Published in final edited form as:
Ear Nose Throat J. 2014 ; 93(0): E37–E44.

PREVALENCE, CLINICAL AND LIFE-STYLE CORRELATE OF DIZZINESS AMONG THE COMMUNITY ELDERLY FROM THE IBADAN STUDY OF AGEING

Akeem O Lasisi, MBChB, FWACS, FMCORL [Senior Lecturer] and
Department of Otorhinolaryngology, University of Ibadan

Oye Gureje, MBBS, PhD, DSc [Professor]
Department of Psychiatry, University of Ibadan

Abstract

Dizziness has been reported to be preponderant among the elderly people, however, little is known about the prevalence and risk factors in the sub Saharan population.

This longitudinal cohort study determines the prevalence of dizziness and the clinical and socio-epidemiological correlates in elderly persons residing in the Yoruba-speaking areas of Nigeria.

Dizziness was reported 318/1299, representing a prevalence of 24.6%. They were made up of 197(58.5%) females and 121(41.5%) males, 39 (27.6%) were in the 65-69 years age range, 91 in the 70-74years age range, 66(26.8%) in the 75-79 years and 122(45.5%) were above 80 years. The majority of the subjects (253/318) (%) lived in rural-sub-urban, with no formal education in (172/318) (%) and more than two-third (213/318) were of low economic status.

Balance test conducted in 1, 006 elderly subjects revealed poor balance (mean balance test score <3.3) in 93/250(37.2%) subjects with dizziness and 189/756(25%) subjects without dizziness(P=0.01). Logistic regression adjusting for age and gender revealed that the odds for poor balance were 1.5 times greater in elderly with dizziness.

Low economic status (P=0.05) and smoking (P=0.01) were found to be significant in univariate analysis while logistic regression revealed smoking(OR=1.51, CI=1.17-1.95, P=0.01) and gender(OR=0.77, CI=0.59-0.99, P=0.05) as significant correlate of dizziness while none of age, residence or educational level was significant.

Significant clinical correlates in the experience of dizziness included self report of suppurative otitis media (OR =2.07, CI=1.21- 3.52, P=0.01), head injury (OR=2.41, CI=1.61-3.61, P=0.00), recurrent rhinosinusitis (OR=2.97, CI=2.05-4.29,P=0.00), current hypertension(OR=1.43, CI=1.03-2.00, P=0.03) and transient ischemic attack(OR=1.97, CI=1.19-3.23, P=0.01), while diabetes mellitus(OR=1.50, CI= 0.83- 2.71, P= 0.18) was not.

The high incidence of dizziness among the community elderly and significant correlation with remediable medical conditions further suggest need for policy formulation for the care of the elderly in Nigeria.

Correspondence: Dr A O Lasisi, Senior Lecturer, Department of Otorhinolaryngology, College of Medicine, University of Ibadan, Postal: PO Box 22040, University of Ibadan, Ibadan, Nigeria, akeemlasisi@gmail.com, Telephone: 2348055369593.

