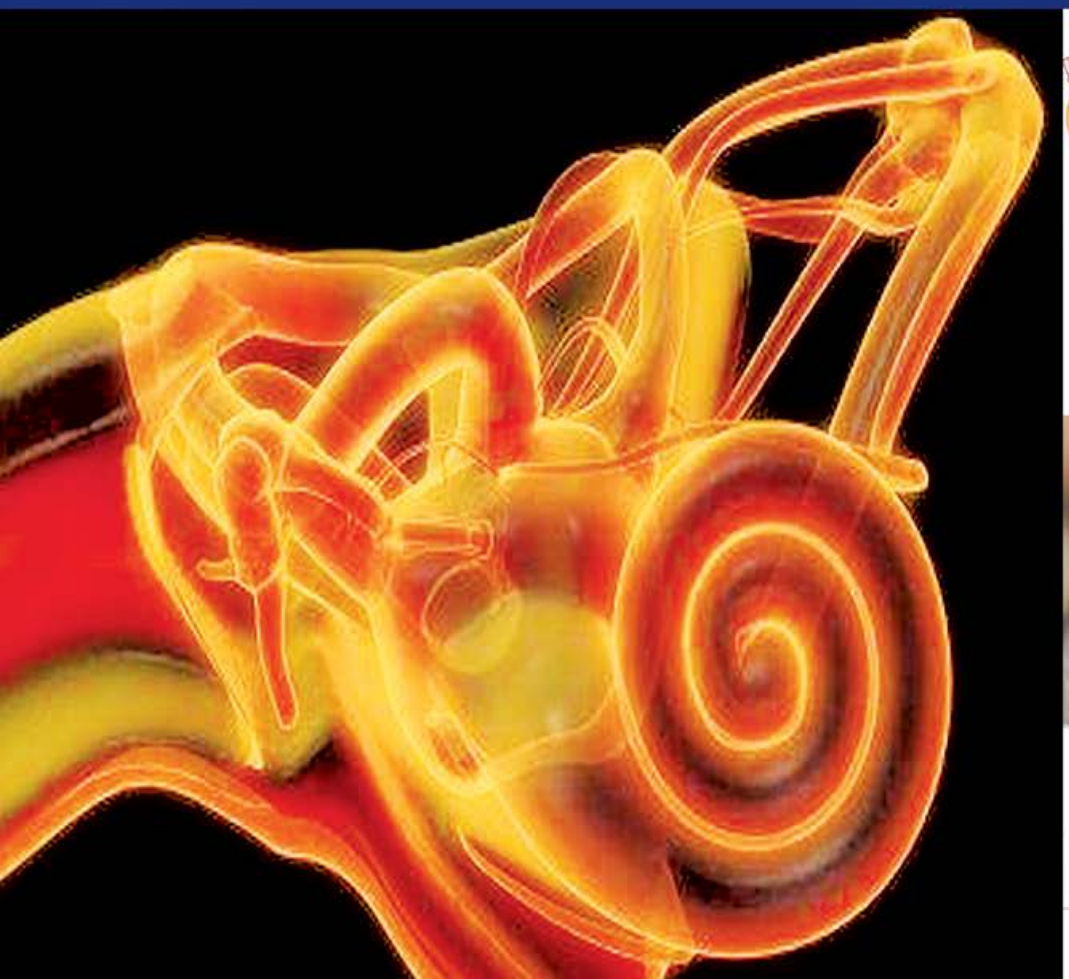
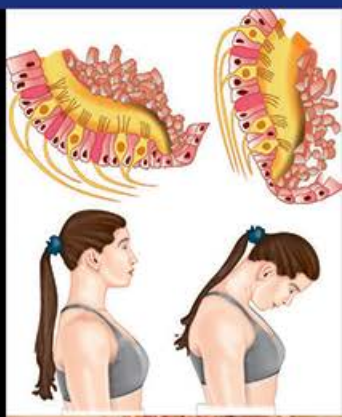
# *Textbook of*

# VERTIGO

## *Diagnosis & Management*

**Francesco Dispenza • Alessandro De Stefano**









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CHAPTER

# 3

# Epidemiology of Dizziness

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## ABSTRACT

Vertigo may arise from lots of medical conditions (otologic, neurological, medical and even psychogenic ones) and it is regularly reported by general adult population, in fact it is a frequent reason for consultation in primary care.

Although it is generally accepted to be common, there are no estimates of the "worldwide" prevalence of dizziness and there are limited informations in Literature too. In the past several studies have tried to assess the epidemiology of dizziness which was found to affect approximately 20-30% of the general population.

Here the authors tried to attempt a synthesis of a large amount of data as reported in past and recent Literature. Even if coming to a univocal conclusion is very difficult, it is important to understand the prevalence of vertigo in order to improve clinical care and to allocate medical resources appropriately.

