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Original Article

Evaluation of symptomatological and hematological aspects of patients with dizziness in a sample of 744 subjects

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ABSTRACT

Aim: To evaluate the hematologic parameters and subgroups that may be useful in the treatment approach of patients presenting with dizziness, together with their symptomatological features.

Methods: 744 participants between the ages of 20-80 were included in this study. The participants were randomly divided into six groups. Participants' gender, educational levels, ages, comorbidities, symptomatological evaluations, complete blood count values, levels of the main electrolytes, kidney function tests, liver function tests, B12 vitamin level and ferritin and thyroid gland function values were investigated.

Results: There were statistically significant differences between some age groups in terms of white blood cell, hemoglobin, hematocrit, neutrophil, glucose, sT4, Na, K, aspartate aminotransferase, and creatinine levels. Study participants described their current dizziness as a feeling of shaking in their heads (5.4%), as if their surroundings are spinning around them (31.2%), imbalance and feeling dizzy (42%), blackening of eyes (1.1%), and as if they were turning and turning around them (20.4%). One hundred and four of 744 patients were diagnosed with benign paroxysmal positional vertigo (BPPV). At least one additional disease was detected in 392 (52.7%) of the participants.

Conclusion: Dizziness is one of the most common symptoms that should be considered more frequently because it causes a decrease in labor force and impacts significantly on quality of life in the affected individuals. Symptomatological and hematological evaluations are very effective on the treatment approach as well as supporting the diagnosis.

Keywords: Dizziness, vertigo, vestibular disease, vestibulopathy.

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Introduction

Dizziness, is one of the most common complaints in many branches of medical practice including otolaryngology, neurology and emergency medicine clinics. Dizziness affects about 30 % of the general population [1]. About 3 % of the patients aged 25 and over admit to the family physician or emergency services with dizziness [2,3]. Dizziness is more frequently seen in elderly people. Its incidence has been found 30 % in patients over 65 years old. This rate was found to be 50 % in the age

of 85 years and above [4,5]. Different studies have been carried out in the emergency services and in neurologic and otorhinolaryngological units, and peripheral dizziness was detected in 40 %, central pathologies in 10 %, psychiatric pathologies in 15 % and hematologic and systemic causes in 25 % of the patients. Etiological factors also vary according to age. Psychiatric disorders and presyncope are more common in younger ages, whereas central pathologies may be seen more frequently in the elderly [6].

It is also important to evaluate hematological parameters in the differential diagnosis of patients presenting with dizziness. Differential diagnosis can be made by evaluating hemoglobin, white blood cell, leukocyte, neutrophil, lymphocyte, platelet counts, liver function tests, renal function tests, vitamin levels and thyroid function tests [7-9].

Studies on etiology of the dizziness are important because dizziness is very common in the community and as a result it affects a very large part of the society and sometimes it is a symptom of life-threatening diseases. In the present study, etiological and symptomatological features, subgroups and hematological evaluations were performed with the intention to be useful in the management of the patients presenting with dizziness.

Materials and Methods

Study design
The study has been conducted in accordance with the principles of the Helsinki Declaration and approved by the local Institutional Review Board (2018-275/08). In the present study, the data of patients who applied to Ear Nose Throat outpatient clinics with dizziness in the previous year were retrospectively reviewed. Our study was performed with 744 participants between the ages of 20-80. Six age groups were formed in the study. Group 1; (20-30), Group 2; (31-40), Group 3; (41-50), Group 4; (51-60), Group 5 (61-70) and Group 6; (71-80).

Outcome parameters
Participants' gender, educational levels, ages, symptomatologic evaluations, comorbidities, complete blood counts [white blood cell (WBC), hemoglobin (Hb), hematocrit (Htc), neutrophil (Neu) Platelets (Plt), lymphocytes (Lym)], body electrolyte values (Na, K, Ca), kidney function tests (urea, creatinine), hepatic functional tests [aspartate aminotransferase (AST), alanine aminotransferase (ALT), total bilirubin, direct bilirubin], B12 vitamin level, ferritin and thyroid gland function values [thyroid-stimulating hormone (TSH) and free T4] were examined. Besides Dix-Hallpike test scores related to dizziness were also evaluated.

Statistical analysis
In the statistical analysis of the results, the scores were expressed as mean ± standard deviation (SD). Gender, age, educational level, hematological parameters were compared using chi-square test and t-test. *p < 0.05* value was accepted as statistically significant.