Europe PMC Funders Author Manuscripts

Keywords

Elderly; Dizziness; Prevalence; lifestyle correlate; clinical correlates

Europe PMC Funders Author Manuscripts

INTRODUCTION

Dizziness is a nonspecific term often used by patients to describe symptoms ranging from feeling of light – headedness to instability and it has been reported to be the most frequent symptom in people aged over 75 years who visited their family physician in the United States in 1985[1, 2]. The prevalence of dizziness in the general population ranges from 20 to 30% [1] and it has been demonstrated that with every 5 years of age increase, there is a 10% increase in the probability of suffering from dizziness [2]. A population-based study estimated that 7.5 million patients with dizziness are examined in the ambulatory care setting in the United States each year and it is associated with functional disability in about 10-20% of sufferers [3-6]. Dizziness is used to describe many different sensations and can be classified into 4 groups: vertigo, which is an illusion of movement, either of the person or the visual surround, dysequilibrium without vertigo, presyncope (near-faint), and psycho-physiologic dizziness, which is often associated with anxiety and panic[4-9]. In the developing countries like Nigeria, poor access to medical service may mean that medical conditions that could otherwise be promptly treated may become chronic and therefore predispose to hearing impairment. As such chronic medical conditions like hypertension or diabetes may become uncontrolled and complicated hence predispose to dizziness through the occurrence of chronic arthrosclerosis which in turn causes a reduction in the blood supply to the inner ear 4-6. In addition it is also plausible to speculate that the presence of chronic recurrent rhinosinusitis and chronic ear discharge might predispose to dizziness in the elderly. In this report, dizziness was assessed based on an affirmative response to question about “feeling of illusion of movement, either of the person or the visual surround, dysequilibrium or near-faint in the last one month. We provide data on the community prevalence as well as correlates of dizziness among community-dwelling elderly persons in Nigeria. To our knowledge, no previous report of the epidemiology of dizziness has been made from sub – Saharan Africa.

METHODOLOGY

The Ibadan Study of Aging (ISA) is a longitudinal cohort study of the mental and physical health status as well as the functioning and disability of elderly persons (aged 65 years and over) residing in the Yoruba-speaking areas of Nigeria, consisting of eight contiguous states in the south-western and north-central regions (Lagos, Ogun, Osun, Oyo, Ondo, Ekiti, Kogi and Kwara). These states account for about 22% of the Nigerian population (approximately, 25 million people). The baseline survey was conducted between November 2003 and August 2004 and the methodology has been described in full elsewhere [10, 11] and only a brief summary is provided here. Respondents were selected using a multi-stage stratified area probability sampling of households. In households with more than one eligible person (aged 65 years and fluent in the language of the study, Yoruba), the Kish table selection method

was used to select one respondent[12]. Face-to face interviews were carried out on 2152 respondents who provided consent to participate, representing a response rate of 74.2%.

An annual three-wave follow-up of the cohort was begun in 2007. Self-report of the experience of dizziness was obtained during the second wave in 2008. The sample in 2008 consisted of 1387 surviving respondents from the previous wave. Of these, 1190 (86%) were successfully interviewed. The majority of those not interviewed had either relocated, too sick to be interviewed or could not be found after multiple calls. Refusals were less than 1%.

Measures

Using standardized protocols administered by trained interviewers, self-report of several health conditions was obtained in face-to-face assessments. This consisted of a checklist of chronic physical and pain conditions [13]. Respondents were asked " if they have feeling of illusion of movement, either of the person or the visual surround, dysequilibrium or near-faint in the last one month. In addition, they were asked if they had been told by a physician that they had diabetes or hypertension. The Rose Angina Questionnaire [14] was used to assess presence of angina. Questions were asked about the current experience of dizziness. Respondents were asked "Within the last one month, have you experienced feeling of light headedness or turning round the environment or the environment rotating round you". A positive response was taken as experience of dizziness within the last one month to the time of interview. Respondents were also asked if they had experienced any of the following: a) "any previous head injury"; b) "recurrent pus discharge from the ear in the past"; and c) "recurrent nasal congestion and rhinorrhoea". Similarly, questions were asked "if respondents used to drink alcohol or smoke cigarette in the past". Respondents were required to give a yes or no answer to each of these questions.

All the respondents had balance examination. Static balance tests were conducted about 1-2hours after the interview by trained assistants who were not the interviewers. The test was evaluated in three separate and progressively more difficult tests which formed part of the Short Physical Performance Battery [15] Participants were ineligible for the tests if it became clear after interview that they were too unsteady on their feet; if they found it painful to stand; or if either the assistants or the participants considered the test unsafe. The tests were demonstrated and the participants were asked to wear appropriate (flat) shoes. The assistant who conducted the test was permitted to help the participants get into position and then stood by in case they began to fall or lose their balance.