## EPIDEMIOLOGY OF DIZZINESS: DIFFICULTY IN THE EXACT DETERMINATION

Vertigo may be the first expression of very different disease processes (systemic, neurological, otoiatric, psychopathological and vision disorders). The classification of dizziness is difficult from an etiologic point of view but also from a terminological one. Strictly speaking, dizziness is an "illusory perception of motion", but patients often refer ambiguously to *vertigo, dizziness, giddiness* and *disequilibrium* (or *imbalance*). Although these terms are often used as synonyms, they have different meanings and they could be due to different clinical conditions.

According to 1995 Guidelines by the American Academy of Otolaryngology-Head and Neck Surgery, vertigo is characterized as "the sensation of motion when no motion is occurring relative to Earth's gravity".[1]

Dizziness (or *dizzy spell*) is defined as a sensation of faintness, lightheadedness or unsteadiness. So unlike dizziness, vertigo has a rotational, spinning component: it is the perception of movement either of the self or surrounding objects.

Disequilibrium simply means unsteadiness, imbalance or loss of equilibrium that is often accompanied by spatial disorientation.

Giddiness is related with a reeling sensation and feeling as being about to fall.

Here the term "dizziness" is defined as the sum of vertigo, imbalance and faintness, so it includes all subtypes without distinction (also in literature dizziness and vertigo are often used as synonyms).

All the symptoms listed above are commonly reported by general adult population: vestibular vertigo is a frequent reason for consultation in primary care but its effect at the general population level may have been underestimated.[2]

Several studies have tried to assess the epidemiology of dizziness (including vertigo and non-vestibular disorders) which was found to be one of the most common complaints in medicine, affecting approximately 20–30% of the general population.[3,4] In another study of four practices in London (UK), Yardley and colleagues[5] noted that dizziness may account for up to 23.3% of problems reported by patients.

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Although it is generally accepted to be common, there are no estimates of the "worldwide" prevalence of dizziness and there is limited information in literature too due to following several reasons.

## Difficulty in the Differential Diagnosis

The data are poor and an accurate prevalence of dizziness is hard to estimate in part because of difficulty in the differential diagnosis.[6] Diagnosing vestibular dysfunction cannot be easy. The symptoms of dizziness and imbalance may be the non-specific sequelae of numerous impairments, including deficits in vision, proprioception and musculoskeletal, autonomic and vestibular function. In addition, testing for isolated deficits of the vestibular end organs often involves complex tools (i.e. electronystagmography, caloric reflex test or assessment of postural function) that complicate widespread application.[7]

## Underestimation of Cases

Common conditions such as benign paroxysmal positional vertigo (BPPV),[8] migrainous vertigo[9] and psychiatric dizziness[10] remain largely underdiagnosed outside of specialty clinics because, although they often require a multidisciplinary approach, they rarely prompt referral to a specialist or a hospital admission for specific investigation. Because of these restrictions, little is known about the burden of vertigo in the community and its underlying disorders which also remain underdiagnosed (and may be insufficiently treated) in a large percentage of cases.[2]

## Variability in Study Designs and Populations

Variability in study designs make the data difficult to compare. Moreover, it is unknown whether susceptibilities differ across demographic groups because of diversity of study populations (age, gender, ethnicity, presence of other clinical disorders).

## Selected Case Series or Not Explicitly Defined Diagnostic Criteria

Epidemiologic data on the prevalence of specific dizziness and vertigo disorders are scarce also because they are based primarily on selected case series or not explicitly defined diagnostic criteria.[11–13] A major source of variability in estimates of the prevalence of vestibular dysfunction is in the definition of a "case". Most of the studies cited in literature primarily used questionnaires to define a case of vertigo.[7]

For all this it appears evident that coming to a univocal conclusion is very difficult. On the other side it seems quite reasonable trying to attempt a synthesis of a large amount of data as reported in past and recent literature.

# EPIDEMIOLOGY OF THE MOST COMMON TYPES OF DIZZINESS

Dizziness may arise from lots of medical conditions. Hain divides dizziness into four categories:[14] (1) Inner ear dizziness (otologic or peripheral dizziness); (2) Neurological dizziness (central dizziness); (3) Medical dizziness and (4) Psychogenic and undiagnosed dizziness.

## Inner Ear Dizziness

It is due to the dysfunction of peripheral balance organs caused by lots of pathologies such as toxic damage to labyrinths, labyrinthitis, ear infections, structural disorders (cholesteatoma, perilymphatic fistula, otosclerosis), trauma (temporal bone fracture, labyrinthine concussion), congenital syndromes [superior canal dehiscence (SCD), subarcuate venous malformation],[15–17] but the most frequent forms are BPPV, Ménière's disease and vestibular neuronitis.