Results
Five hundred and sixty women (75.3 %) and 184 men (24.7 %) were included in the study. The mean age of the participants was 45.10 ± 14.372 (range, 20 to 80) years. The mean age of the women was 46.03 ± 14.001 (range, 20 to 75) years. The mean age of males was 42.26 ± 15.256 (range, 20 to 80) years. When age groups were evaluated, 136 participants (18.3 %) in Group 1, 160 (21.5 %) in Group 2, 192 (25.8 %) in Group 3, 152 (20.4 %) in Group 4, 64 (8.6 %) in Group 5, and 40 in Group 6 (5.4 %) were detected.

When the educational levels of the participants were evaluated, 40 (5.4 %) participants were illiterate. 408 (54.8 %) participants were identified as primary school, 184 (24.7 %) as high school, and 112 (15.1 %) as university graduates. No additional disease was detected in 352 of the participants (47.3%) when the existing comorbidities of the patients who presented to our outpatient clinics with dizziness were evaluated. However, the participants had anemia (n=8; 1.1 %), Behçet's disease (n=8; 1.1 %), brain surgery (n=16; 2.2 %), neck hernia (n=192; 13 %), diabetes mellitus (n=40; 5.5 %), epilepsy (n= 16; 2.2 %), Familial Mediterranean Fever (FMF) (n=8; 1.1 %), thyroid dysfunction (n=24; 3.3 %), hypercholesterolemia (n=16; 2.2 %), hypertension (n=104; 14.1 %), migraine headache (n=8; 1.1 %), chronic otitis surgery(n=16; 2.2 %), osteoporosis (n=16; 2.2 %), tachycardia (n=8; 1.1 %) history of head trauma (n=4; 1 %) (Table 1).

Table 1. The existing comorbidities of the patients.

Comorbidities	N	%
Anemia	8	1,1
Behcet 's disease	8	1,1
Brain operation	16	2,2
Neck hernia	96	13
diabetes mellitus	40	5,5
Epilepsy	16	2,2
Familial Mediterranean Fever	8	1,1
Thyroid dysfunction	24	3,3
Hypercholesterolemia	16	2,2
Hypertension	104	14,1
Migraine	8	1,1
Chronic otitis surgery	16	2,2
Osteoporosis	16	2,2
Tachycardia	8	1,1
Head injury	8	1,1
No additional illness	352	47,3
Total	744	100,0

Study participants described their current dizziness as a feeling of shaking in their heads (n=40; 5.4 %), as if their surroundings are spinning around them (n=232; 31.2 %), imbalance and feeling dizzy (n: 312; 42 %), blackening of eyes (n=8; 1.1 %), and as if they were turning and turning around them (n=152; 20.4%) (Table 2).

Table 2. How do participants define dizziness?

How do participants define dizziness?	N	%
Feeling of shaking in their heads	40	5,4
Surroundings are spinning around them	232	31,2
Imbalance and feeling dizzy	312	42
Blackening of eyes	8	1,1
Turning around them	152	20,4
Total	744	100,0

When the Dix-Hallpike test results were evaluated according to the educational level of the participants; 16 (2.2 %) of the participants who had positive findings in the Dix-Hallpike test were illiterate, and the remaining participants were primary school (n=64; 8.6 %) high school (n=8; 1.1 %), and university graduates (n=16; 2.2 %). In 640 (85.9 %) participants, negative findings were found in the Dix-Hallpike test. In addition, the Head Shake test showed positive findings in 8 (1.1 %) high school and 16 (2.2 %). university graduates, while in 720 participants (96.7 %) we did not find any abnormal findings.

Two hundred and sixteen participants (29 %) had tinnitus, while 528 (71 %) participants had not any complaint of tinnitus. In addition, 96 (13 %) participants had hearing loss at certain levels, and 648 (87 %) participants did not have any hearing loss.

Any statistically significant difference was not found in the statistical evaluation of hematological parameters between the groups

in terms of Ca, ALT, total bilirubin, direct bilirubin, B12 vitamin level, ferritin and urea levels *(p > 0.05)*.

Table 3. Ferritin, B12 level, sT4 (free T4) and TSH levels in age groups.