Side – to- side tandem: With eyes open, the subject stand with the feet placed directly in side-to-side for 10 seconds, scores ranged from 0 point to maximum of 2 points. Semi-Tandem: With eye open, the subject stand with the heel of 1 foot placed to the side of the 1st toe of the opposite foot for 10 seconds, scores ranged from 0 point to maximum of 2 points. Full tandem: With eyes open, the subject stand with heel of one foot was placed directly in front of the other foot for 10 seconds. Swaying out of position was taken as not being able to do it which scored zero. The scores ranged from 0 point to maximum of 3 points, making a maximum total score of 7 points.

Europe PMC Funders Author Manuscripts

The diagnoses of recurrent suppurative otitis media and recurrent rhinosinusitis were made based on positive response to the questions “b” and “c” respectively.

The survey was approved by the University of Ibadan/University College Hospital, Ibadan Joint Ethical Review Board.

Data analysis

We present the unweighted estimates of the occurrence of dizziness. Univariate analysis was used to determine the significance of the differences in the occurrence of the demographic and clinical variables between the subjects with and without dizziness. The balance test score was calculated for each subject and the final score was dichotomised into those with mean score <3.3 (poor balance) and those who scored >3.3 (good balance).

Associations of dizziness with imbalance, socio-economic variables and comorbid conditions were explored using logistic regression and the results are presented as odds ratios (ORs) with 95% confidence intervals. Economic status was assessed by taking an inventory of household and personal items such as chairs, clock, bucket, radio, television set, fans, stove or cooker, car, telephone, etc. The list was composed of 21 such items. This is a standard and validated method of estimating economic wealth of elderly persons in low income settings. [7] Respondents’ economic status was categorized by relating each respondent’s total possessions to the median number of possessions of the entire sample. Thus, economic status is rated low if its ratio to the median is 0.5 or less, low-average if the ratio is 0.5 – 1.0, high-average if it is 1.0 – 2.0, and high if it is over 2.0. Residence was classified as rural (less than 12,000 households), semi-urban (12,000 – 20,000 households) and urban (greater than 20,000 households). The odds for the occurrence of variables were determined with multivariate analysis. The clinical correlates were explored with logistic regression analysis after adjusting for age [16] and the estimates of standard errors of the Odds Ratio (OR’s) obtained were made with the STATA. All of the confidence intervals reported are adjusted for design effects. In order to take account of the sample design, we used the jackknife replication method implemented with the STATA statistical package to estimate standard errors for the means and proportions. [17]Statistical significance was set at 0.05 in two-sided tests.

RESULT

The sample consisted of 1299 subjects made up of 748 (58.6%) females and 551(42.4%) males with the mean age of 77.3years (SD=6.3). Of these, more than half belonged to low economic group, 999(76.9%) resided in rural-suburban area and about one-quarter had no formal education, table 1.

Dizziness was reported in 318, representing a prevalence of 24.6%. Balance test conducted in 1, 006 elderly subjects revealed that there was good (mean balance test score was >3.3) in 724/1006(72.0%) while it was poor (mean balance test score >3.3) in 282/1006(28.0%); consisting of 93/250(37.2%) subjects with dizziness and 189/756(25%) subjects without dizziness. Univariate analysis comparing subjects with dizziness and those without reveal that imbalance was significantly associated with report of dizziness (P=0.01). Further

logistic regression adjusting for age and gender revealed (OR=1.5, CI=1.08-2.05, P=0.01) that the odds for imbalance were 1.5 times greater in elderly with dizziness than those without.

Table 2 shows the sociodemographic and clinical variables among the 318 elderly persons with dizziness. They were made up of 197(58.5%) females and 121(41.5%) males, 39 (27.6%) were in the 65-69 years age range, 91 in the 70-74years age range, 66(26.8%) in the 75-79 years and 122(45.5%) above 80 years. The majority of the subjects with dizziness 253/318(79.6%) lived in rural-sub-urban, with no formal education in 172/318 (54.1%) and more than two-third 213/318 (67.0%) were of low economic status.

Univariate analysis comparing socioeconomic and lifestyle correlates between elderly with and without dizziness revealed economic status (P=0.05) and smoking(P=0.01) as significant correlates of dizziness while none of age (P=0.71), sex (P=0.07), residence(P=0.34), educational level (P=0.74) or alcohol consumption(P=0.28) was significant.