Otologic vertigo estimates vary widely. According to Kroenke et al. approximately 80% of vertigo cases result from peripheral causes.[6] According to Hain, 40% of patients have otologic dizziness,

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but there might be an overestimation of cases and consequently an underestimate of medical or undiagnosed dizziness.[14] According to Neuhauser and colleagues, vestibular vertigo is common in the general population, affecting more than 5% of adults in 1 year.[12] The frequency and health care impact of vestibular symptoms at the population level have been underestimated yet.

### *Benign Paroxysmal Positional Vertigo*

It is probably the most common cause of vestibular vertigo accounting for approximately 20–30% of diagnoses in specialized dizziness clinics.[4,18] Thus far, however, the epidemiology of BPPV in the general population is not known. Between the end of 1980s and the beginning of the 1990s, several studies aimed to assess the epidemiology of BPPV, for example, a study from Japan by Mizukoshi et al. reported an incidence of BPPV of 0.01%;[19] another study from Minnesota in the United States by Froehling and colleagues estimated the incidence rate of BPPV at 0.06%.[20] On the other hand, it must be said that these studies were subject to various methodological limitations (i.e. sample size not representative of the general population; retrospective analysis on medical records which can be a source of inclusion bias) and may be they provided a considerably lower incidence estimates: in the first case, only BPPV patients presenting to the physicians affiliated with the research committee were evaluated; in the second case, study population was selected on the basis of a medical records linkage system so patients not seeking medical care were excluded. In 2007, a big cross-sectional, nationally representative neurotological survey of the general adult population in Germany estimated the prevalence and incidence of BPPV: the mean age of onset was 49 years (in literature it is reported 50–60 years) and there was a marked female preponderance among BPPV patients (ratio F:M=2:1).[8]

### *Ménière's Disease*

Ménière's disease accounts for about 3–11% of diagnoses in dizziness clinics,[18] even if its reliable prevalence and incidence estimates are difficult to obtain. In a large US study,[21] 180 cases of Ménière's disease were identified in the Rochester (Minnesota, USA) population during a period of 30 years (1951–1980): the annual age-adjusted incidence rate was 15.3 per 100,000 population and the point prevalence was 218.2 per 100,000 population, which correspond to 0.2% that is eight times less common than BPPV. In 2005, a Finnish prospective study based on population register data reported a prevalence of 513 per 100,000, which is considerably higher than previous study.[22] In general, Ménière's disease is considered as a disease of the middle-aged, which can occasionally occur in children. This report was confirmed by the above-mentioned Finnish study where a peak prevalence of 1,709 of 100,000 was seen in the age group 61 to 70 years.[22]

### *Vestibular Neuronitis*

The scarcity of epidemiologic data on vestibular neuronitis (also called *vestibular neuritis*), one of the most severely impairing acute vestibular disorders, is remarkable. Vestibular neuritis is likely to be a frequent cause of vertigo because it accounts for 3–10% of diagnoses in specialized dizziness Clinics.[18] In an epidemiological survey from Japan, the frequency of vestibular neuritis in the general population is estimated to be 3.5 per 100,000 inhabitants; peak of age distribution is between 30 and 50 years.[23] Female preponderance is never been observed (Table 1).[23,24]

## Neurological Dizziness

It could be defined as a group of conditions causing dizziness that are usually diagnosed and treated by neurologists. In addition to dizziness associated with dysfunction of the central nervous system, it also includes dizziness or ataxia caused by sensory neuropathy and visual dysfunction.

In most cases central-type vertigo is caused by vascular diseases (i.e. brainstem ischemia, cerebellar infarction, intracranial hemorrhage, vertebrobasilar insufficiency), combined with a larger number of "miscellaneous" causes including acoustic neuroma (also known as *vestibular schwannoma*), migrainous vertigo, CSF drainage, multiple sclerosis, vestibular epilepsy, Chiari malformation, cervical vertigo and conditions accompanied by central positional nystagmus or tremor. It is estimated that about

