

Vestibular disorders among adults in a tertiary hospital in Lagos, Nigeria

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Abstract Dizziness is not an uncommon complaint in the Otolaryngological clinics among other symptoms. To a large number of practitioners, the treatment of dizziness remains the same irrespective of the etiology, i.e., anti-vertiginous drugs. The objective of this study was to document the evaluation, causes and treatment of vestibular disorders among our patients. The design includes descriptive prospective study conducted in the Oto-rhino-laryngology and Orthopedic Clinics of Lagos University Teaching Hospital, Lagos and Nigerian Army Audiological Centre, 68 Nigerian Army Reference Hospital, Yaba, Lagos, Nigeria. Adult patients referred to the audiology clinic for dizziness had detailed history obtained by using structured questionnaire. General physical and neuro-otological examinations were done. Clinical diagnoses were made on standardized criteria. The patients had hearing evaluation, videonystagmography (VNG) evaluation using infrared videonystagmography system. X-ray of the cervical spine and computerized tomo-

gram scan of internal auditory meatus and brain when indicated were done. A total of 102 patients were seen with age range between 21 and 90 years. Thirty patients (29.4%) recorded average duration of episode of vertiginous attacks in seconds, 69 (67.6%) recorded within minutes to hours and 3 (2.9%) with no definite pattern. Clinical signs on neuro-otological examination were elicited on 39 (38.2%) of the patients while on VNG the vestibular subtest mainly caloric test was abnormal unilaterally and bilaterally in 47 (46.1%) while with the oculomotor subtests, smooth pursuit tests were abnormal in 5 (6.9%), saccade tests were abnormal in 8 (7.8%) and OPK were abnormal in 9 (8.8%). Peripheral vestibular disorders are common of which benign paroxysmal positional vertigo (BPPV) was seen in 29 (28.4%), Meniere's disease in 22 (21.6%), recurrent vestibulopathy in 20 (19.6%), cervical vertigo in 18 (17.6%), psychogenic vertigo in 2 (2%), vestibular schwannoma, barotraumas and drug-induced vertigo in 1 (1%), respectively, central vestibular disorders of vascular origin 2 (2%), vertebrobasilar insufficiency in 1 (1%), post-traumatic vertigo in 3 (3%) and unknown in 2 (2%). In conclusion, peripheral vestibular disorders are common of which BPPV is the most prevalent. Pre-referral anti-vertiginous medication is common among general practitioners. The practising ORL/Head neck surgeon and orthopedic surgeons must be conversant with the tools of diagnosis, differential diagnosis and treatment.

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Introduction

Dizziness is not an uncommon complaint in the Otolaryngological clinic among other symptoms. Dizziness affects

over 69 million adult Americans of age 40 years and above and it account for 2.5% of Emergency department visits per year over a 10-year period [1, 2]. Dizziness is a common symptom in adults in primary care in United Kingdom and 8 out of every 100 individuals consults general practitioner per year because of dizziness [3, 4].

In patients below 50 years of age, peripheral disorders are likely to be the cause of dizziness [5].

Dizziness may occur alone as a symptom or it may be associated with other otological symptoms like tinnitus, hearing impairment, or vegetative symptoms like nausea, vomiting, palpitation and sweating. Dizziness of vestibular origin (vertigo) can be peripheral or central in origin. Peripheral causes can be classified based on the duration of the dizzy spells in seconds, minutes, hours, days and vertigo with variable duration [6]. Among these, we have causes like benign paroxysmal positional vertigo (BPPV), Meniere's disease, recurrent vestibulopathy and vestibular neuronitis. Vertigo of central origin though not so common can be caused by vascular disorders and neoplasm [7].

For many general practitioners, the value of neuro-otologic examination and vestibular function tests are underestimated when compared with hearing tests. To a large number of general practitioners, the treatment of dizziness remains the same irrespective of the etiology, i.e., anti-vertiginous drugs. Today the diagnostic parameters for vestibular disorders have changed in the light of computerized videonystamography (VNG). The VNG battery consists of the vestibular and oculomotor subtests based on neurophysiology of the vestibuloocular reflex. Certain subtests are diagnostic of peripheral lesions while others are diagnostic of central vestibular disorders [8]. Separating such disorders as peripheral or central is not enough in itself. The need for detailed history, thorough physical examination and proper understanding and interpretation of the tests cannot be overemphasized.