However, the clinical factors were of more importance in the experience of dizziness. Suppurative otitis media (P=0.01), Head injury (P=0.00), Recurrent rhinosinusitis (P=0.00), Transient ischemic attack (P=0.01) and Hypertension (P=0.04) emerged to be significant clinical correlates while Diabetes mellitus (P=0.19) was not, table 3.

Logistic regression analysis of the demographic and lifestyle correlates, after adjusting for age and gender, table 4, still showed that cigarette smoking(OR=1.5, CI=1.17-1.95, P=0.01) conferred 1.5 odds to the risk of dizziness. The gender was also found to be significant, showing that males are less likely to report dizziness (OR=0.8, CI=0.59-0.99, P=0.05) while the other epidemiologic and lifestyle correlates such as age, sex, residence, educational level or economic status was significant were not. Table 5 shows the logistic regression analysis of the clinical correlates after adjusting for age and gender. It revealed that report of suppurative otitis media (OR=2.1, CI=1.21- 3.52, P=0.01), head injury (OR=2.4, CI=1.61-3.61, P=0.00), recurrent rhinosinusitis (OR=3.0, CI=2.05-4.29,P=0.010), hypertension(OR=1.43, CI=1.03-2.00, P=0.03), and transient ischemic attack(OR=2.0, CI=1.19-3.23, P=0.01) were significant clinical correlates of dizziness, while diabetes mellitus(OR=1.5, CI= 0.83-2.71, P= 0.18) was not.

DISCUSSION

In this report, we have provided estimates of dizziness among community-dwelling elderly persons in a sub-Saharan African country. The prevalence of 24.6% found in this study suggests that dizziness is a common problem among the elderly population in Nigeria. Also, we found gender to be significant on logistic regression analysis with preponderance of dizziness in women. Even though the report of dizziness increased with age, it was not found to be significant correlates of dizziness. Our findings are similar to those by Colledge et al [18] who reported a prevalence of 30% in their sample, although they found a non-significant predominance among females and with increasing age. In general, the prevalence of dizziness in this population is within the range previously reported by most workers. For

example, Gassmann and Rupprecht [19] and Neuhauser [20] reported community prevalence of 27% and 24% respectively, in participants aged 70 years and younger. However, Steven et al [21] reported a much lower prevalence of 11.1% and did not find association with age, gender or wealth similar to this study. The present study found economic status significant in univariate analysis, although the result showed preponderance of subjects having dizziness in the lower education it did not find education significant. This is in contrast to a previous study which found association between educational level and self-reported vertigo or dizziness in univariate but not in multivariate analysis [21]. The association between poor balance and wealth has been explained to mean decline in disability as the socio-economic status increases.[22, 23] Major additions to the literature were the clinical correlates of dizziness. This study found chronic recurrent rhinosinusitis, previous suppurative otitis media, head injury, transient ischemic attack and hypertension to be significant correlates. Although, it is difficult to ascertain the direction of causality, we formed the impression that these clinical correlates predated the onset of dizziness in a great majority of the cases, suggesting they were risk factors. The preponderance of chronic rhinosinusitis might suggest a viral infection of the sinuses and upper respiratory tract, reminiscent of the viral prodrome which could be present in vestibular neuronitis[4, 24]. Vestibular neuronitis has been described as an acute peripheral vestibular dysfunction syndrome characterized by a rapid onset of severe vertigo, nausea, vomiting, and gait instability [24]. The vertigo often lasted for days to weeks, which might distinguish vestibular neuronitis from other forms of peripheral vertigo and is usually associated with a viral prodrome. However, there were multitude of potential causes for dizziness in this age group such as benign positional paroxysmal vertigo with a reported peak age of onset in the sixth decade [23, 25], cerebro-vascular disorders [23-25], multiple neuro-sensory impairments[24, 26] and psychological factors[27]. Drugs were also frequently cited as a cause of dizziness, [28-30] but a previous study found that although cardiovascular medications were associated with dizziness, apparent associations with other drugs were abolished by multivariate analysis [31]. Even though many of our respondents were on medications, most were obtained over the counter and generally difficult to identify by name. We therefore have no information about exposure to medications in this population.