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**Table 1:** Literature on the epidemiology of inner ear dizziness

| *Source* | *Sample (Study)* | *Findings* |
|---|---|---|
| Davis LE, 1994[24] | 117 elderly veterans in Neurology clinic (aged 50+ years) *(descriptive study)* | 71% peripheral vestibular disorder<br>34% BPPV |
| Russell G et al., 1999[25] | 2,165 Scottish children of school age *(prevalence study using a questionnaire)* | 44% unexplained dizziness<br>47% isolated BPPV<br>Age of onset peaked: 12 years |
| Kroenke K et al., 2000[6] | *Metanalysis* of 12 papers | 44% peripheral vestibulopathy |
| Oghalai JS et al., 2000[26] | Geriatric population *(cross-sectional study)* | 61% dizziness<br>77% balance disorder<br>9% unrecognized BPPV |
| Uno A et al., 2001[27] | 1,007 dizzy patients from an ENT Clinic in Japan *(observational study)* | 23% BPPV<br>18% suspected BPPV<br>22% peripheral vestibular disorder |
| Sekine K et al., 2005[28] | 626 dizzy patients from University Hospital Department of Otolaryngology | 65% peripheral vestibular disorder<br>32% BPPV<br>12% Ménière's disease |
| von Brevern M et al., 2007[8] | 4,869 adult Germans *(cross-sectional study)* | 8% BPPV<br>Lifetime prevalence: 2.4%<br>1 year prevalence: 1.6%<br>1 year incidence: 0.6%<br>Median duration of an episode: 2 weeks |
| Neuhauser HK et al., 2008[2] | General adult population living in Germany in 2003 *(cross-sectional study)* | 33% BPPV<br>Lifetime prevalence: 29.3%<br>1 year prevalence: 22.9%<br>1 year incidence: 3.1% |
| Uneri A et al., 2008[29] | 601 Turkish patients (aged 65+ years) *(retrospective study)* | 93.5% peripheral vestibular disorder<br>42.43% BPPV<br>20.29% idiopathic vestibulopathy<br>12.47% Ménière's disease<br>6.49% acute vestibular attack |
| Agrawal et al., 2009[7] | adults aged 40+ years (*cross-sectional study using National Health and Nutrition Examination Surveys*) | 35.4% vestibular dysfunction |
| Gopinath B et al., 2009[30] | 2,751 Australians (aged 50+ years) *(prospective cross-sectional study)* | Dizziness/vertigo prevalence: 36.2%<br>Vestibular vertigo prevalence: 10.0%<br>Non-vestibular vertigo prevalence: 14.2% |
| Yin M et al., 2009[31] | 2,169 Japanese patients (aged 7–90 years) *(retrospective study)* | 33.8% peripheral vestibular disorder |
| Harris JP et al., 2010[32] | over 60 million of US patients *(prevalence study using a national database)* | Ménière's disease prevalence: 0.19% (F:M = 1.89:1)<br>Prevalence MD < 18 years: 0.009%<br>Prevalence MD ≥ 65 years: 0.44% |
| Isaradisaikul S et al., 2010[33] | 547 Thai patients (aged 8–89 years) *(retrospective study)* | 72.9% peripheral vestibular disorder<br>52.5% BPPV<br>14.6% Ménière's disease<br>2.9% sudden idiopathic hearing loss<br>0.7% benign paroxysmal vertigo of childhood<br>0.7% labyrinthitis |

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| *Source* | *Sample (Study)* | *Findings* |
|---|---|---|
| Maarsingh OR et al., 2010[34] | 417 Dutch patients (aged 65–95 years) *(cross-sectional study)* | 14% peripheral vestibular disorder |
| Mendel B et al., 2010[35] | 2,547 participants *(cross-sectional study)* | Overall dizziness prevalence: 21% (F: 27%; M: 14%)<br>5% BPPV (F > M)<br>15% falls because of dizziness |
| Somefun OA et al., 2010[36] | 102 Nigerians (aged 21–90 years) *(descriptive prospective study using a questionnaire)* | 28.4% BPPV<br>21.6% Ménière's disease<br>19.6% recurrent vestibulopathy |
| Lai YT et al., 2010[37] | General adults in Taiwan in 2006 (*cross-sectional study using National Health Insurance claims database*) | Vertigo prevalence: 3.13 cases per 100 adults (M:F=1:1.96)<br>Recurrence within 1 year: 37.7% |
| Bunasuwan P et al., 2011[38] | 149 Thai patients *(retrospective study on medical records)* | 80.5% peripheral vestibular disorders<br>53% BPPV<br>10.1% Ménière's disease<br>8.1% recurrent vestibulopathy |
| Dispenza F et al., 2011[39] | 18 Italian patients with whiplash *(retrospective study)* | 33.9% BPPV |
| Royl G et al., 2011[40] | 475 Emergency Room (ER) patients *(retrospective study)* | 22% BPPV |

11% of population suffers from central dizziness.[6] The incidence of neurological dizziness in the emergency setting is only about 2%. The incidence in the primary care setting is unknown, but probably also low.[14]

Patients affected by intracranial tumors (i.e. internal auditory canal mass, cerebellopontine angle tumors) can also suffer from an insidious type of paroxysmal positional vertigo (the so-called *malignant paroxysmal positional vertigo*) which appears to be intractable with canalith repositioning maneuver and which is not self-limiting.[41]

Without any doubt migraine has a large majority percentage of central dizziness.

