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ORIGINAL RESEARCH

Independent Predictors of Recurrence of Vertigo Among Nigerians

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Abstract

Background: Recurrence of vertigo indicates a morbidity to the patient and a dilemma for the managing physician.

Objectives: To describe the characteristics of vertigo, document prevalence and explore the characteristics which could independently predict recurrence of vertigo.

Methods: A cross-sectional study of patients managed for vertigo in a tertiary facility was retrospectively done. Patients' demographic and clinical characteristics, associations of vertigo, audiological symptoms, comorbid illnesses, and duration to achieve control of vertigo were recorded. Recurrence of vertigo was used to categorize the patients. The factors that were associated with recurrence on univariate analyses were evaluated as independent predictors of recurrence of vertigo.

Results: The 73 patients with a male-to-female ratio of 1:1.4 were aged 35 -78 (mean 56.6±9.9) years. The associated symptoms included body weakness (34.2%), audiological symptoms (38.4%), 27.4% had antecedent head and neck injury and vertigo was precipitated or aggravated by changes in the head and neck position in 63.0%. Vertigo was controlled within 1 -7 (Median 2) days, 35.6% had a recurrence of vertigo. Age, the experience of nausea and vomiting, previous head and neck injury, presence of comorbidity, and long duration to achieve control of vertigo were significantly associated with recurrence of vertigo. All these factors except the presence of comorbidity could independently predict the recurrence of vertigo.

Conclusion: Vertigo is common in adult females, and mostly positional in type. About a third of patients may have a recurrence of vertigo. Age, especially above 57 years, nausea and vomiting, head and neck injury and prolonged period to control vertigo may independently predict recurrence of vertigo.

Keywords: *Audiological symptoms, Dizziness, Head and neck injury, Recurrence, Vertigo.*

Introduction

Vertigo refers to an erroneous perception of self- or object-motion or an unpleasant distortion of static gravitational orientation, that is a result of a mismatch between vestibular, visual, and

somatosensory systems. [1] It can simply be described as a vestibular disorder of movement in which a person feels rotating relative to the environment or vice-versa. Vestibular vertigo accounts for about a quarter of dizziness complaints and has a 12-month prevalence of 5%

and an annual incidence of 1.4%. [2] Vertigo affects approximately 20-30% of the general population, and its prevalence rises with age with a peak between 50 and 60 years. [3] The prevalence of vestibular disorders among elderly patients was reported as 18.6% in a suburban region in Nigeria. [4]

The common types of vestibular disorders are benign paroxysmal positional vertigo (BPPV), Meniere's disease, and vestibular neuronitis. [5] The clinical characteristics and modalities of presentations of these disorders differ. The management of vertigo can be challenging because symptoms are often non-specific and may reflect different or multiple aetiologies. [6] The management is multidisciplinary; depending on the aetiology, it may involve the otologist, neurologist, physiotherapist and sometimes, the clinical psychologist. Vertigo is often controlled effectively provided the appropriate treatments are instituted in time. Failure or short-comings in any of these steps may result in the recurrence of vertigo.

Recurrent vertigo is described as the reappearance of vertiginous attacks, after at least two weeks from the execution of effective control of a previous vertigo case. [7] Recurrent vertigo often poses a challenge to the managing team because the aetiopathophysiology of the recurrence must be discovered before an effective treatment can be provided. There had been reports of some unusual causes of recurrent vertigo-like cerebellar arteriovenous malformation, [8] pneumolabyrinth from trauma to the stapes, [9] and iridodonesis. [10] Studies have also reported recurrent vertigo resulting from cardiovascular, endocrine, psychiatric and other systemic diseases like hypertension, and dyslipidaemia. [11] Recurrences of vertigo also occur in the more common peripheral vestibular disorders. For instance, BPPV often relapses after the first episode, with a recurrence rate between 15% and

50%, while 26.0% recurrence has been reported for vestibular neuronitis. [12] Recurrent vertigo co-existing with other pathologies portends higher morbidity to the patient. Hypertensive patients with recurrent vertigo have higher stroke mortality. [13] It will be medically beneficial to estimate the probability of recurrence of an episode of vertigo, by exploring clinical factors that may be pointers to such.

The study objectives were to describe the common characteristics of vertigo, describe the prevalence of recurrence, and explore the characteristics which could independently predict the recurrence of vertigo. This will be important for the prevention of recurrence and prognostication of every vertiginous attack.