Nolan [32] reported that many of the patients with head injury would suffer from a problem known as post-concussion syndrome which includes dizziness among other symptoms. It was reported that these problems might arise days or months to even years after the initial head injury. It was thought to be psychological in origin, presently, the physiologic basis has been established, hence require treatment and rehabilitation [33].

The occurrence of dizziness following otitis media has been explained by three theories. One of the theories was that of imbalance in afferent vestibular input in middle ear effusions [34-37]. The second theory was related to serous or toxic labyrinthitis which has been suggested as a possible cause of vestibular dysfunction during episodes of acute otitis media (AOM). Animal study has showed that exotoxin left on the round window causes labyrinthitis [38]. Ben-David et al [39] studied children with OME with no history of episodes of AOM and otalgia by craniocorpography and rotatory chair testing and suggested that a history of dysequilibrium and dizziness in patients with OME could be related to episodes of AOM that might cause a mild serous labyrinthitis. The third theory was pressure

changes in the tympanic cavity. According to this theory, the pressure changes could cause displacement of the round window membrane, leading to secondary perilymphatic movement [40]. Grace and Pfleiderer [35] have mentioned that these changes of the middle ear pressure could result in imbalance in posture.

Steven et al [21] found that dizziness were significantly associated with an abnormal heart rhythm (OR = 1.85) and Colledge et al [18] reported that dizziness was significantly associated with angina and previous myocardial infarction ($p < 0.001$) and antihypertensive therapy ($p < 0.05$). In a similar vein, Cloutier and Saliba [41] and others has linked vertigo of vascular origin to migraine, transient ischemic attacks, and ischemic or hemorrhagic stroke [4-9, 17, 19]. This study did not find diabetes mellitus to be significant similar to Colledge et al [18] and others. One major finding of our study was the significant association between dizziness and smoking. This could be explained by the fact that smoking has been reported to adversely affect the vascular supply of the inner ear thus predisposing to dizziness among other inner ear symptoms. [21, 42, 43]

Similar to other studies [1-5], we did not find alcohol to be significant risk factors. In the work of Steven et al [21] those who drink more alcohol seem to be at lower risk of balance problems, which supports findings about alcohol consumption and disability in older people [42, 43], but it was possible that those who experience balance problems reduced their alcohol consumption because they thought, or at least feared, that it could exacerbate those problems.

Finally, we found significant association of dizziness with poor balance.This could be due to common aetiological factors of both conditions. And this might suggest possible common interventions to improve both dizziness and balance, hence, reduce the risk of falls. However, this study did not examine the socioepidemiological risk factors of poor balance.

To our knowledge, this is the first large-scale population-based study in sub-Saharan Africa to examine the socio-demographic and lifestyle risk factors and clinical correlates of dizziness in non-disabled older people. We relied on self-reported dizziness similar to previous workers [1-8]. We found dizziness to be a common problem among the elderly and to be often associated with remediable medical conditions that may have causal associations. The severity of the dizziness in this elderly population suggests the need for further study on the effect on the quality of life of these people. This has implication for the development of policy for the care of the elderly in Nigeria and other developing countries.

Acknowledgement

The Ibadan Study of Ageing is funded by the Wellcome Trust. The Wellcome Trust is not involved in the collection analysis or interpretation of data presented in this report.

REFERENCES

1. Chawla N, Olshaker JS. Diagnosis and management of dizziness and vertigo. Med Clin North Am. 2006; 90:291–304. [PubMed: 16448876]
2. Baloh RW. Clinical practice. Vestibular neuritis. N Engl J Med. 1998; 339:680. [PubMed: 9725927]
3. Baloh RW. Stroke and vertigo. Cerebrovatc Dis. 1992; 2:3–10.