### *Migrainous Vertigo*

Migrainous vertigo also known as Migraine-Associated Vertigo (MAV), the recognition of an association between migraine and vertigo dates back almost 150 years when the English physician Edward Living noted that 6 out of 60 patients with migraine had spontaneous attacks of vertigo, as documented in his monograph *On megrim: a contribution to the study of nerve storms.*[42] That about 10% of migraineurs suffer from vertigo caused by migraine has been confirmed recently,[8] but the interrelations of migraine and vertigo are more complex and they are still poorly understood.[43] It has been speculated that migraine could cause vasospasm of the labyrinthine arteries, leading to detachment of otoconia from the utricular macula.[44] The frequency of migraine was three times higher in idiopathic BPPV than in BPPV secondary to head trauma or surgery (Table 2).[8]

## Medical Dizziness

Hain[14] defines "medical" dizziness as that related to general medical diagnoses including disorders which alter blood pressure (low or high blood pressure, postural or orthostatic hypotension, internal bleeding) and blood sugar (diabetes or hypoglycemia), or which are attributed to an infection, a medication (e.g. high blood pressure medications, sedatives, tranquilizers, antidepressants, pain relievers, certain antibiotics, diuretics) or a heart disease (heart attack, cardiac arrhythmia). All these conditions can be the cause of the so-called *lightheadedness* or *presyncope* rather than an actual vertigo or dizziness.

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**Table 2:** Literature on the epidemiology of neurological dizziness

| *Source* | *Sample (Study)* | *Findings* |
|---|---|---|
| Davis LE, 1994[24] | 117 elderly USA veterans in Neurology clinic (aged 50+ years) *(descriptive study)* | 26% disorders of the visual system<br>17% disorders of the proprioceptive system<br>59% structural lesions of the brainstem or cerebellum or metabolic disorders that affected normal brainstem function |
| Kroenke K et al., 2000[6] | *Metanalysis* of 12 papers | 11% central vestibulopathy<br>6% cerebrovascular disease (stroke)<br>< 1% brain tumor |
| Uno A et al., 2001[27] | 1,007 dizzy patients of an ENT Clinic in Japan *(observational study)* | 7% cerebrovascular disease<br>1.2% space-occupying lesions in the posterior fossa |
| Sekine K et al., 2005[28] | 626 dizzy patients from University Hospital Department of Otolaryngology | 7% central vestibulopathy<br>1% space-occupying lesions in the posterior fossa<br>1.9% cerebral infarction |
| Neuhauser HK et al., 2006[9] | 4,869 adult Germans *(cross-sectional study)* | Lifetime prevalence of MAV: 0.98%<br>1 year prevalence of MAV: 0.89%<br>67% spontaneous rotational vertigo<br>24% positional vertigo<br>24% headaches with vertigo |
| Neuhauser HK et al., 2008[2] | General adult population living in Germany in 2003 *(cross-sectional study)* | 14% MAV |
| Uneri A et al., 2008[29] | 601 Turkish patients (aged 65+ years) *(retrospective study)* | 13.15% MAV |
| Yin M et al., 2009[31] | 2,169 Japanese patients (aged 7–90 years) *(retrospective study)* | 17.2% central vestibulopathy |
| Isaradisaikul S et al., 2010[33] | 547 Thai patients (aged 8–89 years) *(retrospective study)* | 0.8% central vestibulopathy<br>0.3% vestibular schwannoma |
| Somefun OA et al., 2010[36] | 102 Nigerians (aged 21–90 years) *(descriptive prospective study using a questionnaire)* | 2% central vestibulopathy<br>1% vertebrobasilar insufficiency<br>17.6% cervical vertigo<br>1% vestibular schwannoma, barotraumas and drug-induced vertigo |
| Bunasuwan P et al., 2011[38] | 149 Thai patients *(retrospective study on medical records)* | 4.7% central vestibulopathy |
| Hsu LC et al., 2011[45] | 1,436 women aged 40–54 years from Taiwan *(community-based study)* | 19.4% migraine<br>1 year prevalence of MAV: 5%<br>MAV subjects vs only-migraine subjects:<br>aura 23.6% vs 9.6% (OR 2.9)<br>nausea 76.4% vs 55.8% (OR 2.6)<br>photophobia 61.1% vs 41.7% (OR 2.2) |
| Royl G et al., 2011[40] | 475 Emergency Room (ER) patients *(retrospective study)* | 20% cerebrovascular disease (stroke) |

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The reported data varies hugely. General medical diagnoses are assigned to about 33% of cases of dizziness seen in the emergency setting or in the primary care setting. Hypertension, disturbances of blood glucose and coronary atherosclerosis are the most common diagnoses.[46] General medical diagnoses are very unusual in specialty settings, associated with only 2% of diagnoses in the otology setting and 5% in the neurotology setting (Table 3).[14]

## Psychogenic and Unlocalized Dizziness

Psychogenic dizziness consists of a sensation of motion (e.g. spinning, rocking, tilting, levitating, etc.) that can be reasonably attributed to a psychiatric disorder (e.g. anxiety, depression, somatization disorder, etc.). Examination and laboratory evaluations are generally normal.

