

Original Research Article

The prevalence of vertigo among high school students and an evaluation of quality of life

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ABSTRACT

Background: The purpose of the study is to determine the prevalence of vertigo among secondary and high school students, to examine the variables thought to be related and to evaluate the quality of life.

Methods: This study was carried out between 1st November-30th December 2016 on secondary and high school students in Beylikova and Sivrihisar counties which is located at the research area of the Department of Public Health Eskisehir Osmangazi University. Those who had dizziness within the last three months have been assumed as having vertigo. Visual Analog Scale has been used in order to evaluate the severity of vertigo. The life quality of children has been evaluated through Quality of Life Scale (QoL) for Children.

Results: The study group has been composed of 911 males (46.5%) and 1.047 females (53.5%). The prevalence of vertigo has been determined as 30.8%. The most common concomitant symptoms of students are headache (22.6%), staggering while walking (15.8%), and tinnitus (10.3%). It has been found that the QoL of students having complaints of vertigo is lower than that of those not having complaints of vertigo. The most common type of vertigo within the study group has been Orthostatic Dizziness (70.0%). There has been no correlation between types of vertigo and QoL; however, when the severity of vertigo is considered, it has been found within our study group that the QoL of the students having mild vertigo is higher than that of those having moderate or higher severity of vertigo ($p < 0.05$).

Conclusions: Vertigo is one of the most common symptoms among children and adolescents and may result from many factors. It may be useful to carry out screening with the purpose of early diagnosis and treatment parentheses, direct diagnosed cases to specialist physicians and organize events to create awareness. More comprehensive studies are needed to reveal the relationship between vertigo and QoL.

Keywords: Semi rural area, Students, Vertigo

INTRODUCTION

Vertigo is a motion hallucination and is a concept used to define the impairment of spatial orientation.^{1,2} Spinning vertigo, swaying vertigo, orthostatic dizziness and

unspecified dizziness are the four types of vertigo and the most common type seen in adolescents is orthostatic dizziness.³ The deterioration of functions of visual, vestibular and proprioceptive systems or the coordination between these systems play role in its etiology.⁴ Otitis

media and middle ear effusion the most common factors that cause vertigo in childhood.⁵ Among other factors are trauma history, infection, malign diseases in central nervous system, migraine, benign paroxysmal vertigo and psychosomatic disorders.⁶ Headache and tinnitus are most prevalent symptoms accompanying dizziness.¹ Besides, the complaints such as ataxia, anorexia, vomiting, stomach-ache, headache, diplopia, abnormal movements in eyes, loss of hearing, tinnitus, earache, and ear discharge could be counted as other complaints.⁴ It is not an easy task to evaluate vertigo in childhood. Since having limited vocabulary and communication skills and thus not being able to express their complaints in detail, many child patients can not completely tell their history and are not diagnosed properly.^{6,7} While the prevalence of vertigo in childhood is lower than those of adults, the prevalence increases in adolescents.¹ Various studies in some countries report that the prevalence of vertigo among children and adolescents vary from 1.5% to 15.0%.⁸⁻¹⁰

It is known that the quality of life is negatively affected by vertigo in especially childhood. The quality of life is perceiving one's own status within the culture, way of living, and ethos and it is a concept that includes an individual's psychological state, physical condition, social relations in and outside the family, peripheral influence, and belief.¹¹ Dizziness in children usually gives rise to deterioration of daily activities, absenteeism in school, social isolation and therefore the impairment of life quality.^{12,13}

This study has been carried out in order to determine the prevalence of vertigo among secondary and high school students in Sivrihisar and Beylikova counties, examine the variables thought as related and evaluate the life quality of students.

METHODS

This cross-sectional study was carried out between 1st November 2016 and 30th December 2016 on secondary and high school students in Beylikova and Sivrihisar counties which is located at the research area of the Department of Public Health of Faculty of Medicine at Eskisehir Osmangazi University. According to the 2015 data of Turkish Statistical Institute, the population of Beylikova is 6,091, of which 3,049 (50.1%) is female and 3,042 (49.9%) is male. The population of Sivrihisar contains 10,587 (49.8%) female and 10,678 (50.2%) male, corresponding to a total of 21,265 (TUİE, 2015).¹⁴ The main means of living and source of income for both counties are agriculture and stock-breeding.^{15,16}

There are a total of 2,669 students, 586 students in 4 high schools and 3 secondary schools from Beylikova and 2,083 students in 8 high school and 3 secondary schools from Sivrihisar, in both counties. The study group is composed of 1,958 (73.3%) students.

