1(0.98)
Total	102(100)	72(70.5)	32(31.3)	27(26.4)	27(26.4)
p value (<0.05)		0.002	0.00001	0.00001	0.00001

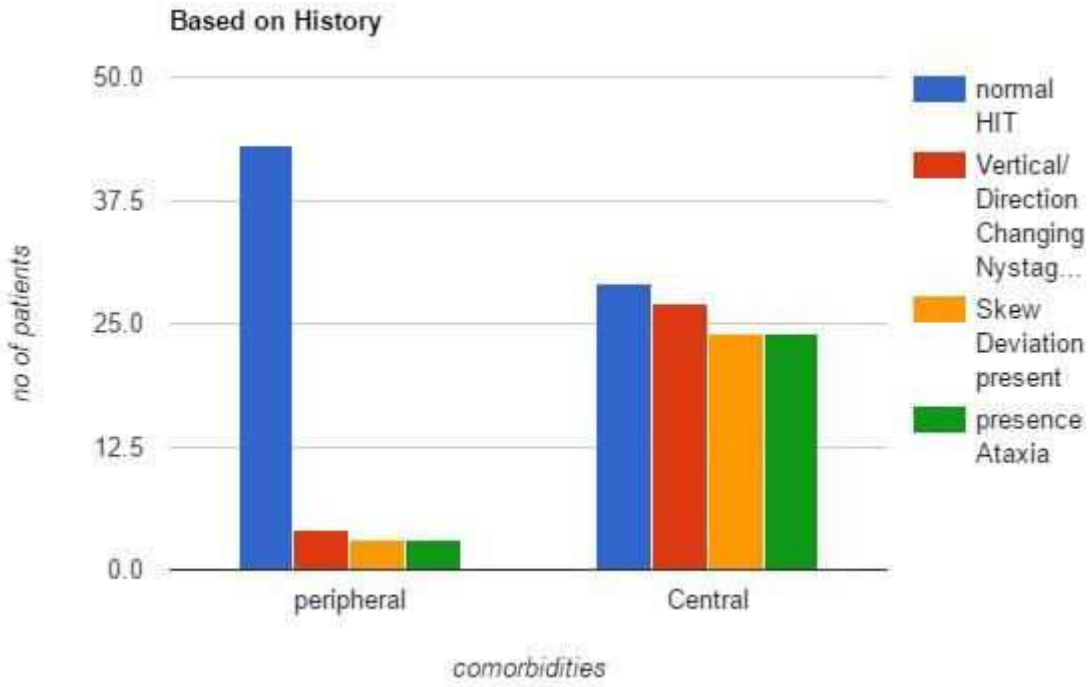

Fig 13: Vertigo Examination Findings - HIT, Nystagmus, Skew Deviation, Ataxia

1. 30(29.41%) of 102 patients had abnormal Head Impulse Test. The abnormal Head Impulse Test was found in 27(38.5%) patients with peripheral cause of vertigo and 3 (9.3%) in case of central cause of vertigo. It shows statistical significance (p value 0.002 at p <0.01) to differentiate peripheral from central causes of vertigo
2. 31(30.39%) of 102 patients had Vertical or Direction changing Nystagmus. The Vertical or Direction changing Nystagmus was found in 4(5.71%) patients with peripheral cause of vertigo and 27 (84.3%) in case of central cause of vertigo. It shows statistical significance (p value 0.00001 at p <0.01) to differentiate central from peripheral causes of vertigo
3. 27(26.47%) of 102 patients had positive skew deviation. The skew deviation Test was found positive in 3(38.5%) patients with peripheral cause of vertigo and 24 (75%) in case of central cause of vertigo. It shows statistical significance (p value 0.00001 at p <0.01) to differentiate central from peripheral causes of vertigo
4. 27(26.47%) of 102 patients had ataxia. The ataxia was found in 3(38.5%) patients with peripheral cause of vertigo and 24 (75%) in case of central cause of vertigo. It shows statistical significance (p value 0.00001 at p <0.01) to differentiate central from peripheral causes of vertigo.

10. Clinical parameters to suggest stroke:

Table 11: Diagnostic Test Performance for Vertigo Symptoms: Sensitivity, Specificity, PPV, NPV

TEST	SENSITIVITY(95 %CI)	SPECIFICITY (95% CI)	PPV (95% CI)	NPV (95% CI)
DIPLOPIA	38% (0.21;0.56)	96% (0.88;0.99)	80 %(0.52;0.95)	77% (0.66;0.85)
DYSPHAGIA	44% (0.26;0.62)	97% (0.9;0.99)	87% (0.6;0.98)	80% (0.68;0.87)

DYSARTHRA	50% (0.31;0.68)	98% (0.92;0.99)	94% (0.7;0.99)	81% (0.7;0.88)
HEAD IMPULSE TEST(N)	90% (0.74;0.98)	39% (0.27;0.5)	40% (0.28;0.52)	90% (0.73;0.97)
NYSTAGMUS(DC/V)	84% (0.67;0.94)	94% (0.86;0.98)	87% (0.7;0.96)	92% (0.84;0.97)
SKEW DEVIATION(P)	75% (0.56;0.88)	95% (0.87;0.99)	89% (0.70;0.97)	89% (0.80;0.95)
ATAXIA(P)	75% (0.56;0.88)	95% (0.87;0.99)	89% (0.70;0.97)	89% (0.80;0.95)

Diplopia has lower sensitivity (38% (0.21; 0.56)) and higher specificity (96% (0.88; 0.99))