Psychiatric dizziness includes the so-called phobic postural vertigo (PPV) and chronic subjective dizziness (CSD).

Phobic postural vertigo was firstly described by Brandt in 1991 as a symptom complex characterized by situationally triggered panic attacks, frequently including vertigo with unsteadiness.[49] PPV is mainly reported in the European Literature (most from Germany), on the contrary it is not a popular diagnosis in the USA. According to Strupp, when left untreated, PPV becomes chronic in most cases and leads to considerable impairments and it takes on considerable medical and socioeconomic significance; however, when diagnosed correctly, it can be treated successfully in more than 70% of cases.[50]

In CSD anxiety is a strong predisposing factor. The pathophysiologic concept of this disorder assumes that balance function and emotion share common neurologic pathways, which might explain that the balance disorder can provoke fear and vice versa, giving rise to a problem in perception of space and motion. In anxious patients this can turn into a space and motion phobia, with avoidance behavior. Vestibular examination reveals no anomalies.[51]

"Unlocalized" dizziness is quite common in general population and it may account for even 25% of all dizziness. It includes manifestations of vertigo of unclear origin or without further definition (*nonspecific* dizziness) such as hyperventilation syndrome, post-traumatic vertigo (i.e. after head trauma or whiplash) (Table 4).[14]

**Table 3:** Literature on the epidemiology of medical dizziness

| *Source* | *Sample (Study)* | *Findings* |
|---|---|---|
| Kroenke K et al., 2000[6] | *Metanalysis* of 12 papers | 1.5% cardiac arrhythmia |
| Uno A et al., 2001[27] | 1,007 dizzy patients of an ENT Clinic in Japan<br>*(observational study)* | 3.6% cardiocirculatory disease |
| Sekine K et al., 2005[28] | 626 dizzy patients from University Hospital Department of Otolaryngology | 4% orthostatic hypotension |
| Maarsingh OR et al., 2010[34] | 417 Dutch patients (aged 65–95 years)<br>*(cross-sectional study)* | 69% presyncope<br>57% cardiovascular disease<br>23% adverse drug effect |
| Bunasuwan P et al., 2011[38] | 149 Thai patients<br>*(retrospective study on medical records)* | 11.4% diabetes mellitus<br>32.2% hypertension<br>34.2% dyslipidemia |
| Radtke A et al., 2011[47] | Orthostatic dizziness in general adult population living in Germany in 2003<br>*(population-based cross-sectional study)* | 42% orthostatic dizziness<br>1 year prevalence: 10.9%<br>(F: 13.1% vs M: 8.2%)<br>Lifetime prevalence: 12.5%<br>(F: 15.0% vs M: 9.6%) |
| Lin HW et al., 2012[48] | 37.3 million elderly persons (aged 65+ years)<br>*(cross-sectional study using a national database)* | 19.7% adverse drug effect |

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**Table 4:** Literature on the epidemiology of psychogenic and unlocalized dizziness

| *Source* | *Sample (Study)* | *Findings* |
|---|---|---|
| Kroenke K et al., 2000[6] | *Metanalysis* of 12 papers | 16% psychiatric causes<br>26% other conditions<br>13% unknown cause |
| Uno A et al., 2001[27] | 1,007 dizzy patients from an ENT clinic in Japan<br>*(observational study)* | 18% other disorders<br>19% undiagnosed |
| Strupp M et al., 2003[50] | 4,214 German dizzy patients (aged 20–50 years) | 22–26% PPV |
| Odman M et al., 2008[51] | 1,552 Swiss patients<br>*(retrospective study)* | 10.6% CSD<br>(F:M=111:53) |
| Wiltink J et al., 2009[52] | 1,287 German adults (aged 14–90 years)<br>*(cross-sectional survey using a self-administered questionnaire)* | 28.3% anxiety disorder (generalized anxiety, social phobia, panic) |
| Yin M et al., 2009[31] | 2,169 Japanese patients (aged 7–90 years)<br>*(retrospective study)* | 26.8% unclassified vertigo<br>22.2% unknown cause |
| Isaradisaikul S et al., 2010[33] | 547 Thai patients (aged 8–89 years)<br>*(retrospective study)* | 0.2% psychogenic vertigo<br>26.1% unknown cause |
| Maarsingh OR et al., 2010[53] | 417 Dutch patients (aged 65–95 years)<br>*(cross-sectional study)* | 10% psychiatric illness |
| Maarsingh OR et al., 2010[34] | 3,990 Dutch dizzy patients (aged 65+ years)<br>*(cross-sectional study)* | 1 year prevalence: 8.3% (F > M)<br>Incidence 47.1 per 1,000 person-years<br>39% unknown cause |
| Somefun OA et al., 2010[36] | 102 Nigerians (aged 21–90 years)<br>*(descriptive prospective study using a questionnaire)* | 2% psychogenic vertigo<br>3% post-traumatic vertigo<br>2% unknown cause |
| Bunasuwan P et al., 2011[38] | 149 Thai patients<br>*(retrospective study on medical records)* | 4% non-vestibular related disorders<br>10.1% undiagnosed |