4. Baloh RW. Vertigo in older people. Curr Treat Options Neurol. 2000; 2:81–89. [PubMed: 11096739]
5. Sixt E, Landahl S. Postural disturbances in a 75-year-old population: I. Prevalence and functional consequences. Age and Ageing. 1987; 16:393–398. [PubMed: 3425486]
6. Bloom J, Katsarkas A. Paroxysmal positional vertigo in the elderly. J Otolaryngol. 1989; 18:96–98. [PubMed: 2785606]
7. Brashear RE. Hyperventilation syndrome: managing elderly patients. Geriatrics. 1984; 39:114–125. [PubMed: 6145660]
8. Casselbrant ML, Black FO, Nashner L, Pannion R. Vestibular function assessment in children with otitis media with effusion. Ann Otol Rhinol Laryngol. 1983; 92:46–47.
9. Casselbrant ML, Furman JM, Rubenstein E, Mandel EM. Effect of otitis media on the vestibular system in children. Ann Otol Rhinol Laryngol. 1995; 104:620–624. [PubMed: 7639471]
10. Bekibele CO, Gureje O. Self-reported visual impairment and impact on vision- related activities in an elderly Nigerian population: report from the Ibadan Study of Aging. Ophthalmic Epidemiology. 2008; 92:612–615.
11. Gureje O, Ogunniyi A, Kola L, et al. Functional disability among elderly Nigerians: results from the Ibadan Study of Ageing. J Am Geriatr Soc. 2006; 54:1784–1789. [PubMed: 17087709]
12. Kish, L. Survey sampling. John Wiley and sons Inc.; New York: 1965.
13. National Center for Health Statistics. Evaluation of National Health Interview Survey diagnostic reporting. Vital and Health Statistics 2. 1994; 120:1–116. 1994.
14. Rose, GA.; Blackburn, H. World Health Organisation. WHO; Geneva: 1986. Cardiovascular Survey Methods. Monograph no. 56
15. Guralnik JM, Simonsick EM, Ferrucci L, et al. A short physical performance battery assessing lower extremity function: association with self-reported disability and prediction of mortality and nursing home admission. J Gerontol. 1994; 49:M85–94. [PubMed: 8126356]
16. Hosmer, DW.; Lemeshow, S. Applied logistic regression. John Wiley & Sons; New York: 2000.
17. StataCorp.. Stata Statistical Software, version 7.0 for windows. Texas, Stata, College Station: 2001.
18. Colledge NR, Wilson JA, Macintyre CA, Maclennan WJ. The Prevalence and characteristics of dizziness in an elderly community. Age and Ageing. 1994; 23:117–120. [PubMed: 8023718]
19. Gassmann KG, Rupprecht R. Dizziness in an older community dwelling population: a multifactorial syndrome. J Nutr Health Aging. 2009; 13:278–282. [PubMed: 19262968]
20. Neuhauser HK, von Brevern M, Radtke A, et al. Epidemiology of vestibular vertigo: a neurotologic survey of the general population. Neurology. 2005; 65:898–904. A. [PubMed: 16186531]
21. Steven KS, Lang IA, Guralnik JM, Melzer D. Epidemiology of balance and dizziness in a national population: findings from the English Longitudinal Study of ageing. Age and Ageing. 2008; 37:300–305. [PubMed: 18270246]
22. Chan Y. Differential diagnosis of dizziness. Curr Opin Otolaryngol Head Neck Surg. 2009; 17:200–203. [PubMed: 19365263]
23. Sloane P, Blazer D, George LK. Dizziness in a community elderly population. J Am Geriatr Soc. 1989; 37:101–108. [PubMed: 2783432]
24. Drachman DA, Hart CW. An approach to the dizzy patient. Neurology. 1972; 22:323–334. [PubMed: 4401538]
25. Farrehi PM, Santinga JT, Eagle KA. Syncope: diagnosis of cardiac and on cardiac causes. Geriatrics. 1995; 50:24–30. [PubMed: 7590365]
26. Luxon LM. Disturbances of balance in the elderly. Br J Hosp Med. 1991; 45:22–26. [PubMed: 2009435]
27. Karatas M. Central vertigo and dizziness: Epidemiology, differential Diagnosis, and common Causes. Neurologist. 2008; 14:355–364. [PubMed: 19008741]
28. Kerber KA, Brown DL, Lisabeth LD, et al. Stroke among patients with dizziness, vertigo, and imbalance in the emergency department: a population-based study. Stroke. 2006; 37:2484–2487. [PubMed: 16946161]

