



# Prevalence of Cervical Spondylosis among Cases with Vertigo in a Tertiary Care Center

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## Abstract

**Introduction** Etiology of vertigo is wide and each etiological factor should be treated accordingly. This study was conducted to assess the prevalence of cervical spondylosis among the cases with vertigo and to assess the clinical factors associated with it.

**Materials and Methods** A hospital-based cross-sectional study was conducted among cases with vertigo attending the outpatient department of otorhinolaryngology at Chettinad Hospital and Research Institute, Chennai, Tamil Nadu, India, during the months of November 2020 to March 2021. A total of 180 cases with vertigo and 180 controls without vertigo were included in the study. Primary outcome assessed was the prevalence of cervical spondylosis among cases with vertigo and the secondary outcome was to assess the clinical characteristics of the study participants and factors associated with the presence of cervical spondylosis. Analysis was done using SPSS version 20.

**Results** Majority of participants belong to 51 to 55 years of age with slight female predominance. Impacted cerumen auris, otitis media, and perforated tympanic membrane were noted in 19.4, 10, and 10.6% of cases, respectively. Prevalence of cervical spondylosis was reported as 17.2%, and 12.2% of cases had abnormal pure-tone audiometry findings with significant association between the presences of cervical spondylosis.

**Conclusion** Assessment of hearing using pure-tone audiometry can be done as a routine practice for all the cases with vertigo which occurs due to cervical spondylosis.

## Keywords

- ▶ vertigo
- ▶ cervical spondylosis
- ▶ pure-tone audiometry
- ▶ prevalence

## Introduction

Dizziness and giddiness are the most commonly reported complaints by the patients not only in the otolaryngology, neurology, or cardiology departments but also in almost every general outpatient department. Both these terms are widely used by the patients to describe their state of feeling unsteady, off balance, and lack of confidence about their

consciousness. These symptoms are more nonspecific and arriving at a diagnosis with this history is unlikely; however, a wide range of differential diagnosis can be made with the support of few other histories especially about the heavy headedness, syncope, disequilibrium, ataxia, and the true vertigo. True vertigo refers to absence of obligatory illusion of movement of either themselves or their surroundings.<sup>1</sup>

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The term “vertigo” was derived from Latin “Vertere” which means “to turn” and “igo” refers to “condition of turning about.” Thus, vertigo is best explained as a sense of feeling the environment moving around us when actually it does not.<sup>2</sup> Cases with vertigo are often associated with complaints of headache, nausea and vomiting, pain in the neck, tinnitus, and visual disturbances.<sup>3,4</sup> Though there are several etiological factors reported for the occurrence of vertigo, the cervical spondylosis remains unavoidable.

The degenerative changes which occur in the bones can result in alteration of alignment and stability of spine, more commonly reported in the cervical and lumbar spines. Cervical spondylosis is one of the most common degenerative conditions reported more frequently in the past two decades. It may occur with or without symptoms which are related to pressure on the cord, nerves, and blood vessels. In the literature it was stated that approximately 25 to 50% of the population develop cervical spondylosis by the age of 50 years and approximately 70% of the population by the age of 75 years.<sup>5</sup> Vertebral artery stenosis which occurs due to the presence of a spur in the transverse foramen can cause vertigo, more frequently reported among the elderly people.<sup>6,7</sup> Also, it was noted that there was significant association between cervical spondylosis and vertigo due to vertebrobasilar insufficiency.<sup>8,9</sup>

Karlberg et al<sup>10</sup> in their study conducted among the cases with cervical spondylosis found that dizziness was reported by 50% of their study population. Colledge et al<sup>11</sup> reported cervical spondylosis as an important cause of dizziness in 65% of their study population. Cervicogenic dizziness was found to be reported more commonly among the cases with cervical spondylosis.<sup>12</sup> Due to the increasing burden of vertigo among the cases with cervical spondylosis, it is important to assess its burden from time to time in different populations. Hence, this study was planned to find the incidence of cervical spondylosis among cases with vertigo and to assess the clinical factors associated with it.