Dysphagia has lower sensitivity (44% (0.26; 0.62)) and higher specificity (97% (0.9; 0.99))

Dysarthria has lower sensitivity (50% (0.31; 0.68)) and higher specificity (98% (0.92; 0.99))

Head impulse test has higher sensitivity (90% (0.74; 0.98)) and lower specificity (39% (0.27; 0.5))

Vertical or direction changing Nystagmus has lower sensitivity (84% (0.67; 0.94)) and higher specificity (94% (0.86; 0.98))

Skew Deviation Test has lower sensitivity (75% (0.56; 0.88)) and higher specificity (95% (0.87; 0.99))

Ataxia has lower sensitivity (75% (0.56; 0.88)) and higher specificity (95% (0.87; 0.99))

Considering individual variables, Diplopia, dysarthria, dysphagia, Nystagmus, skew deviation and ataxia shows low sensitivity and high specificity. whereas head impulse test shows high sensitivity and low specificity. Therefore, this study shows individual variables used separately cannot differentiate central from peripheral

Table 12: Diagnostic Test Results

	DISEASE PRESENT	DISEASE ABSENT
TEST POSITIVE	12 (TRUE POSITIVE)	0 (FALSE POSITIVE)
TEST NEGATIVE	1 (FLASE NEGATIVE)	27(TRUE NEGATIVE)

Table 13: Diagnostic Test Performance: Sensitivity, Specificity, PPV, NPV

TEST	RESULT
SENSITIVITY(95%CI)	92.31% (0.63to 0.99)
SPECIFICITY (95% CI)	100% (0.87 to 1)
PPV(95% CI)	100% (0.73 to 1)
NPV (95% CI)	96% (0.82 to 1)

When combined all the variables into a single test, the study shows good sensitivity 92.31%(0.63to 0.99) and specificity 100% ((0.87 to 1)). This test is good tool to differentiate central from peripheral causes of vertigo.

DISCUSSION

Acute vestibular syndrome is a condition i.e., challenging for the physicians, more so in the emergency department, the stroke has to be reliably and rapidly ruled in or ruled out. We have attempted to answer whether the presence or absence of a set of clinical parameters can rule out stroke in comparison to MRI. These clinical findings which was observed here can get within 1min, other authors also attempted the same discussion.

Kattah et. al., showed that majority of patients with vertigo were males (65%) and The mean age at presentation was 56.1 years10. Almost same results were present in this study i.e., Mean age of patients who presented with vertigo: 49.64706 ± 14.3931(SD). 66 were males (64.3%) and 36 were females (35.7%)10.

None of the Indian studies mentioned about mean time arrival to Emergency department, and activity at the time of onset. This study shows Mean time arrival to Emergency Department presentation(hrs.): 12.54902 ± 10.76355 (SD) and Most people, who presented to Emergency Department are at work (49%), Sleeping (10.78%), Walking (25.49%), Bathing (4.90%), Cooking (6.86%), Sitting (2.94%) when they feel vertigo

Some studies showed that the distribution of causes of vertigo, peripheral (70%)7 and posterior circulation (25%)10. Almost same results were present in this study i.e., 31.4% Patients with vertigo were diagnosed to have central cause (posterior circulation (28.46%) and other central causes (2.94%) and remaining 68.6% were due to peripheral origin.

Kattah, et al. showed that a three step bedside oculomotor examination was more sensitive that early DWI MRI in the diagnosis of stroke in acute vestibular syndrome2. i.e.., HINTS was 100% sensitive and 96% specific for the presence of a central lesion and discussed only about skew deviation which was present in 68% of patients who had central lesion who presented with vertigo10.

Here in this study, all the variables were studied to differentiate central from peripheral causes.

Nausea or vomiting, hearing abnormality, headache, tinnitus. These variables did not show statistical significance to differentiate central from peripheral causes.

Diplopia, Dysphagia, Dysarthria, Head impulse test, Nystagmus examination, Skew deviation test, and neurological signs like limb or truncal ataxia, these variables shows statistical significance to differentiate central from peripheral causes.

Considering individual variables, Diplopia, dysarthria, dysphagia, nystagmus, skew deviation and ataxia showed low sensitivity and high specificity. whereas head impulse test showed high sensitivity and low specificity. Therefore, this study shows individual variables used separately cannot differentiate central from peripheral causes of vertigo

When combined all the variables into a single test (Diplopia, Dysphagia, Dysarthria, Head impulse test, Nystagmus examination, Skew deviation test), the study showed good sensitivity 92.31% (0.63to 0.99) and specificity 100% ((0.87 to 1)) like HINTS by Katah et al study. So this test can be used as a good tool to differentiate central from peripheral causes of vertigo.

Vertigo is a vague or confusing presentation. Differentiating whether it is due to central or peripheral cause is a challenge to a ED Providers. Here, in this study we concluded that “Absence of Diplopia, Dysphagia, Dysarthria, abnormal head impulse test, no direction changing Nystagmus and absence of Skew deviation, when clearly demonstrated in the first clinical visit with vertigo, the possibility of central cause can be reliably excluded and discharged home from ED safely without further investigations and imaging”.

CONCLUSION

Absence of Diplopia, Dysphagia, Dysarthria, abnormal head impulse test, no direction changing Nystagmus and absence of Skew deviation, when clearly demonstrated in the first clinical visit with vertigo, the possibility of central cause can be reliably excluded and discharged home from ED safely without further investigations and imaging.

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