29. Minkler M, Fuller-Thomson E, Guralnik JM. Gradient of disability across the socioeconomic spectrum in the United States. N Engl J Med. 2006; 355:695–703. [PubMed: 16914705]
30. Sloane PD, Baloh RW. Persistent dizziness in geriatric patients. J Am Geriatr Soc. 1989; 37:1031–1038. [PubMed: 2809049]
31. Querner V, Krafczyk S, Dieterich M. Phobic postural vertigo. Body sway during visually induced roll vection. Exp Brain Res. 2002; 143:269–275. [PubMed: 11889504]
32. Nolan S. Traumatic Brain Injury A Review. Crit Care Nurs Q. 2005; 28:188–194. [PubMed: 15875448]
33. Hickey, J. The Clinical Practice of Neurological and Neurosurgical Nursing. 5th ed.. Lippincott Williams & Wilkins; Philedelphia: 2003.
34. Jones NS, Radomskiy P, Princhard ANJ, Snashall SE. Imbalance and chronic secretory otitis media in children: effect of myringotomy and insertion of ventilation tubes on body sway. Ann Otol Rhinol Laryngol. 1990; 99:477–481. [PubMed: 2350133]
35. Grace ARH, Pfleiderer AG. Disequilibrium and otitis media with effusion. J Laryngol Otol. 1990; 104:682–684. [PubMed: 2230572]
36. Goycoolea MV, Muchow D, Schachern P. Experimental studies on round window structure: function and permeability. Laryngoscope. 1988; 98:1–120. [PubMed: 3287079]
37. Tsuzunku T, Kaga K. Delayed motor function and results of vestibular function tests in children with inner ear anomalies. Int J Pediatr Otorhinolaryngol. 1992; 23:261–268. [PubMed: 1375590]
38. Venna N. Dizziness, falling and fainting: differential diagnosis in the elderly. Geriatrics. 1986; 41:30–42. [PubMed: 3710165]
39. Ben-David J, Podoshin L, Fradis M, Faraggi D. Is the vestibular system affected by middle ear effusion? Otolaryngol Head and Neck Surg. 1993; 109:421–426. [PubMed: 8414557]
40. Lang I, Wallace RB, Huppert FA, et al. Moderate alcohol consumption in older adults is associated with better cognition and well-being than abstinence. Age and Ageing. 2007; 36:256–261. [PubMed: 17353234]
41. Cloutier JF, Saliba I. Isolated vertigo and dizziness of vascular origin. J Otolaryngol Head Neck Surg. 2008; 37:331–339. [PubMed: 19128636]
42. National centre for health statistics. Data from the national health survey: cigarette smoking and health characteristics July 1964 – June 1965. Vital Health Stat. 1965:11–14. 10 34.
43. Lang I, Guralnik J, Wallace RB. What level of alcohol consumption is hazardous for older people? Functioning and mortality in US and English national cohorts. J Am Geriatr Soc. 2007; 55:49–57. [PubMed: 17233685]

Europe PMC Funders Author Manuscripts

Europe PMC Funders Author Manuscripts

Table1

Frequency of demographic variables

Gender	
Female	748 (53.8%)
Male	551(46.2%)
Age	
65-69	189
70-74	361(32.6%)
75-79	267(25.4%)
80+	482 (42.0%)
Residence	
Urban	300(22.8%)
Semi-urban	560 (42.9%)
Rural	439 (34.3%)
Economic	
High	110(9.1%)
High Middle	399(31.3%)
Low Middle	486(36.7%)
Low	304(23.0%)
Education, years completed	
13+	97(7.5%)
7-12	173 (13.5%)
1-6	328(26.2%)
0	701(52.8%)