## EPIDEMIOLOGY OF DIZZINESS IN THE ELDERLY

Good balance is important for daily life and it requires the complex integration of sensory information regarding the position of the body relative to the surrounding and the ability to generate appropriate motor responses to control body movement. Systems involved in balance are vision, vestibular sense, proprioception, muscle strength and reaction time.

With increasing age there could be a progressive loss of function of these systems due to normal ageing or to a specific pathology affecting a particular component. Impairments of the function of the vestibular system can contribute to balance deficits and sudden instability (*presbyequilibrium*) in older people.[54]

Approximately one in five elderly persons experiences annual problems with dizziness or balance.[48] The most common complaint among older adults is dizziness together with postural instability (with a tendency to fall), spinning vertigo, floating sensation,[55] unsteadiness and faintness.[48]

Prevalence of dizziness increases significantly with age and among institutionalized patients.[11,37,55–59] Moreover, it is often associated with limiting clinical conditions (i.e. depression, fatigue, excessive sleepiness and impaired memory)[56] and reduced quality of life.[55] A recent cross-sectional study evaluating about 37.3 million elderly persons in the USA[48] showed as the 27.4% reported that balance problems specifically prevented them from participating in activities including exercise (61.2%), social events (45.8%) and driving (47.1%). Given the significant prevalence and negative

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effect of balance problems on daily activities in the elderly, balance disorders merit special attention, particularly in the face of an aging population.[48]

## Dizziness, Elderly and Falls

It is highlighted the association between dizziness and recurrent falls, fear of falling and lower performance in physical function tests, which can restrict independence.[56] As said before, falls are a frequent problem in patients in ENT outpatient medical care.[60] Association with falls and fall-related injuries make balance disorders a growing public health concern, particularly in regions of the world in which high proportions of the population are elderly.[54] For this reason fall prevention is advisable in the context of an interdisciplinary approach.[60]

## Dizziness, Elderly and Comorbidities

The elderly tends to have multiple comorbidities which act as factors associated or strongly related to sudden sensory-neural hearing loss[61] or hearing impairment.[62] Most of these factors (such as diabetes, hypercholesterolemia, hypertriglyceridemia, hypertension) likely promote detachment of otoconia from the otolith organs, which consequently enter into semicircular canals, or lead to a vascular damage of the inner ear and thus to dizziness.[8] On the basis of this knowledge several Authors have hypothesized a possible influence of comorbidities also on vestibular system. It was found an association between BPPV and hypertension, hyperlipidemia,[7,8] arthritis and abnormal heart rhythm.[63] As noted in several studies[7,64-66] diabetes seems to have a significant negative influence on vestibular function probably because of its microangiopathic effects which lead to ischemia of the vestibular structures (vestibulotoxicity) or because impaired glucose metabolism could alter the metabolism of inner ear fluids leading to labyrinthine dysfunction.[7] Unpublished data from a big multicenter study by De Stefano and colleagues[67] on BPPV and comorbidities suggest that the presence of comorbid disorders exposes the patient to an increased risk of relapse of dizziness especially if there are more than one comorbid diseases (OR = 2.25 in presence of one comorbidity and OR = 2.84 in case of two or more diseases). Moreover it seems that there is a statistical significant difference between the number of comorbidities and the number of recurrences. The mechanism by which comorbidities can cause this increase is not known yet (Table 5).