There are few reports on vestibular disorders within West African sub-region. A few were on general pattern of vestibular disorders [9, 10] others focused on specific peripheral vestibular disorders like Meniere's [11–13] and cervical vertigo [14] while others treated the vestibular disorders as part of a review of pattern of diseases in their locality [15–17]. The aim of the study is to document the evaluation, causes and treatment of vestibular disorders seen among our patients.

Subjects/methods

This is a descriptive prospective study on adult patients referred to the Audiology and Orthopedic clinics of Lagos University Teaching Hospital Lagos Nigeria, with dizziness between January 2007 and April 2009. Detailed history was

obtained using structured questionnaire about the description of dizziness, duration of onset, episodes of attacks, associated otological, vegetative symptoms, aggravating and relieving factors, effect on functional activities of the patients and endocrine disorders. General physical and neuro-otological examinations were done and Frenzel's glasses were used to aid visualization of nystagmus. Clinical diagnoses were made on standardized criteria. The patients had pure tone audiometry, tympanometry, transient otoacoustic emission (TOAE), auditory brain stem response (ABR) audiometry and VNG performed at Nigerian Army Audiological Centre Yaba, Lagos, Nigeria. VNG evaluation was done using infrared VNG system to evaluate the vestibular and the oculomotor subsets. The vestibular subsets was evaluated for spontaneous nystagmus and elicited nystagmus in supine position, postural position, head hanging position, Dix-Hallpike test and Caloric tests. The oculomotor subsets comprises of smooth pursuit test, saccade test, optokinetic (OPK) and gaze test. The smooth pursuit test was evaluated for the wave form, gain phase lag and symmetry, the saccade test was evaluated for the dysmetria, latency, peak velocity and symmetry, OPK and gaze tests for symmetry. The results were classified as normal or abnormal according to wave form morphology and reference ranges for measurable parameters. Radiological investigations like computerized tomogram (CT) scan of internal acoustic meatus and brain when indicated were done for some of the patients. Patients with cervical vertigo had review with orthopedic surgeon along with X-ray of the cervical spine. Treatment given was documented. The data was entered and analyzed using SPSS package. The patients had an informed consent about the study. Excluded from the analyses were patients who did not complete the diagnostic investigations.

Results

A total of one hundred and two (102) patients were seen over the period of the study, with age range between 21 and 90 years (Table 1). Forty-six (45.1%) were male and 56 (54.9%) female. Majority, 55 (53.9%) presented <6 weeks of onset of the vertiginous symptoms (Table 2). Thirty patients (29.4%) recorded average duration of episode of vertiginous attacks in seconds, 69 (67.6%) recorded minutes to hours and 3 (2.9%) with no definite pattern. Vegetative symptoms like nausea and vomiting was not common among the patients and it was present in 20 (19.6%). Aggravating factors like neck turning, lying on the side and effect of activity were recorded in 39 (38.2%). Cervical symptoms like neck pain and pain radiating to the forearm were recorded in 22 (21.6%) patients. Endocrine diseases were recorded in 31 (30.4%) patients namely hypertension

Table 1 Age group distribution

	Frequency	Percent
21–30	2	2.0
31–40	21	20.6
41–50	34	33.3
51–60	16	15.7
61–70	16	15.7
71–80	9	8.8
81–90	4	3.9
Total	102	100.0

Table 2 Duration of dizzy spell before presentation

	Frequency	Percent
<6 weeks	55	53.9
>6 weeks and <6 months	17	16.7
>6 months and <1 year	9	8.8
>1 and <2 years	5	4.9
>2 years and <3 years	11	10.8
>3 years	5	4.9
Total	102	100.0

Table 3 Effect of dizzy episodes on functional scale by patients

	Frequency	Percent
No effect on activity	19	18.6
Stop activity during attack no change after	73	71.6
Stop activity during attack make changes to accommodate	9	8.8
Able to work with great deal constantly making changes	1	1.0
Total	102	100.0

and diabetes. Medication by the general physician before referral was recorded in 57 (55.9%). The effect of vertigo on the functional scale of the patients showed no effect on activity in 19 (18.6%) while 73 (71.6%) will stop activity during the attack (Table 3). Clinical signs were elicited on 39 (38.2%) patients.

Pure tone audiometry was normal bilaterally in 67 (65.7%) patients, 15 (14.7%) patients had unilateral mild sensorineural hearing loss (SNHL) and 9 (8.9%) patients had bilateral mild SNHL. Three (3%) patients had unilateral moderate SNHL and 4 (3.9%) patients with bilateral moderate SNHL. Moderate to severe SNHL was seen unilaterally and bilaterally in 1 (1%) patient and in 2 (2%) patients, respectively. One patient was seen with moderate unilateral conductive hearing loss. Some of the hearing impairments were not related to the vestibular disorders in four patients. Fifty-nine (57.8%) patients pass the TOAE

bilaterally, 9 (8.8%) failed bilaterally and 34 (33.4%) patients failed unilaterally. ABR was normal bilaterally in 78 (76.5%) patients, abnormal unilaterally and bilaterally in 16 (15.7%) and 8 (7.8%) patients, respectively (Table 4).