Parameters	Groups*	N	Mean ±SD
TSH	1	136	1,67±0,61
	2	160	1,39±0,76
	3	192	2,14±1,68
	4	152	1,42±0,60
	5	64	2,14±1,57
	6	40	1,79±0,92
sT4	1	136	0,98±0,14
	2	160	0,98±0,22
	3	192	0,95±0,14
	4	152	1,04±0,15
	5	64	0,92±0,24
	6	40	0,91±0,05
B12 vitamin level	1	136	322±167,59
	2	160	276±115,44
	3	192	283±154,78
	4	152	297±165,58
	5	64	272±81,24
	6	40	387±195,62
Ferritin	1	136	20,38±32,49
	2	160	14,08±13,36
	3	192	16,18±16,64
	4	152	15,97±16,73
	5	64	11,20±7,11
	6	40	37,12±54,93

Values: Mean±SD, TSH: Thyroid stimulation hormone, *Group 1; (20-30), Group 2; (31-40), Group 3; (41-50), Group 4; (51-60), Group 5 (61-70) and Group 6; (71-80).

In comparisons between groups in terms of WBC values (Group 1 *vs* Group 2), (Group 1*vs* Group 4), (Group 2*vs* Group 6), (Group 3 *vs* Group 6), (Group 4*vs* Group 6) (p < 0.05) statistically significant intergroup differences were detected. In terms of hemoglobin values, statistically significant intergroup differences were observed; (Group 1*vs* Group 3), (Group 3*vs* Group 4), (Groups 3 *vs* Group 6) (p < 0.05).

In terms of hematocrit values, statistically significant intergroup differences were observed (Group 3 *vs* Group 4), (Group 3 *vs* Group 5), (Group 3 *vs* Group 6) *(p < 0.05)*. In terms of neutrophil counts, statistically significant intergroup differences were observed (Group 1 *vs* Group 4), (Group 1 *vs* Group 6), (Group 2 *vs* Group 6), (Group 3 *vs* Group 4), (Group 4 *vs* Group 6) *(p < 0.05)*. Sodium (Na) values were significantly different between some groups; (Group 2 *vs* Group 5), (Group 3 *vs* Group 5) *(p < 0.05)*. Potassium (K) values were statistically significantly different between some groups; (Group 4 *vs* Group 5), (Group 4 *vs* Group 6) *(p < 0.05)*. AST values were statistically significantly different between some groups (Group 1 *vs* Group 4), (Group 1*vs* Group 5), (Group 3 *vs* Group 4) *(p <0.05)*. Creatinine (cre) values were statistically significantly different between some groups; (Group 1 *vs* Group 2), (Group 1 *vs* Group 3), (Group 1 *vs* Group 4), (Group 1 *vs* Group 5), (Group 1 *vs* Group 6) (p <0.05). In terms of glucose (fasting) values, statistically significant difference was observed between Groups 1, and 4, *(p = 0.021, p < 0.05)*. In terms of TSH values statistically significant differences were observed between Groups 3 and 4 *(p < 0.05)*. In terms of sT4 values statistically significant differences were observed between some groups; (Group 1 *vs* Group 6), (Group 3 *vs* Group 4), (Group 4 *vs* Group 5), (Group 4 *vs* Group 6) *(p < 0.05)*.

WBC, hemoglobin, hematocrit, platelet, neutrophil, ferritin, B12 level, fasting glucose value, s4 and TSH levels, serum electrolyte values (Na, K, Ca), liver function tests (AST, ALT, total bilirubin and direct bilirubin) and the mean ± standard deviation values of kidney function tests (urea, creatinine) were also evaluated within the scope of our study (Table 3 - 6).

Table 4. WBC, Hgb, Htc, Plt, Neutrophil, fasting glucose levels in age groups.

Parameters	Groups*	N	Mean ± SD	Parameters	Groups*	Mean ± SD
WBC	1	136	7,12±1,99	**Neutrophil**	1	4,20±1,52
	2	160	8,68±2,74		2	4,87±2,06
	3	192	7,70±2,32		3	4,19±1,48
	4	152	8,33±2,28		4	5,13±1,77
	5	64	8,01±3,09		5	4,62±2,03
	6	40	6,55±0,82		6	3,57±0,67
Hgb	1	136	13,42±1,65	**Platelet**	1	245±39,83
	2	160	13,23±2,15		2	276±50,63
	3	192	12,69±1,45		3	288±61,64
	4	152	13,60±1,28		4	273±53,14
	5	64	13,66±1,75		5	264±52,97
	6	40	13,50±0,73		6	215±47,51
Hematocrit	1	136	38,93±3,86	**Fasting glucose value**	1	99±22,40
	2	160	38,55±4,79		2	105±22,02
	3	192	37,68±2,76		3	105±20,38
	4	152	39,49±3,06		4	112±26,95
	5	64	40,03±4,13		5	102±18,52
	6	40	40,44±2,25		6	109±19,64