**Table 5:** Literature on the epidemiology of dizziness in the elderly

| *Source* | *Sample (Study)* | *Findings* |
|---|---|---|
| Aggarwal NT et al., 2000[57] | 6,158 African-Americans and Caucasians (aged 65+ years) | Overall prevalence of dizziness: 9.6%<br>Prevalence 65–74 years: 6.6%<br>Prevalence 75–84 years: 11.6%<br>Prevalence ≥ 85 years: 18.4% |
| Sloane PD et al., 2001[11] | *Metanalysis* | Prevalence of dizziness in young adults: 1.8%<br>Prevalence of dizziness in the elderly: > 30% |
| Jonsson R et al., 2004[58] | 2,011 Swedish patients (aged 70+ years) *(longitudinal cross-sectional gerontological and geriatric population study)* | Prevalence 70 years: 36% (F), 29% (M)<br>Prevalence 88–90 years: 51% (F), 45% (M)<br>Unsteadiness: 11% (F), 41% (M)<br>Rotatory symptoms: 2% (F), 17% (M) |
| Stevens KN et al., 2008[63] | 2,925 British patients (aged 65+ years) *(large population-based study: English Longitudinal Study of Ageing—ELSA)* | 21.5% impaired balance<br>11.1% dizziness |

*Contd...*

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*Contd...*

| *Source* | *Sample (Study)* | *Findings* |
|---|---|---|
| Gassmann KG et al., 2009[59] | 1,801 German patients (aged 65+ years) *(prospective cohort study using a standardized questionnaire)* | 29.2% dizziness<br>Prevalence ≤ 70 years: 27%<br>Prevalence ≥ 90 years: 54%<br>68.2% daily or weekly dizziness<br>27.9% multiple sensations of dizziness |
| Tamber AL et al., 2009[68] | 17,638 Swedish adults (aged 30–76 years) *(cross-sectional survey: the Oslo Health Study using a self-administered questionnaire)* | Prevalence of faintness/dizziness: 28.7% |
| Wiltink J et al., 2009[52] | 1,287 German adults (aged 14–90 years) *(cross-sectional survey using a self-administered questionnaire)* | 15.8% dizziness |
| de Moraes SA et al., 2011[56] | 391 Brazilian patients (aged 65+ years) *(prospective population-based study using a multidimensional questionnaire)* | Prevalence of dizziness: 45%<br>70.4% vertigo<br>43.8% at least one vertigo crises along life |
| Lai YT et al., 2011[37] | General adults in Taiwan in 2006 *(cross-sectional study using National Health Insurance claims database)* | Prevalence of vertigo: 3.13 cases per 100 adults<br>(F:M=1.96:1)<br>37.7% recurrence within 1 year |
| Lin HW et al., 2012[48] | 37.3 million elderly persons (aged 65+ years) *(cross-sectional study using a national database)* | 19.6% dizziness<br>68.0% unsteadiness<br>30.1% vertigo<br>29.6% faintness<br>(F: 21.0% vs M: 17.7%) |
| Tuunainen E et al., 2012[55] | 72 Finnish elderly persons from a single residential facility *(population-based study using a questionnaire)* | 68% dizziness, vertigo, poor maintenance of posture and black-outs |
| Walther LE et al., 2012[60] | 673 German patients (aged 60+ years) *(multicentre study)* | 23% one fall<br>13.7% more than one fall<br>38% dizziness and balance disorders |

## SOME HOPE IN THE NEAR FUTURE

As said before, dizziness can disrupt a person's daily activities with a profoundly negative impact on quality of life.[12,69]

Broadening epidemiologic data on the high frequency of both vestibular and non-vestibular dizziness may help enhance clinician awareness of these disorders and subsequently improve the recognition, differential diagnostic workup and effective treatment in the large group of patients with dizziness.[2] Moreover, it is important to understand the prevalence of vertigo in order to improve clinical care and to allocate medical resources appropriately.[36]

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# *Textbook of* VERTIGO
# *Diagnosis & Management*

The vertigo is one of the commonest symptoms complained by patients. It is also a symptom variously referred by patients and may be present in several diseases. Therefore, this book could be a helpful tool for all physicians approaching patients with vertigo or dizziness. The general practitioner may learn how to approach a dizzy patient with basic steps ranging from the physical examination to instrumental tests. However, the book could be useful to specialist like Otorhinolaryngologist and Neurologist, who may read the latest updates on instrumental examination, therapy and rehabilitation of dizzy patients, as well as find in a single book the various approach to diagnose and treat several inner ear diseases causing vertigo.

The book had the contribution of eminent specialists worldwide, that shared their experience with clear and synthetic chapters. The Editors Dr Francesco Dispenza and Dr Alessandro De Stefano have collected together the experiences of colleagues from America to Asia passing through Europe to give to the reader the most complete picture possible. The reader will be supported by about 1000 references, including cornerstone papers and recent bibliography, that will help to study in deep the vertigo, a complex symptom that must be known.

**Salient Features**

- All features of vertigo are discussed from diagnosis to management
- 20 chapters about all fields of vertigo
- More than 30 expert authors from several countries worldwide
- About 1000 references cited
- Chapters dedicated to specific inner ear diseases
- Approach to dizzy patients
- Discussion about medical therapy
- Instrumental diagnosis for vertigo



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