## Materials and Methods

A hospital-based comparative case-control study was conducted among cases with peripheral vertigo attending the outpatient department of otorhinolaryngology at Chettinad Hospital and Research Institute, Chennai, Tamil Nadu, India, during the months of November 2020 to March 2021. Patients who attend the outpatient department of otorhinolaryngology with symptoms of peripheral vertigo were included in this study. Patients below the age of 40 years and above the age of 65 years and cases with central vertigo were excluded from the study. Based on literature considering the prevalence of cervical spondylosis as 13% among cases with vertigo with 95% confidence interval and 5% absolute precision, the sample size was calculated as 174. Hence, it was rounded and a total of 180 participants were included as cases with vertigo and another 180 controls without vertigo, in the study. Also, the comparison group was matched for age and gender. This study was approved by the institutional ethics committee. Written informed con-

sent was obtained from the study participants before conducting the study.

Patient's history was collected and they were examined clinically by the principle investigator. Also, all the cases underwent X-ray of cervical spine (C spine) and radiologist report was obtained for the same. Pure-tone audiometry (PTA) and impedance audiometry were performed to assess the hearing loss for all the study participants. The primary outcome assessed was the prevalence of cervical spondylosis among cases with vertigo and the secondary outcome was to assess the clinical characteristics of the study participants and factors associated with the presence of cervical spondylosis. All the data was entered in a pro forma and the same was entered in Microsoft Excel sheet.

Data from the Microsoft Excel sheet was converted to Statistical Package for Social Sciences (SPSS) and the analysis was done using SPSS version 20. Chi-square test was done to assess the association between two variables. A *p*-value of  $\leq 0.05$  was considered as statistically significant.

## Results

Among the study participants, 28.3, 25.6, 20.6, 16.1, and 9.4% were between the age group of 51 to 55, 56 to 60, 46 to 50, 41 to 45, and above 60 years of age, respectively. In this study, 53.3% of the participants were females. Cases with vertigo and controls without vertigo were matched for age and gender.

Based on the body mass index (BMI), 60.6% of the participants were found to have normal BMI while 28.3 and 11.1% participants were under overweight and obese category, respectively. However, the association between cases and controls with respect to BMI was insignificant. Along with vertigo chronic illness like diabetes mellitus, hypertension, dyslipidemia, and hypothyroidism were present among 11.7, 13.3, 8.9, and 2.9% of the participants, respectively. However, the proportional difference in various chronic illnesses was found to be insignificant.

The otoscopic finding was found to be normal among 60% participants whereas 19.4% had impacted cerumen auris, 10.6% of the participants presented with otitis media, while 10.6% of the participants had perforated tympanic membrane. Also, the association between the otoscopic findings among the cases with vertigo and controls without vertigo was significant (► **Table 1**).

The most common cause of vertigo in this study was found to be otologic causes (43.3%), followed by cardiovascular causes (30.6%). Cervical spondylosis was the cause for vertigo among 17.2% of the participants, for 6.7% participants the cause was neurologic, and metabolic causes was the reason for vertigo among 2.2% of the participants (► **Table 2**).

On assessing the audiologic parameters PTA was found to be abnormal among 12.2% of the participants, level of involvement was bilateral among 59.1% participants and unilateral among 40.9% of the participants. Conductive hearing loss was found in 13.6% of the cases and sensorineural hearing loss was found in 63.6% of the cases. Mixed hearing loss was seen in 22.7% of the cases in this study. Degree of