Videonystamographic findings showed that smooth pursuit was normal bilaterally in 95 (93.1%) patients, abnormal unilaterally and bilaterally in 5 (4.9%) and 2 (2%) patients, respectively. Saccade was normal bilaterally in 94 (92.2%) patients, abnormal unilaterally and bilaterally in 4 (3.9%) patients, respectively. Optokinetic gain and symmetry were normal bilaterally in 93 (91.2%) patients, abnormal unilaterally and bilaterally in 8 (7.8%) and 1 (1%) patients, respectively. Gaze was normal bilateral in 97 (95.1%) patients, abnormal bilaterally and unilaterally in 1 (1%) and 4 (4%) patients, respectively. Caloric test was normal bilaterally in 55 (53.9%) patients, abnormal unilaterally and bilaterally in 35 (34.3%) and 12 (11.8%) patients, respectively (Table 5). Requested plain radiograph of the cervical spine among patients with cervical vertigo was reported abnormal, with features of cervical osteophytes in 15 (14.7%) and normal in 3 (3%) patients. CT scan was requested in 11 patients and was reported abnormal in 2 (2%) patients.

Diagnosis of BPPV was made in 29 (28.4%) patients of whom bilateral disease was recorded only in one patient. Meniere's disease was diagnosed in 22 (21.6%) patients of which unilateral and bilateral disease were in 19 and in 3 patients, respectively. Diagnosis of recurrent vestibulopathy was made in 20 (19.6%) patients, cervical vertigo in 18 (17.6%) patients and psychogenic vertigo in 2 (2.0%) patients. Vestibular schwannoma, barotraumas and drug-induced vertigo in 1 (1%) patient, respectively.

Central vestibular disorders of vascular origin was diagnosed in 2 (2%) patients, vertebrobasilar insufficiency in 1 (1%), and post-traumatic vertigo in 3 (3%) and diagnosis was unknown in 2 (2%) patients (Table 6).

Treatments given were medical treatment with prescription of anti-vertiginous drugs (cinnarazine or prochlorperazine) to 45 (44.1%) patients, vestibular rehabilitation in 34 (33.3%) patients, surgery (myringotomy) in 1 (1%) patient and combination of medical and rehabilitation in 22 (21.6%) patients.

Discussion

Dizziness can be frightening to patients not only because of sensation of physical disorientation in space and sense of turning which is usually sudden in onset but also when it is associated with vegetative symptoms of nausea, vomiting and palpitation which equally could be further distressing. The description of the attacks varies as the number of patients with the attacks. Vestibular disorders documented

Table 4 Audiometric results

	BPPV	Meniere's	Recurrent vestibulopathy	Cervical vertigo	VBI	Trauma to inner ear	Brain stem lesion	Pyscho-genic	Unknown	Vestibular schwannoma	Total
Pure tone audiometry											
Normal bilateral	18	7	20	16	1	2		2	1		67
Mild unilateral SNHL	5	8		1		1					15
Mild bilateral SNHL	6	1		1		1					9
Mod unilateral SNHL		2								1	3
Mod bilateral SNHL		2					2				4
Mod-sev unil SNHL		1									1
Mod-sev bil SNHL		1							1		2
Mod unilateral CHL						1					1
Total	29	22	20	18	1	5	2	2	2	1	102
Transient otoacoustic emission											
Pass bilateral	17	7	14	15	1	2		2	1		59
Fail unilateral	12	9	6	2		3					32
Fail bilateral		6		1			2		1	1	11
Total	29	22	20	18	1	5	2	2	2	1	102
Auditory brain stem audiometry											
Normal bilateral	24	10	20	17	1	2		2	1		77
Abnormal unilateral	4	9				3				1	17
Abnormal bilateral	1	3		1			2		1		8
Total	29	22	20	18	1	5	2	2	2	1	102

BPPV benign paroxysmal positional vertigo, *VBI* vertebrobasilar insufficiency

in this study are mostly in adults even though the clinic attends to children, it is a rare condition in children in this environment from our data.