Europe PMC Funders Author Manuscripts

Table 2

Demographic and clinical variables in dizzy subjects(n=318)

Variables	Unweighted N with Dizziness
Age 80+	122(38.4%)
75-79	66(20.8%)
70-74	91(28.6%)
65-69	39(12.3%)
Gender – Female	197(62.0%)
Male	121(38.1%)
Education, number of years	19(6.0%)
13+	47(14.8%)
7-12	80(25.2%)
1-6	172(54.1%)
0	
Economic status	27(8.5%)
High	78(24.5%)
High middle	129(40.6%)
Low middle	84(26.4%)
Low	
Residence Urban	65(20.4%)
Semi-urban	137(43.1%)
Rural	116(36.5%)
Alcohol Drinking	151(47.5%)
Never	165(51.9%)
Ever	
Cigarette smoking	162(50.9%)
Never	156(49.1%)
Ever	
Suppurative otitis media	24(7.6%)
Head injury	46(14.5%)
Recurrent rhinosinusitis	61(19.2%)
Transient ischemic attack	27(8.5%)
Diabetes mellitus	17(5.4%)
Hypertension	63(19.8%)

Europe PMC Funders Author Manuscripts

Table 3

Univariate analysis comparing the clinical correlates between elderly subjects with dizziness(n=318) and those without (n=981)

Variables	Subjects with Dizziness vs subjects without dizziness	P value
Suppurative otitis media	39.3 vs 23.7%	0.01
Head injury	41.8 vs 22.9%	0.00
Recurrent rhinosinusitis	45.5% vs 22.1%	0.00
Transient ischemic attack	38.0% vs 23.6%	0.01
Hypertension	30.1% vs 23.4%	0.04
Diabetes mellitus	25.9% vs 23.4%	0.19

Europe PMC Funders Author Manuscripts

Table 4

Sociodemographic and life-style correlates in dizzy subjects n=246

Variables	Unweighted N with Dizziness	Odds Ratio*	Confidence Interval	P value
Age 80+	122	reference	reference	reference
75-79	66	1.0	0.69-1.37	0.86
70-74	91	1.0	0.73-1.36	0.97
65-69	39	0.8	0.51-1.15	0.20
Gender – Female	197	reference	reference	reference
Male	121	0.8	0.59-0.99	0.05
Education, number of years	19	reference	reference	reference
13+	47	1.5	0.74-2.92	0.27
7-12	80	1.2	0.66-2.35	0.50
1-6	172	1.3	0.68-2.28	0.47
0				
Economic	27	reference	reference	reference
High	78	0.8	0.45-1.23	0.25
High middle	129	1.1	0.68-1.77	0.71
Low Middle	84	1.2	0.70-1.92	0.58
Low				
Residence Urban	65	reference	reference	reference
Semi-urban	137	1.2	0.83-1.62	0.39
Rural	116	1.3	0.90-1.81	0.17
Alcohol Drinking	151	reference	reference	reference
Never	165	0.8	0.40-1.55	0.44
Ever				
Cigarette smoking	162	Reference	Reference	reference
Never	156	1.5	1.17-1.95	0.01
Ever				

*Adjusted for sex, age, or both as appropriate.

Europe PMC Funders Author Manuscripts

Table 5

Clinical correlates in dizzy subjects n=246

Risk factors	Weighted N with Dizziness	Adjusted Odds ratio*	Confidence interval	P value
Suppurative otitis media	24	2.1	1.21- 3.52	0.01
Head injury	46	2.4	1.61-3.61	0.01
Recurrent rhinosinusitis	61	3.0	2.05-4.29	0.01
Hypertension	63	1.4	1.03-2.00	0.03
Transient ischemic attack	27	2.0	1.19-3.23	0.01
Diabetes mellitus	17	1.5	0.83-2.71	0.18

*Adjusted for age