**Table 1** Background characteristics of the study participants

Characteristics	Cases with vertigo Frequency (%)	Controls without vertigo Frequency (%)	p-Value
Age group (y)			
41–45	29 (16.1)	29 (16.1)	1.000
46–50	37 (20.6)	37 (20.6)	
51–55	51 (28.3)	51 (28.3)	
56–60	46 (25.6)	46 (25.6)	
> 60	17 (9.4)	17 (9.4)	
Gender			
Male	29 (16.1)	29 (16.1)	1.000
Female	37 (20.6)	37 (20.6)	
BMI			
Normal	109 (60.6)	121 (67.2)	0.279
Overweight	51 (28.3)	38 (21.1)	
Obese	20 (11.1)	21 (11.7)	
Chronic illnesses			
Diabetes mellitus	21 (11.7)	23 (12.8)	0.751
Hypertension	24 (13.3)	20 (11.1)	0.524
Dyslipidemia	16 (8.9)	20 (11.1)	0.487
Hypothyroidism	5 (2.8)	3 (1.7)	0.482
Otoscope findings			
Normal	108 (60)	132 (73.3)	< 0.001 <sup>a</sup>
Impacted cerumen auris	35 (19.4)	46 (25.6)	
Otitis media	18 (10)	1 (0.6)	
Perforated tympanic membrane	19 (10.6)	1 (0.6)	

Abbreviation: BMI, body mass index.

<sup>a</sup>Statistically significant.

hearing loss was found to be mild, moderate, severe, and profound among 22.7, 45.5, 22.7, and 9.1% of the participants, respectively. Among the controls without vertigo none had abnormal PTA findings (→ **Table 3**).

In this study, the prevalence of cervical spondylosis was reported as 17.2% among the cases with vertigo and none among the controls without vertigo. Association between age and cervical spondylosis was found to be statistically insignificant ( $p$ -value > 0.05), there was no statistical significant association found for gender and cervical spondylosis ( $p$ -value > 0.05).

**Table 2** Proportion of participants based on the causes for vertigo

Cause of vertigo	Frequency	Percentage
Otologic	78	43.3
Cardiovascular	55	30.6
Cervical spondylosis	31	17.2
Neurologic	12	6.7
Metabolic	4	2.2

Association between BMI and cervical spondylosis was found to be statistically insignificant ( $p$ -value 0.7733). There were no statistically significant associations found between chronic illnesses like diabetes mellitus, hypertension, dyslipidemia, and hypothyroidism and cervical spondylosis ( $p$ -values > 0.05). Likewise, there was no statistical significance found for otoscopic findings and cervical spondylosis ( $p$ -value > 0.05). There was high statistical significant association found between PTA findings and cervical spondylosis in our study with  $p$ -value  $\leq$  0.05 (→ **Table 4**).

## Discussion

In the present study, the prevalence of cervical spondylosis among the cases with vertigo was 17.2% and abnormal PTA finding was the only factor found to be associated with cervical spondylosis. The findings of the present study were found to be consistent with the study conducted by Nwaorgu et al<sup>5</sup> who reported that 53.5% of males and 46.5% of females in their study had vertigo in their study. On assessing the radiological findings of these study participants there were 26% of cases with normal C spine X-ray and 74% of cases with C spine X-ray suggestive of cervical

**Table 3** Audiologic characteristics of cases with vertigo

Parameters	Frequency	Percentage
PTA findings		
Abnormal	22	12.2
Normal	158	87.8
Level of involvement		
Bilateral	13	59.1
Unilateral	9	40.9
Type of hearing loss		
Conductive hearing loss	3	13.6
Sensory neural hearing loss	14	63.6
Mixed hearing loss	5	22.7
Degree of hearing loss (db)		
Mild (26–40)	5	22.7
Moderate (41–60)	10	45.5
Severe (61–80)	5	22.7
Profound (> 80)	2	9.1

Abbreviations: db, decibel; PTA, pure-tone audiometry.

spondylosis. Also, they stated that PTA findings were found to be normal in 40% of cases and abnormal in 60% of cases. High-frequency, low-frequency, and both high- and low-frequency sound were affected in 40, 10, and 50% of cases, respectively. They reported that decibel hearing level (dBHL) loss was found to be between 30 and 90 dBHL with a mean decibel hearing loss as  $43 \pm 8.5$  dBHL. However, Kumar and Prasad<sup>13</sup> conducted a study to assess the different etiologies of vertigo and reported that in their study cervical spondylosis was reported among 2.1% of cases.