A survey form which is coherent with purposes of the study has been prepared by making use of the literature.^{5,6,17-20} This survey form contains questions related to Visual Analog Scale (VAS) Quality of Life Scale for Children (QoL-C) used for grading the severity of vertigo such as some sociodemographic features (school, class, age, sex, type of personality, family type, family income status) of children, the existence and type of vertigo and factors thought as related to vertigo (smoking, hearing disorder, vision disorder, history of a Physician diagnosed disease that requires continuous medication use, repeated back / neck pain history within the last year, history of car sickness while traveling, head trauma history within the last year, history of experiencing a sad event within the last year, vertigo related to lifting heavy things, and history of vertigo within the family), and the existence of concomitant symptoms for vertigo (headache, nausea-vomiting, hearing impairment, tinnitus, pressure sensation in ears, loss of sensation in hand, arm and leg, staggering while walking, diplopia, photophobia, redness, burning or irritation of eyes and excessive sweating).

The study has been carried out with the approval of Ethics Committee of Non-Invasive Clinical Research of Eskisehir Osmangazi University, dated 15th August 2016 with the registration number of 80552721/G-236. The necessary approvals for collecting the data from schools have been granted from Eskisehir Provincial Directorate for National Education and District Directorate of National Education. The necessary appointments have been made for suitable days and times by meeting with the directors of the schools which were within the scope of the study. The research team have gone to schools on determined days and times and collected students in their own classrooms. The students were informed about the scope and purposes of the study and then oral consent have been taken from those who agreed to take part in the study. The survey forms which were prepared before were filled by the students on their own under supervision in about 20-25 minutes.

Those who had dizziness within the last three months have been assumed as having vertigo. If the dizziness is similar to rotating of merry-go-round, the type has been assumed as Spinning Vertigo. If the dizziness is similar to swaying of a small boat, the type has been assumed as Swaying Vertigo. Should the dizziness occur when standing up quickly and is accompanied by greyout, then, it has been assumed as Orthostatic Dizziness. The types of dizziness other than these definitions are accepted as Unspecific Dizziness.

Visual Analog Scale (VAS) has been used in order to evaluate the severity of vertigo. This scale is used for converting some values into quantitative results which are impossible to measure numerically. At the one end of the scale is written "no vertigo" and the expression of very severe vertigo is written at the other end. The

students have been asked to mark their condition on the 100 mm line of the scale.^{18,19}

The life quality of the children has been measured through Quality of Life Scale for Children (QoL-C). This scale was developed by Varni et al in 1999 and the reliability and validity tests of Turkish version of the scale were carried out by Çakm Memik et al in 2005. Developed for evaluating the life quality of children, the scale is composed of 23 questions all of which are 5 point-likert type and each question is scored between 0 and 100 points. The possible answers for questions are never, rarely, sometimes, usually, and almost always and the points for these answers are 100, 75, 50, and 25, respectively. The final score for the scale varies from 0 to 2300 and the higher the score is, the higher is the quality of life related to health.^{20,21}

The students who smoke at least once a day are accepted as a smoker.²² The family income status is evaluated as lower, medium or higher according to self-perceptions of the students. Those who have defined themselves as flurried, enthusiastic, and impatient have been accepted as type A personality while those defining themselves as quite, patient, and organized have been accepted as type B personality.²³

The collected data have been assessed via IBM SPSS (version 20.0) statistics software. The analyses have been

carried out through Chi-Square, Mann-Whitney U, and Kruskal Wallis tests and Logistic Regression Backward: Wald method. The statistical significance value has been accepted as $p \leq 0.05$.

RESULTS

The study group has been composed of 911 males (46.5%) and 1.047 females (53.5%). The age range is between 10 and 19 and the mean age (Mean \pm SD) is 14.60 \pm 2.23. Of the students 416 (21.3%) are at or below 12 years of age, 750 (38.3%) students are between 13-15 years and 792 (40.4%) students are at or above 16. The prevalence of vertigo has been determined as 30.8% (n=603). The distribution of participants in terms of some sociodemographic features has been given in Table 1.