The severity of most of the documented peripheral vestibular disorder seems to be mild as reflected in fewer percentages of patients with vegetative symptoms and a high percentage 87% on the functional scale, describing the attacks as having no effect on activity while others admitted that they stop activity during attack with no change thereafter. The severity and the disability from the attacks form one of the basis for invasive or surgical intervention. This report is at variance with reports from North America and Europe, which indicate surgical treatment options for management of peripheral vestibular disorder in 10% of individuals suffering from Meniere's disease [18].

The association between vestibular dysfunction and patients with endocrine disorders is well documented [1, 19, 20]. The odds of vestibular dysfunction increases with diabetes mellitus and hypertension and this effect has been attributed to sub-clinical damage to the central nervous system controlling balance. The relationship between vestibular disorders and endocrine disorders mainly hypertension and diabetes do not show a statistical significance in this study p value 0.34 and 0.6 for unilateral and bilateral vestibular disorders, respectively.

The poor understanding of vestibular disorders and its differential diagnosis by general practitioners coupled with the anxiety of the patients accounted for medical treatment using labyrinthine sedatives empirically (cinnarazine or prochlorperazine) in a number of our patients before referral.

Among the peripheral vestibular disorders documented in this study, BPPV is the commonest. It is acclaimed as the commonest of peripheral disorders and the commonest cause of dizziness seen by otolaryngologist [21]. The hallmark of diagnosis is the Dix-Hall pike test. It is not unusual for some of the patients to present with either tinnitus or mild sensorineural hearing loss but not the two together as documented in a few of our patients.

Meniere's disease is the second commonest peripheral vestibular disorder in this study and in Ile Ife south western Nigerian [7]; it was reported as the commonest cause of vertiginous visits to specialist clinics in Toronto, Canada and UK [21, 22]. Meniere's disease is said to be rare among blacks three decade ago [10, 23, 24]. Reports from West African sub-regions mainly eastern Nigeria [11] western Nigeria [12] and Ghana [13] showed the disease is not uncommon among Africans. Okafor [11] recorded a prevalence of 0.4% among eastern Nigerians, Ibekwe and Ijaduola [12] reported 0.22% among western Nigerians and Brobby [13] 0.32% among Ghanaians. The observed

Table 5 Vestibular results

	BPPV	Meniere's	Recurrent vestibulopathy	Cervical vertigo	VBI	Trauma to inner ear	Brain stem lesion	Psycho-genic	Unknown	Vestibular schwannoma	Total
Optokinetic tests											
Normal bilateral	27	20	20	18	1	5		2			93
Abnormal unilateral	1	2					2		2	1	8
Abnormal bilateral	1										1
Total	29	22	20	18	1	5	2	2	2	1	102
Gaze tests											
Normal bilateral	28	22	20	18		1		2	1	1	97
Abnormal unilateral	1						2		1		4
Abnormal bilateral					1						1
Total	29	22	20	18	1	1	2	2	2	1	102
Smooth pursuit tests											
Normal bilateral	28	21	20	18		5		2		1	95
Abnormal unilateral	1	1			1				2		5
Abnormal bilateral							2				2
Total	29	22	20	18	1	5	2	2	2	1	102
Saccade tests											
Normal bilateral	29	22	20	16		5		2			94
Abnormal unilateral				2	1					1	4
Abnormal bilateral							2		2		4
Total	29	22	20	18	1	5	2	2	2	1	102
Caloric tests											
Normal bilateral	15	3	15	16	1	3		2			55
Abnormal unilateral	14	15	5							1	35
Abnormal bilateral		4		2		2	2		2		12
Total	29	22	20	18	1	5	2	2	2	1	102

BPPV benign paroxysmal positional vertigo, *VBI* vertebrobasilar insufficiency

Table 6 Aetiology of vestibular disorders

	Frequency	Percent
Benign paroxysmal positional vertigo (BPPV)	29	28.4
Meniere's disease	22	21.6
Recurrent vestibulopathy	20	19.6
Cervical vertigo	18	17.6
Vestibular schwannoma	1	1.0
Vertebrobasilar insufficiency	1	1.0
Central vestibular disorder (vascular)	2	2.0
Psychogenic	2	2.0
Trauma to inner ear (post-trauma, drug induced and barotrauma)	5	4.9
Unknown	2	2
Total	102	100.0

prevalence in the West Africa sub-region is comparable to the Caucasians, which further confirms the non-rarity among Africans. Meniere's was reported with a better prognosis