Methods

The study is a retrospective, cross-sectional study conducted in the Ear Nose Throat Department of Olabisi Onabanjo University Teaching Hospital, Sagamu, south-west Nigeria, a tertiary hospital in south-western Nigeria. The study subjects were patients diagnosed and managed for vertigo from January 2015 to December 2019. Vertigo was defined as a feeling of rotation of the subject relative to the environment or vice-versa. The patients' medical records were recovered from the Medical Records department of the hospital after a search conducted at the clinic, emergency room and wards admission registers to determine eligible subjects for the study.

Patients' information retrieved from the case record charts included demographic characteristics like age, sex, clinical characteristics including a description of vertigo, duration of symptoms before presentation, other symptoms associated with vertigo, audiological symptoms, precipitating and aggravating factors, antecedent trauma to the ear, head and neck region, presence of co-morbid illnesses, and

duration to achieve control of vertigo. Patients with recurrence of vertigo were noted; for such patients, the characteristics recorded were those of prior admission before the recurrence.

All the patients received labyrinthine sedatives to control vertigo. Other treatments offered to the patients depended on the assumed cause of vertigo or its recurrence; therefore, those with suspected BPPV had canalith repositioning procedures (Epley manoeuvre), and vestibular rehabilitation. Patients with suspected Meniere's disease or syndrome had diuretics and were advised to reduce dietary sodium intake; anxious patients and those with alleged panic attacks had tranquillizers and sedatives, while those with suspected neurological disorders were referred to neurologists for evaluation.

The information was recorded in a proforma and transferred to the computer to constitute data for the study. Patients with other forms of imbalance not meeting the definition of vertigo were excluded. Data of patients with missing or inadequate vital information were also excluded. The study protocol was approved by the hospital's Health Research Ethics Committee (HREC) with approval number 342/2020AP. The study was conducted in accordance with the principles of research on human subjects as detailed in the Helsinki declaration.

Appropriate descriptive statistics were utilized to summarize the data. Kolmogorov-Smirnov test was used to check for normality of distribution of continuous variables. Patients were categorized into two groups, based on the recurrence of vertigo as Non-recurrent or Recurrent vertigo. Differences in the categorical variables between the two categories of patients were explored with the Chi-Square test, while independent samples

t-test was used to compare continuous variables. The factors that were statistically significant at univariate analyses between the two groups of patients were evaluated as possible independent predictors of recurrence of vertigo by using multivariate logistic regression analyses. Recurrence of vertigo was treated as the outcome variable and each of the factors as the independent predictors. The statistical analysis was performed using IBM SPSS version 21.0 (Chicago, IL), software and the level of significance was set at $p < 0.05$ for all tests.

Results

There were 73 patients with adequate information for data analyses; these comprised 30 (41.1%) males and 43 (58.9%) females giving a male-to-female ratio of 1:1.4. The age ranged from 35 to 78 years; the mean age was 56.6 ± 9.9 years. The distribution of the age groups according to the sex of the patients is shown in Figure 1.

The major symptoms associated with vertigo included body weakness (25; 34.2%), and experience of audiological symptoms such as hearing loss, tinnitus or blockage of the ears (28; 38.4%). Twenty patients (27.4%) had antecedent head and neck injury; vertigo was precipitated or aggravated by changes in the head and neck position in 46 (63.0%) patients while 47 (64.4%) had at least one chronic (comorbid) illness. The duration to achieve control of vertigo ranged from 1 to 7 days, (median: 2 days). Twenty-six (35.6%) patients had a recurrence of vertigo. The details of the demographic and clinical characteristics of the patients are shown in Table I.