The Logistic Regression Analysis has been carried out with the variables determined to be related to vertigo after Chi-Square analysis such as school type, age group, gender, type of personality, type of family, family income status, smoking, hearing disorder, vision disorder, history of physician diagnosed disease that requires continuous medication use, history of car sickness while traveling, repeated back/neck pain history within the last year, history of head trauma, experiencing a sad event, flu-cold, sinusitis, otitis media, and tonsillitis within the last year and Body-Mass-Index (BMI). The results of the analysis have been given in Table 2.

Table 1: The distribution of participants in terms of some sociodemographic characteristics.

Sociodemographic characteristics	N	%
School type		
Secondary School	873	44.6
High School	1085	55.4
Age		
≤ 12	416	21.3
13-15	750	38.3
≥ 16	792	40.4
Sex		
Male	911	46.5
Female	1047	53.5
Type of Personality		
Type A	1314	67.1
Type B	644	32.9
Family type		
Nuclear	1546	79.0
Extented	305	15.5
Fragmented	107	5.5
Family income status		
Good	586	29.9
Moderate	1301	66.4
Bad	71	3.7
Total	1958	100.0

Table 2: The results of the Logistic Regression Model (step final).

Variables	β	SE ^a	P value	OR ^b	%95 CI ^c
Age (ref: ≤ 12)					
13-15	0.819	0.173	0.000	2.268	1.617-3.181
≥ 16	0.758	0.174	0.000	2.133	1.517-3.000
Sex (ref: Male)					
Female	0.309	0.119	0.009	1.362	1.080-1.719
Type of Personality (ref: B)					
A type	0.280	0.124	0.024	1.324	1.038-1.688
Hearing disorder (ref: None)					
Yes	1.087	0.295	0.000	2.965	1.664-5.282
Vision disorder (ref: None)					
Yes	0.309	0.139	0.027	1.362	1.037-1.790
History of physician diagnosed disease that requires continuous medication use (ref: None)					
Yes	0.477	0.190	0.012	1.611	1.110-2.337
History of repeated back / neck pain history within the last year (ref: None)					
Yes	0.833	0.117	0.000	2.300	1.828- 2.894
History of car sickness while traveling (ref: None)					
Yes	0.680	0.118	0.000	1.974	1.566-2.490
Head trauma history within the last year (ref: None)					
Yes	0.960	0.135	0.000	2.612	2.006-3.400
History of experiencing a sad event within the last year (ref: None)					
Yes	0.544	0.122	0.000	1.722	1.355-2.189
Influenza-cold history within the last year (ref: None)					
Yes	0.389	0.127	0.002	1.476	1.152-1.892
Sinusitis history within the last year (ref: None)					
Yes	0.639	0.158	0.000	1.895	1.389-2.585
Tonsillite history within the last year (ref: None)					
Yes	0.615	0.216	0.004	1.849	1.211-2.824
Constant	-3.414	0.212	0.000	-	-

SE^a: Standard error, OR^b: Odd's ratio, CI^c: Confidence interval**Table 3: The distribution of concomitant symptoms in students complaining of vertigo.**

Symptoms	n*	%
Headache	357	22.6
Nausea-vomiting	140	8.8
Hearing impairment	42	2.6
Tinnitus	164	10.3
Pressure sensation in ears	118	7.4
Loss of sensation in hand, arm and leg	143	9.0
Staggering while walking	251	15.8
Diplopia	86	5.4
Photophobia	132	8.3
Redness, burning or irritation of eyes	64	4.0
Excessive sweating	66	4.2
Other	25	1.6
Total	1588	100.0

*Symptoms were assessed based on frequencies.

The most common concomitant symptoms of students within the study group have been headache (22.6%), staggering while walking (15.8%), and tinnitus (10.3%).

The distribution of concomitant symptoms in students complaining of vertigo is given in Table 3.

Table 4: The distribution of students with and without complaints of vertigo in terms of average QoL-C scores.

Vertigo	n (%)	QoL-C scores Median (min-max)
None	1355 (69.2)	1950 (0-2300)
Yes	603 (30.8)	1725 (400-2300)
Total	1958 (100.0)	1886 (0-2300)

z=15.669; p=0.001

Table 5: The distribution of average QoL-C scores of the students complaining of vertigo in terms of vertigo types.

Vertigo Type	n (%)	QoL-C scores Median (min-max)
Spinning Vertigo	56 (9.0)	1787.5 (400-2300)
Swaying Vertigo	57 (10.0)	1650 (925-2225)
Ortostatik Dizziness	422 (70.0)	1725 (400-2300)
Unspesifik Dizziness	68 (11.0)	1712.5 (800-2250)
Total	603(100.0)	1725 (400-2300)

KW= 3.610; p=0.307

The QoL-C scores of the students varies from 0 to 2300 and the average score is 1886. The distribution of students with and without complaints of vertigo in terms of average QoL-C scores is given in Table 4.