with medical treatment among Africans when compared with Caucasians [11, 13]. Caffeine is methylxanthine, which is present in coffee, tea, soda beverage and chocolate and it is one of the most commonly consumed stimulant in temperate Europe and North America [25, 26]. Caffeine consumption has been linked to many human diseases in epidemiological studies [27]. The documented severity of episodes of vertiginous attacks in Meniere's disease in temperate Europe and North America has been ascribed to the high consumption of coffee and tea. Average intake of caffeine in USA and United Kingdom is between 170 and 200 mg per day [28]. Medline literature search did not reveal any scientific basis for these assumption further studies may shed light on this. Few of the patients experienced hearing loss in the affected ear few years before the onset of other symptoms of Meniere's diseases. It was reported that a large proportion of Meniere's patient (85%), were treated effectively with conservative management, anti-vertiginous drugs and surgery [29]. In our experience, hardly is surgery ever warranted in any of our patients as the disease hardly has untoward effect on daily activities of the patients.

A pathological degenerative change of the cervical spine has been documented to produce vertigo with some abnormality of VNG vestibular subsets and oculomotors subsets along with hearing impairment [14, 30]. Few of our patients were seen with mild sensorineural hearing loss, abnormal saccades and abnormal caloric tests. The pathophysiology of this vestibular disorder has been attributed to disorders of the cervical spine, the vertebral artery and the cardiovascular system [31]. Many of these patients were successfully managed with anti-inflammatory drugs, anti-vertiginous drugs and cervical collar support with resolution of their symptoms.

Recurrent vestibulopathy is not an uncommon disorder in our clinic, it is the third common peripheral disorder seen in our clinic and it accounts for 9.3% of tertiary hospital visits in Toronto Canada [21]. None of the reviewed literatures [9–17] in the sub-region recorded this vestibular disorder, this should not be taken to mean the disorder is non-existent or rare, most probably it is under diagnosed.

Two decades ago, chronic suppurative otitis media (CSOM) formed the bulk work of otolaryngological practice in the West African sub-region with its attendant complications [13, 32–34]. The advent of antibiotics brought in a change in this pattern and this is reflected in this report and others about the decline in the complications of CSOM among which is the circumscribe labyrinthitis [9, 35].

Central vestibular disorder is uncommon, vestibular insufficiency though commonly seen in elderly and in patients with vascular and hemodynamic abnormality like diabetes and hypertension is not a common cause of vertigo among our patients.

Three decades ago, post-traumatic vertigo accounted for the commonest cause of vertigo among young male Ugandans [8]. Post-traumatic vertigo resulting from labyrinthine concussion was seen in only three patients following a fall over a motorbike with resultant head injury. One expects a higher figure compared to what was recorded in this study since motorbike is a fast means of transportation among the low income people in Lagos metropolis and many ride without a protective crash helmet in defiance of the law. Many of the patients with severe head injury along with other intracranial complication do not make it to the hospital and the few that survive end up being treated by the neurosurgeon. This may account for the few recorded among other factors. Prevalent among general practitioner is the use of combination of procaine penicillin and streptomycin injections for infections generally, or gentamicin and metronidazole injections as a broad spectrum drug coverage for acute abdomen especially among the poor patients who cannot afford to pay for expensive antibiotics based on sensitivity pattern. The cochleotoxic complication arising from these drugs have been documented among Nigerians with little or no reports on the vestibulotoxic aspect [36–39]. Our patient with drug-induced vertigo presented with tinnitus,

dizziness and imbalance after receiving treatment in forms of injections (gentamicin and metronidazole) for abdominal pain by a general practitioner. The vestibulotoxic effect of gentamicin is well documented and there is no safe dose and no safe serum level to predict this toxic effect [40–42]. The best remedy is to withdraw the drug as soon as the symptoms of toxicity appear.

Barotraumas is a pressure-induced injury as a result of effect of pressure changes within the middle ear and inability of the Eustachian tube to equilibrate the pressure difference [43, 44]. This differential pressure can be transmitted to the round or oval window causing displacement into the labyrinth and sometimes rupture into the inner ear resulting in vestibular and auditory symptoms. The rupture sometimes occurs as micro fissures and non-visualizable leakage [43–45]. Barotraumas was recorded in one patient following an air travel.

Conclusion

Peripheral vestibular disorders are common of which BPPV is the most prevalent. Pre-referral anti-vertiginous medication is common among general practitioners. The practicing ORL/Head neck surgeon and orthopedic surgeons must be conversant with the tools of diagnosis, differential diagnosis and treatment.

Conflict of interest statement We the authors hereby state that there is no financial disclosure and no conflict of interest.

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