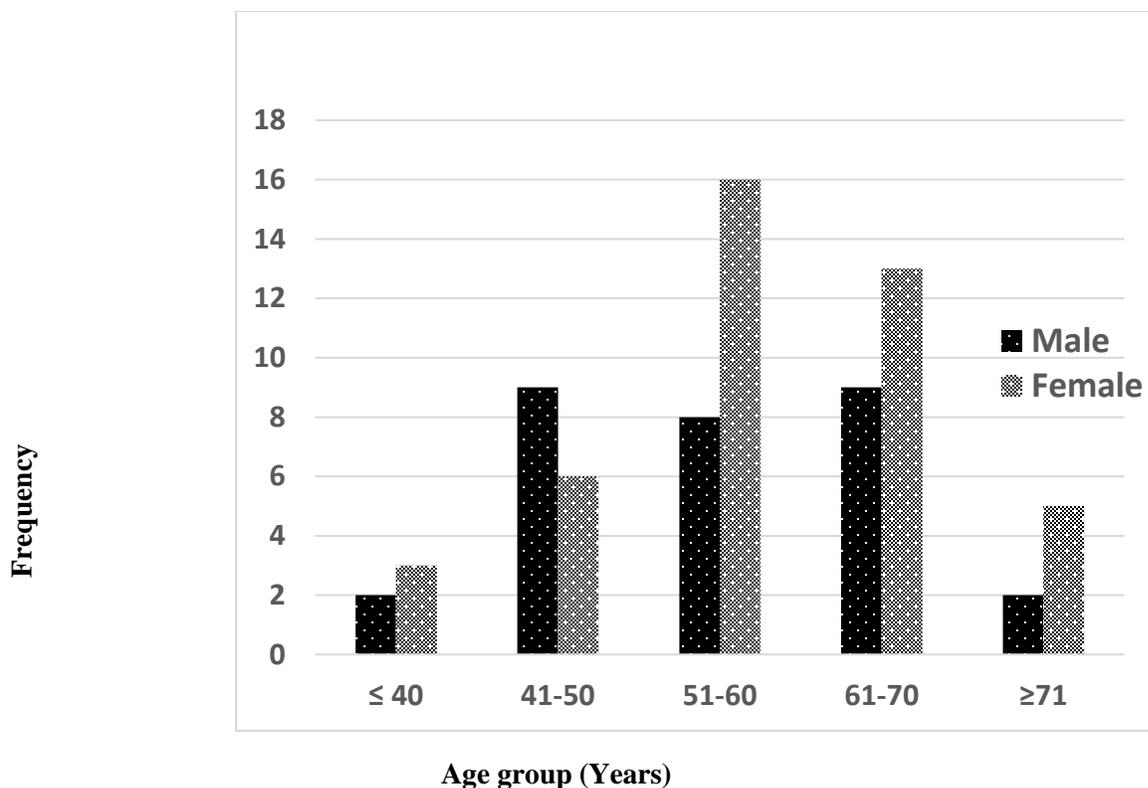


Figure 1: Age group distribution by sex of patients

Table I: Clinical characteristics of patients

Parameter	Frequency	Percentage
Major associated symptoms		
Hearing and Tinnitus	28	38.4
Body weakness	25	34.2
Anxiety and fear	20	27.4
Nausea and vomiting	17	23.3
Antecedents		
Head and neck injury	20	27.4
Ear injury	17	23.3
Precipitating factors		
Change in head and neck position	46	63.0
Stress/Strenuous exercise	12	16.4
Hypoglycaemia	9	12.3
Acute ear trauma/slap	5	6.8
Recurrence	26	35.6
Co-morbidities		
Hypertension	22	30.1
Diabetes	16	21.9
Osteoarthritis	9	12.3

The demographic and clinical characteristics of the patients were depicted as the factors compared between the two categories of patients (Non-recurrent versus Recurrent vertigo) in Table II. There were statistically significant differences in the age and age distribution about the median (of 57 years) between the two patient categories. The duration to achieve control of

vertigo was also distributed about the median of 2 days (range of 1-7 days) with short duration denoting ≤ 2 days and long duration > 2 days. Experience of nausea and vomiting, previous head and neck injury, and presence of at least one chronic illness (comorbidity), and long duration to achieve control of vertigo were significantly different between the two categories of patients.

Table II: Factors associated with Recurrence of vertigo

Parameter	Vertigo recurrence		Statistics	
	No (%)	Yes (%)		<i>p-value</i>
Mean \pm SD (Years)	52.5 \pm 8.7	63.9 \pm 7.6	5.580	<0.001
Age >57 years	12 (25.5)	22 (84.6)	23.485	<0.001
Sex (Female)	27 (57.4)	16 (61.5)	0.116	0.734
Associated nausea and vomiting	5 (10.6)	12 (46.2)	11.819	0.001
Associated hearing loss and tinnitus	16 (34.0)	12 (46.2)	1.038	0.308
Previous head and neck injury	7 (14.9)	13 (50.0)	10.372	0.001
Previous ear injury	14 (29.8)	3 (11.5)	3.121	0.077
Presence of co-morbidity	23 (48.9)	24 (92.3)	13.732	<0.001
Vertigo control > 2 days	7 (14.9)	18 (69.2)	21.949	<0.001

The factors that were significantly different between the two categories of patients were analysed as possible independent predictors of recurrence of vertigo in the multivariate logistic regression analyses in Table III. Although there was no significant difference in sex between the two categories of patients, sex was included in

the logistic regression equation as a possible confounder. [14] Age, the experience of nausea and vomiting, previous head and neck injury and prolonged duration to control vertigo were independent predictors of recurrent vertigo. The presence of comorbidity did not independently predict the recurrence of vertigo.