The most common vertigo type within the study group has been determined as Orthostatic Dizziness (70.0%). The distribution of types of vertigo within the study group is given in Figure 1.

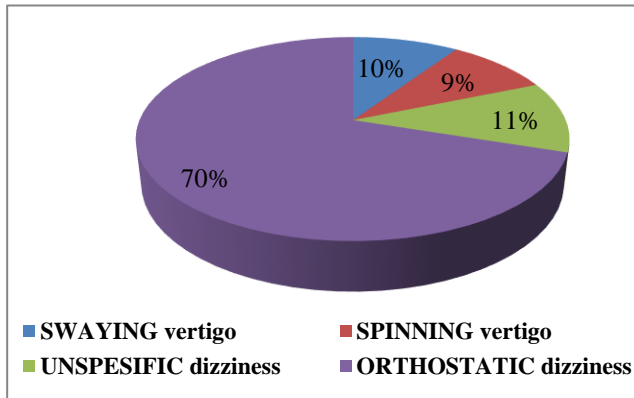


Figure 1: The distribution of types of vertigo within the study group.

The QoL-C scores of the students vary from 400 to 2300 and the average score is 1725. The distribution of average QoL-C scores of the students complaining of vertigo in terms of vertigo types is given in Table 5.

It has been found out that 603 of the students have complaints of vertigo. Of these students, 155 (25.7%) have mild, 390 (64.7%) have moderate and 58 (9.6%) have severe vertigo. The distribution of average QoL-C scores in terms of vertigo severity is given in Table 6.

Table 6: The distribution of average QoL-C scores in terms of vertigo severity.

Vertigo Severity	n (%)	QoL-C scores Median (min-max)
Mild	155 (25.7)	1850 (400-2300)
Moderate	390 (64.7)	1700 (400-2300)
Severe	58 (9.6)	1600 (400-2200)
Total	603 (100.0)	1725 (400-2300)

KW=26.057; p=0.001

DISCUSSION

Vertigo is a life-damaging symptom and is among the most common reasons for admitting to neurology and otorhinolaryngology clinics and even to emergency services, thus increasing the burden of healthcare system.²⁴

The prevalence of vertigo has been determined as 30.8% within this study. Several studies report that the

prevalence of vertigo varies between 1.5% and 15.0%.⁸⁻¹⁰ Similarly, in a study investigating dizziness within the last 3 months, it has been reported that 72% of adolescents has experienced at least one vertigo attack.³ The reason of different values for the prevalence of vertigo in different studies may stem from the variety in questions, criteria and period.

The prevalence of vertigo is expected to increase in adult population due to such reasons as decreasing baroreceptor’s sensitivity, deterioration of cardiac-arterial conformity, and renal dysfunction.²⁵ Since physical examination and anamnesis are still the most important diagnosis methods for vertigo despite technological advances in childhood, diagnosing vertigo in children is a difficult task due to the problems in communicating with them and their inability to express their complaints²⁶. Therefore, the prevalence of vertigo is expected to increase with increasing age.^{9,27} Being 13 and above is determined as an important risk factor for vertigo within our study (p<0.05). Szirmai et al, and Li CM el al, have reported similar results in their studies.^{5,9}

It is estimated that particularly in premenstrual, gestation, breast-feeding periods, female sex steroids cause cerebrospinal fluid to increase and thus deteriorating the fluid balance in middle ear resulting in vertigo.²⁸ Besides, more cases of vertigo are anticipated to be seen in women due to higher prevalence of some health problems such as headache/migraine and anaemia.⁹ It has been found out within this study that the prevalence of vertigo is 1.36 times higher in females than males (p<0.05). It has been stated that the prevalence of vertigo is higher than females than males as well while in two other studies, it has been determined that there is no difference in terms of vertigo prevalence between females and males.^{3,8,9}

The prevalence of vestibular problems in persons with hearing loss and the prevalence of hearing problems in persons with vestibular problems make us think that the etiological factors (genetic factors, infections, etc.) which cause deterioration of cochlear and vestibularend organs induce similar dysfunctions in middle ear.^{29,30} The prevalence of vertigo has been found 2.97 times higher in persons with hearing loss within our study. Some other studies also report that the prevalence of vertigo is higher in children with hearing loss.^{9,30,31} The reason of vertigo in children may be induced from ocular reasons.^{32,33} It has been stated that more than 5% of patients had ocular problems while neurological and vestibular tests were normal.³⁴ The prevalence of vertigo was also reported to be higher in children with vision problems in the public-based study carried out in the USA.⁹ Our study has yielded similar results with 1.36 times higher prevalence of vertigo in children with vision impairments than those without vision problems.