Values: Mean±SD, WBC: White bloodcell, Hgb: Hemoglobin, Htc: Hematocrit, Plt: Platelet, *Group 1; (20-30), Group 2; (31-40), Group 3; (41-50), Group 4; (51-60), Group 5 (61-70) and Group 6; (71-80).

Discussion

Dizziness is one of the most common complaints in the geriatric age group. The prevalence of dizziness in the general population is about 20 % to 30 %. Generally, symptoms and signs are indeterminate, nonspecific, and difficult to identify [10]. Nevertheless, a robust systematic approach can often lead to diagnosis. It may be difficult to establish a satisfactory diagnosis of the cause of vertigo for many physicians. In most cases, laboratory tests and radiological examinations may not be helpful in making a diagnosis. In fact, a detailed history with a systematic approach is the most important component in the evaluation of patients with dizziness. Although the causes of vertigo are mostly due to otologic reasons, it may be related to central, somatosensory, and visual etiologies [11]. In

this study, patients who were admitted to our clinic with central dizziness were excluded from the study. Sociodemographic, hematological and symptomatologic evaluation of 744 patients with dizziness were performed. Five hundred and sixty women (75.3 %) and 184 men (24.7 %) were included in the study. The median age of the study participants was 46 years. The median ages of the women, and men who participated in the study were 46 and 42 years, respectively. In a study conducted with 907 participants, the mean age of the participants was 59 years. Female participants constituted 59 % of the study population [12]. In a different study, 62.8 % of 1194 patients above 70 years of age were female [13]. In the literature, it was determined that patients presenting with dizziness described the

Table 5. Serum electrolyte (Na, K and Ca) levels in age groups.

Parameters	Group*	N	Mean ± SD
Na	1	136	139,12±3,56
	2	160	138,75±2,16
	3	192	138,79±2,84
	4	152	139,68±2,48
	5	64	140,25±2,29
	6	40	140,20±2,61
K	1	136	4,23±0,36
	2	160	4,27±0,33
	3	192	4,25±0,34
	4	152	4,15±0,39
	5	64	4,37±0,22
	6	40	4,44±0,27
Ca	1	136	9,22±0,55
	2	160	9,40±0,60
	3	192	9,38±0,38
	4	152	9,27±0,41
	5	64	9,13±0,46
	6	40	9,62±0,64

Group 1; (20-30), Group 2; (31-40), Group 3; (41-50), Group 4; (51-60), Group 5 (61-70) and Group 6; (71-80).

dizziness as imbalance (16 %), feeling as if they were going to faint (14 %), and drowsiness (10 %) [3]. In another study with 185 patients, 33 % of the patients described dizziness as a drowsy feeling [14]. In this study, we determined that the patients described dizziness as a feeling of drowsiness in 42 %, feeling of everything rotating around them in 31.2 %, and feeling himself rotating in 20.4 % of the patients. Although the changes in the rates of symptoms vary in the literature and when we look at the study, patients generally describe dizziness with similar terms

When the presence of additional diseases with dizziness in patients was evaluated, in a multicenter study of 1092 participants, the effects of comorbidities on the recurrence rates of benign paroxysmal positional vertigo were compared and significant results were obtained. It has been shown that the increase in the number of comorbid diseases also increases the frequency of recurrence [15]. A different study reported that recurrence was observed in 29.3

Table 6. Kidney function tests and hepatic functional tests levels in age groups.