In another study, Bayrak et al<sup>14</sup> conducted a study and reported that based on the assessment of total degeneration scores no differences were observed between the patients with vertigo and without vertigo. The mean difference in total degeneration scores among the cases with and without vertigo was found to be statistically insignificant. Olszewski et al<sup>15</sup> in their study stated that they found a statistically significant association between the flow velocity in the basilar artery and prevalence of vertigo, grade of radiological changes. They also reported that all the cases with high-grade cervical spondylosis were found to have complaints of vertigo.

**Table 4** Association between different clinical parameters and cervical spondylosis among cases with vertigo

Parameters	Cervical spondylosis		Total	p-Value
	Present n = 31	Absent n = 149		
Age group (y)				
41–45	01 (3.2)	28 (18.8)	29	0.1505
46–50	07 (22.6)	30 (20.1)	37	
51–55	13 (41.9)	38 (25.5)	51	
56–60	08 (25.8)	38 (25.5)	46	
> 60	02 (6.5)	15 (10.1)	17	
Gender				
Male	13 (41.9)	71 (47.7)	84	0.5616
Female	18 (58.1)	78 (52.3)	96	
BMI				
Normal	17 (54.8)	92 (61.7)	109	0.7733
Overweight	10 (32.3)	41 (27.5)	51	
Obese	04 (12.9)	16 (10.7)	20	
Chronic illnesses				
Diabetes mellitus	6 (19.4)	15 (10.1)	21	0.1439
Hypertension	5 (16.1)	19 (12.8)	24	0.6242
Dyslipidemia	3 (9.7)	13 (8.8)	16	0.8735
Hypothyroidism	1 (3.2)	4 (2.7)	5	0.8780
Otoscope findings				
Abnormal	13 (41.9)	59 (39.6)	72	0.8089
Normal	18 (58.1)	90 (60.4)	108	
PTA findings				
Abnormal	10 (32.3)	12 (8.1)	22	0.0001 <sup>a</sup>
Normal	21 (67.7)	137 (91.9)	158	

Abbreviations: BMI, body mass index; PTA, pure-tone audiometry.

<sup>a</sup>Statistically significant.

Yang et al<sup>16</sup> conducted a case-control study in Taiwan to assess the association of cervical spondylosis and peripheral vertigo. They reported that a statistically significant difference was noted among the cases with cervical spondylosis and cases with peripheral vertigo compared with the controls without cervical spondylosis. Also, they stated that the odds of cervical spondylosis were high among the cases with peripheral vertigo who were aged between 45 and 64 years of age. Kadaňka et al<sup>17</sup> conducted a study and reported that the vertigo in the past 6 months was reported by 47% of cases with cervical spondylosis. However, none of these cases were found to have significant stenosis of the vertebral arteries.

Also, Konopka et al<sup>18</sup> conducted a study to assess the hearing in people with vertigo and reported that audiometric testing was found to be impaired in 55.9% of cases with vertigo. In their study they included 73 cases with vertigo of vascular origin and among them bilateral cochlear lesion was noted in 33 cases and unilateral cochlear lesion in 9 cases. Also, among the 8 cases with cervical ankylosing spondylitis, there were 3 cases with cochlear hearing loss.

This study was conducted in a single health care center which might restrict the study population; however, if conducted as a multicentric study, the results would have been much appropriate.

## Conclusion

We found that the prevalence of cervical spondylosis among the cases with vertigo was 17.2% and abnormal PTA finding was found to be associated with the presence of cervical spondylosis. This shows that there is an inevitable need to conduct further research on the same in different populations, to get a better insight of the burden of cervical spondylosis among cases with vertigo. Further comparative studies among cases with vertigo and without vertigo are recommended to assess the odds of cases with vertigo for developing cervical spondylosis. Also, this study shows the importance of doing PTA in routine practice for all the cases with vertigo due to cervical spondylosis.

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