Table III: Independent predictors of recurrence of vertigo*

Parameter	Odds Ratio	95% Confidence Interval	<i>p-value</i>
Age >57 years	0.086	0.014-0.528	0.008
Associated nausea and vomiting	0.097	0.013-0.742	0.025
Previous head and injury	0.069	0.009-0.560	0.012
Co-morbidity	0.707	0.083-6.056	0.752
Vertigo control >2 days	0.079	0.012-0.511	0.008

*Multivariate logistic regression analyses, adjusted for sex

Discussion

Balance disorders remain one of the common problems that Otolaryngologists will manage in their practice. While vertigo has been noted to occur in all age groups, it is particularly common from 50 to 70 years old. [15] In the present study, the age group of 51-60 years had the highest proportion of 32.9% among patients with vertigo. While few children were managed for complaints related to maintenance of balance in the facility, they did not meet the operational definition of vertigo applied in this study, thus, their data were excluded. It is possible we did not evaluate the patients thoroughly as it was stated that BPPV is a relatively common cause of dizziness in the paediatric population. [16] In tandem with other studies, [14, 15] we found that the prevalence of vertigo increased with age. There were also more females with vertigo in this study with a male-to-female ratio of 1: 1.4. Other studies had reported ratios ranging from 1 to 1.5-2.6. [16, 17]

Close to two-thirds (63.0%) of the patients in this cohort had precipitating or aggravating factor of change in the position of the head and neck suggesting positional vertigo. BPPV is the most common cause of vertigo. [18] However, different pathologies including Meniere's disease, vestibular neuronitis and vestibular schwannoma can present as vertigo. [5,15] Therefore, thorough clinical evaluation, particularly vertigo history and physical examination, are crucial to making an appropriate diagnosis. The common causes of vertigo in our patients were BPPV, Meniere's syndrome and head and neck trauma. Correct diagnosis enhances appropriate intervention and resolution of vertigo. [19] While the resolution of vertigos appears to be common, recurrence can occur for various reasons. Recurrent attack of vertigo has been reported to be usually milder than that of the previous attack, [12] but it can be

associated with fear, anxiety and psychological distress. [20] More than a quarter (27.4%) of the patients in the present study experienced fear and anxiety, while many (34.2%) also reported generalized body weakness. The managing physician will need to ascertain the cause and institute management of the recurrence. The recurrence rate of vertigo varies between causes, ages and gender. Choi *et al.* [7] reported that recurrence of BPPV occurs in about 20%-50% of cases. Clinical patterns characterized by frequent recurrence have been described in the literature as 'atypical' vertigo. [21] The recurrence rate of 35.6% found in this study implies that every one of three persons that present with vertigo will likely experience a recurrence. Therefore, it is instructive to ascertain the factors that could be associated with such from the outset.

A higher prevalence of recurrent vertigo has been reported with increasing age, epitomized in older patients. [14] Accordingly, it has been asserted that older patients respond less effectively to the treatment of vertigo and have a tendency for recurrence. [22] A previous study had recorded a prevalence rate of 45.6% for recurrent vertigo among elderly (>60 years) patients, [4] against the rate of 35.6% found in the present study. Increased age, especially above 57 years, was significantly associated with recurrent vertigo in the present study. Picciotti *et al.*, [14] and Babec *et al.* [23] had similarly reported an increased recurrence rate of positional vertigo among elderly people, in large-scale populations. On the contrary, Perez *et al.* [24] reported no significant difference after stratification of the recurrence rate of vertigo according to age.

There have also been reports of associations of recurrent vertigo with the female gender. [14] There was no significant difference in terms of gender between patients with or without recurrence of vertigo in the present study. This

may be peculiar to our patient cohort. However, other authors did not report significant differences in the recurrence rate according to sex. [24, 25] Similarly, there were no differences in terms of recurrence about the experience of audiological symptoms like tinnitus, hearing impairment, and ear blockage, nor with previous injuries to the ears in this study. While some forms of vertigo-like Meniere's disease can present with associated audiological symptoms, other ailments could also present with such symptoms. It has been noted that the noise level in the environment is relatively high, [26] and attendant noise-induced hearing loss can present with audiological symptoms. Presbycusis, another condition that could present with audiological symptoms, has been noted to commence at earlier ages about the fifth decade in the environment. [27] Therefore, audiological symptoms may be a less specific parameter associated with vertigo or its recurrence among our patients. Most of the patients with ear trauma had physical non-explosive ear trauma sometimes associated with single episodes of vertigo. [28]