Parameters	Group*	N	Mean ± SD	Parameters	Group*	Mean ± SD
AST	1	136	22,94±4,91	Direct	1	0,11±0,05
	2	160	20,70±9,66	Bilirubin	2	0,13±0,06
	3	192	22,42±9,58		3	0,11±0,05
	4	152	19,11±2,92		4	0,11±0,06
	5	64	19,56±5,62		5	0,10±0,05
	6	40	23,40±6,46		6	0,15±0,07
ALT	1	136	16,53±5,44	Blood urea	1	13,33±3,86
	2	160	20,13±12,41	nitrogen	2	12,43±4,91
	3	192	18,00±9,90	(BUN)	3	12,94±3,69
	4	152	17,11±6,15		4	13,33±3,52
	5	64	18,38±10,78		5	14,18±5,34
	6	40	18,00±5,85		6	15,52±4,83
Total bilirubin	1	136	0,51±0,25	Creatinine	1	0,64±0,09
	2	160	0,54±0,23		2	0,69±0,12
	3	192	0,54±0,26		3	0,69±0,11
	4	152	0,51±0,15		4	0,71±0,18
	5	64	0,55±0,33		5	0,71±0,08
	6	40	0,56±0,22		6	0,74±0,11

% of 475 patients. In patients with recurrence, comorbidities were detected in 72.6 % of the patients. Higher recurrence rates have been reported in patients with HT, DM, cardiovascular system disorders, rhythm disorders, migraine, endocrine disorders and psychiatric disorders [16]. In this study, we evaluated the comorbidity rates of patients presenting with dizziness. In our study, no additional disease was found in 352 (47.3 %) of the participants, while 392 (52.7 %) participants had different additional diseases. This suggests that the incidence of dizziness in patients may be higher in the presence of additional diseases.

In a different study concerning the effect of different levels of education on dizziness and the frequency of referrals to clinics, the educational level of patients admitted with complaints of dizziness was evaluated and patients were found to be university (15 %), primary school (38 %) and high school (11 %) graduates [17]. In this study, we determined that the participants were illiterate (n=40; 5.4 %), primary school (n=408; 54.8 %), high school (n=184; 24.7 %), and university (n=112; 15.1 %) graduates. This phenomenon shows us that the prevalence of dizziness is higher in individuals with primary education level.

When we look at the relationship between differences in educational level and benign paroxysmal positional vertigo (BPPV), in a study conducted with 105 patients diagnosed as BPPV, 21 % of the BPPV patients, and 16 % of 297 BPPV negative patients had higher education levels. However, there were no statistical differences between the two groups [18]. In this study, we identified 64 (62 %) of 104 patients diagnosed with BPPV as primary school and 16 (15 %) of them as university graduates. These results were found to be consistent with the literature. However, we

concluded that there was no relationship between education level and BPPV positivity. Additional pathologies such as tinnitus and hearing loss can also be detected in patients with dizziness [19]. In a study conducted with 400 patients, it was shown that dizziness may be accompanied by tinnitus and hearing loss in 46.9 %, and 38.2 % of the cases, respectively [20]. In our study, tinnitus and hearing loss accompanied dizziness in 29 %, and 13 % of the cases, respectively.

Inflammation and trauma in the neck or head area in BPPV were thought to be possible etiologic factors [21]. In addition, stress-related inflammation may be seen in cases of vertigo-related anxiety. Therefore, the relationship between the diagnosis of BPPV and inflammatory biomarkers in general can be shown [22]. In a study, 114 patients presented with dizziness were diagnosed as peripheral positional vertigo. We found significant differences between patients as for hemogram, biochemistry, vitamin B12 levels, thyroid function tests, urea, creatinine, total bilirubin and direct bilirubin levels [23]. In this study, we did not detect significant differences in terms of Ca, ALT, total bilirubin, direct bilirubin, B12 vitamin level, ferritin and urea levels. However, we found statistically significant differences among various age groups in terms of WBC, hemoglobin, hematocrit, neutrophil counts, fasting glucose value, free T4, Na, K, AST, and creatinine levels.In addition, in this study, 6 different groups were formed for each decade between 20 and 80 years of age. Differences in hematological values among these groups were revealed. When we look at the literature, we did not find any studies evaluating the differences according to age groups.

When the limitations in our study were evaluated; increasing the number of patients in groups and multi-center studies may reveal

more different results. In addition, detailed vestibular tests were not performed in this study. Studies can also be done to compare the results of videonystagmography and caloric test results in age groups.

As a conclusion, dizziness is one of the symptoms that should be considered more frequently because it is often seen in the community and causes a decrease in the quality of work and quality of life in the affected individuals. Symptomatological and hematological evaluations are highly effective on the treatment approach, and they also aid in diagnosis.

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