The most common concomitant symptoms of students within the study group have been headache (22.6%), staggering while walking (15.8%), and tinnitus (10.3%).

Another study reported that three most common concomitant symptoms of vertigo were headache (65.5%), tinnitus (49.1%), and nausea-vomiting (47.2%).⁶ It has been indicated in a study that the most common complaint of children and adolescents with vertigo when being admitted to clinics was headache.³⁵ It is known that almost half of children with vertigo have complaints of headache and migraine is the most common reason for paediatric headaches.³⁶⁻³⁸ While the pathophysiology between migraine and vertigo is not known exactly, it is suggested that vasospasm during migraine attacks cause ischemia in vestibular system and thus inducing a neurochemical instability.^{39,40}

It is thought that the reason of motion sickness is intersensoric incompatibility between visual and vestibular system. Therefore, it is more possible for individuals with motion sickness to have other vestibular problems.^{41,42} In our study, the prevalence of vertigo in patients with motion sickness history has been 1.97 times higher than those without motion sickness.

It has been reported in different studies that patients with history of motion sickness have vertigo and in the study, it has been stated that 70% patients within the study group had history of motion sickness.^{36,43,44}

Dizziness and balance problems could be nonspecific symptoms of many disorders such as neurological diseases, musculoskeletal and metabolic system disorders. In the study of Li et al carried out in the USA, it has been reported that 32.8% of children with vertigo had physician diagnosed neurological disorder, history of physician-prescribed medicine use, and at least one metabolic disease such as hypoglycaemia and it has been stated that the percent of accompanying disease rose to 59.6 as the severity of vertigo increased. Similarly, vertigo could be a sign of such serious clinical cases as hypothyroid and epilepsy.^{9,45} The similar literature supporting results have been obtained in our study and the existence of history of a physician diagnosed disease which necessitates continuous medicine use has been found as an important risk factor for vertigo. For this reason, clinicians should carry out more detailed physical examination and consider differentiating symptoms against other diseases since children with vertigo have difficulty in expressing symptoms they experience.

Cranial trauma is frequently seen in childhood and vertigo is one of the important symptoms of this case when being admitted to clinics.⁴⁶ Though the aetiology of vertigo induced after trauma is not known exactly, it is thought that the pressure on vertebral artery, damaging of cervical vertebrae, and neuromuscular or neurovascular mechanisms play role in this case.³⁶ Moreover, since vertigo could be a symptom of temporal bone fracture and/or perilymphatic fistula, children with head trauma should be examined more extensively.⁴ It has been indicated that in some studies that head trauma plays role in the aetiology of vertigo.^{6,26,36} The similar results have

been obtained through our study and it has been found out that the prevalence of vertigo in children with the history of head trauma within the last year has been 2.61 times higher ($p < 0.05$). Upper respiratory tract infections are frequently seen in childhood and they are usually induced due to viral reasons.⁴⁷ When combined with the dysfunction of Eustachian tube, otitis media, labyrinthitis, and vestibular neuritis, both upper respiratory tract and systemic viral infections could induce vertigo.^{36,48} The prevalence of vertigo has been higher in children who declared having had any type of upper respiratory tract infections such as flucold (1.476), sinusitis (1.895), and tonsillitis within the last year. In the study in which they studied the aetiology of vertigo, the most common reason for vertigo was found as the history of viral infection.³⁶ In another study carried out children with vertigo diagnosed with vestibular neuritis/labyrinthitis had a history of viral upper respiratory tract infection before complaining of vertigo.⁴³

Orthostatic dizziness has been the most common (70.0%) type of vertigo within the study group. Similarly, Langhagen et al. has reported in their study that orthostatic dizziness has been the most common type of vertigo in adolescents.³ Other studies report that the vertigo associated with benign paroxysmal vertigo, vestibular migraine, and otitis media/middle ear effusion is three most common types of paediatric vertigo while orthostatic reasons have been less observed.^{4,49} Orthostatic dizziness is particularly induced in fast growing-up period with sudden changes in body position and usually lasts for several seconds/minutes and the vestibular tests are normal.⁴ While orthostatic dizziness is the most common type of vertigo in public-based studies, that is not the case in clinical studies carried out on diagnosed patients due to few numbers of admittance to clinics since symptoms are transient and this type of vertigo is less affecting patients than other types of vertigo.