Vertigo is a common symptom in patients who sustained trauma to the head and neck region that resulted from motor vehicle accidents, falls, assaults, and contact sports. [29] Sometimes, the trauma was minor head traumas which occurred a fairly long time before the onset of vertigo. [30] Consequently, some patients would not remember nor volunteer history of such traumatic experience at the time of presentation. The history was often given after vertigo had been controlled and the patient had the frame of mind to recapitulate previous experiences. Clinical and microscopic findings in such patients could be posttraumatic otoconial detachment, related to microscopic haemorrhages, or 'tissue shearing,' resulting in biochemical changes that enhance the formation of 'resistant' otoconial clots. [14] In patients with previous head and neck trauma, an increase of

persistence rate is reported as it is more difficult to obtain complete recovery [7, 24] and they are prone to recurrence of vertigo. [31] In the present study, significantly more patients with previous head and neck trauma had a recurrence of vertigo.

Nausea and vomiting are symptoms associated with many ailments including vestibular diseases and irritation. Chronic vestibular dysfunction is an unappreciated cause of nausea and vomiting and it may connote more serious pathology. [32] Experience of associated nausea and vomiting by the patients was significantly associated with recurrence of vertigo in this study. Many patients with vertigo had other chronic (comorbid) diseases. In the present study, 92.3% of the patients with recurrence of vertigo had comorbid illnesses against 48.9% of those without recurrence. This is similar to the findings of Picciotti, *et al.* who reported that comorbidities were present in 72.6% of their subjects with recurrent BPPV against 48.9% of patients with no recurrence. [14] The common comorbid illnesses found among the patients in the present study included diabetes mellitus, hypertension, osteoarthritis, and sickle cell disease. Studies have also reported an association between comorbidities and recurrence of vertigo, and some patients had multiple comorbidities. [14, 33] However, the effect of multiple comorbidities on the recurrence of vertigo was not explored in this study.

Generally, severe vertigo which causes static imbalance, resolves in an average of two to three days in 70% of patients, although it may last for more than two weeks in 4% of patients. [34] Most (65.7%) of the patients with vertigo in the present study were controlled within two days of intervention. Further period to achieve control was regarded as prolonged or poor response to therapy. A longer duration to control vertigo (more than two days) was found to be significantly associated with recurrence in the

present study. A longer duration of vertigo before treatment has also been reported to be a risk factor associated with the need for multiple canal repositioning procedures in BPPV. [35]

Predicting recurrence for every episode of vertigo could be of prognostic importance, thus determination of such independent predictors may moderate the possibility of recurrence. There is no consensus in the literature about risk factors or predictors of recurrence of vertigo. [14] All of the clinical factors that were significantly associated with the recurrence of vertigo in the present study, except comorbidity, were also found to be its independent predictors. This study, therefore, hypothesizes that, provided the comorbidity is effectively managed and controlled, its effects on recurrence of vertigo is ameliorated and may be close to that of subjects without comorbidity.

Few limitations were noted in the present study. The relatively small sample size might reduce the scientific power of the study. The use of patients' case charts as the only source of data was a limitation. Monitoring or follow-up of the patients via other means like telephone conversations could have detected more recurrences of vertigo among the patients. Some patients could have a recurrence of vertigo and present at other health facilities for management. Therefore, this study could have inadvertently recorded lower recurrence rates. These limitations might, however, not negate the validity of this study. Nevertheless, this study recommends a prospective, cross-sectional study on this subject to prevent the known limitations of a retrospective study.

Conclusion

Vertigo is common among adult females, especially around the sixth decade of life, and is mostly positional in type. About a third of

patients had recurrences of vertigo, which were associated with increased age, especially above 57 years, nausea and vomiting, head and neck injury, comorbidity and a prolonged period before vertigo could be controlled. All these factors, except comorbidity, could independently predict the recurrence of vertigo. The identification of any of these predictors in a patient with vertigo behoves closer monitoring and evaluation on the managing physician, to prevent a recurrence. It may require more frequent follow-up in a specialized and dedicated vertigo clinic, that is multi-specialist in operation.

Authors' Contributions: SOA conceptualized and designed the study, collected and analysed data and drafted the manuscript. OEA participated in study design and reviewed the manuscript for important intellectual content. Both authors approved the final version of the manuscript.

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