Vision, somatosensorial, and proprioceptive systems in cervical spine are of extreme importance for posture against gravity and maintaining balance and stability.⁵⁰ Therefore, it is assumed that disorders associated with bone, joints and muscles in neck region could induce vertigo by disturbing cervical proprioception, creating cervical sympathetic dysfunction and causing pressure on vertebral artery.⁵¹⁻⁵⁴

Within our study, the prevalence of vertigo has been 2.30 times higher in patients with the history of recurring back/neck pain within the last year than those without the same history. There are other studies reporting similar results.⁵³⁻⁵⁵

Individuals having Type-A personality is aggressive, impatient, and workaholic and experience more stress levels.⁵⁶ Stress could affect central vestibular system directly through glucocorticoid pathway or indirectly through stress-associated neuroactive mediators

(histamine, etc.). Besides, increased stress hormones could induce forming or increasing of vestibular symptoms by affecting inner ear homeostasis or deteriorating peripheral vestibular end-organs and cochlear functions.^{57,58} Therefore, the expectancy of the prevalence of vertigo is higher in individuals with Type-A personality and in cases when stress levels increase. Our study has yielded similar results by finding out that both having Type-A personality and experiencing a distressing event within the last year is an important risk factor for vertigo. Similarly, Monzai et al. have indicated that experiencing a distressing event within the last year increased the prevalence of vertigo compared with patients who did not experience a sad event.⁵⁹

Vertigo makes people more worried by making them anxious about an unforeseen attack or an underlying disease. This worrying situation causes functional limitations in daily life activities and personal task or care which necessitate quick adjusting of balance even in asymptomatic individuals by decreasing motor capacity and creating psychological stress. In two different studies, it has been observed that children with vertigo spend more time in bed and therefore having much absenteeism in school and limited social activities.^{3,9} Consequently, vertigo spoils the life quality of individuals by negatively affecting family, professional and social life. It has been determined that children with vertigo has lower quality of life ($p < 0.05$).

Moreover, it has been found within our study group that the life quality of the students having mild vertigo is higher than that of those having moderate or higher severity of vertigo. In their similar study, they have reported that individuals with vertigo have lower quality of life than that of general population and as the symptoms increase, the quality of life decreases.⁶⁰ There are other studies indicating that the life quality of persons with vertigo is lower than that of other people who have not.^{61,62}

This study is of cross-sectional type which is limitation of this study. Also, the study has only been carried out in semi-rural area of a city. No audiometric or tomographic investigations have been executed.

CONCLUSION

The prevalence of vertigo has been determined as 30.8% ($n=603$). Factors such as age group, sex, type of personality, hearing disorder, vision disorder, history of physician diagnosed disease that requires continuous medication use, history of car sickness while traveling, history of repeated back / neck pain history within the last year, history of experiencing a sad event within the last year, influenza or cold, sinusitis and tonsillitis within the last year have been found as important risk factors for vertigo ($p < 0.05$ for each). The most common concomitant symptoms of students are headache (22.6%), staggering while walking (15.8%), and tinnitus (10.3%).

It has been found that the life quality of students having complaints of vertigo is lower than that of those not having complaints of vertigo ($p < 0.05$ for each). The most common type of vertigo within the study group has been Orthostatic Dizziness (70.0%). There has been no correlation between types of vertigo and life quality ($p > 0.05$); however, when the severity of vertigo is considered, it has been found within our study group that the life quality of the students having mild vertigo is higher than that of those having moderate or higher severity of vertigo ($p < 0.05$).

Vertigo is one of the most common symptoms among children and adolescents and may result from many factors. It is usually stated as having no relationship with important diseases and generally heals spontaneously. However, it sometimes associated with very serious neurological diseases.

Recommendations

It may be useful to carry out screening with the purpose of early diagnosis and treatment, direct diagnosed cases to specialist physicians and organize events to create awareness. More comprehensive studies are needed to reveal the relationship between vertigo and quality of life.

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