Diet-Related Quality of Life in Patients with Dizziness and Balance Disorders: Associations with Psychological Distress, Autonomic Dysfunction, and Migraine

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Article

Diet-Related Quality of Life in Patients with Dizziness and Balance Disorders: Associations with Psychological Distress, Autonomic Dysfunction, and Migraine

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Abstract

Background/Objectives: This study aimed to examine the associations between diet-related quality of life (DRQOL) and psychological distress, autonomic dysfunction, and migraine in patients with dizziness and balance disorders. **Methods**: In this retrospective cross-sectional study, 122 patients (56 men, 66 women; mean age 40.4 ± 12.8 years, minimum 14, maximum 65) from the vertigo outpatient clinic at JR Tokyo General Hospital completed self-reported questionnaires. These included the DRQOL scale, Dizziness Handicap Inventory (DHI), Hospital Anxiety and Depression Scale (HADS), Self-rating Depression Scale (SDS), Orthostatic Dysregulation (OD) checklist, and migraine assessments (POUNDing [Pulsating, duration of 4–72 h, Unilateral, Nausea, Disabling], MIDAS, migraine screener). Correlational analyses, group comparisons, and receiver operating characteristic (ROC) analyses were conducted. **Results**: DRQOL scores showed positive correlations with psychological distress (SDS: $\rho = 0.58$; HADS-A: $\rho = 0.50$; HADS-D: $\rho = 0.52$; all $p < 0.001$) and OD severity ($\rho = 0.48$, $p < 0.001$), but not with age, DHI, or individual migraine indices. Migraine screener-positive patients had significantly higher DRQOL scores ($p < 0.01$). DRQOL alone modestly discriminated positive migraine screener (AUC = 0.65), improving to AUC = 0.77 in a multivariable model including age and sex. **Conclusions**: DRQOL can capture psychological and autonomic symptom burden rather than vestibular or headache severity, suggesting that it may serve as a complementary, patient-centered metric in the holistic assessment of dizziness patients.

Keywords: diet-related quality of life; psychological distress; autonomic dysfunction; migraine; dizziness; balance disorders

1. Introduction

Vertigo, dizziness, and balance disorders are highly prevalent conditions that substantially impair daily functioning and quality of life (QOL), and are frequently associated with psychological distress, reduced balance confidence, and cognitive burden [1,2]. Migraine is widely recognized as one of the major conditions associated with dizziness and unsteadiness, making its identification and management particularly important in clinical practice [3,4]. Additionally, autonomic dysfunction, including orthostatic dysregulation (OD), frequently coexists with vestibular symptoms and migraine, contributing to the complexity of symptom presentation.

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Dietary factors have long been recognized as potential triggers of migraine attacks. Previous studies have mainly focused on the role of specific foods or irregular eating patterns, such as alcohol, caffeine, chocolate, and meal skipping, in relation to migraine exacerbation [5,6]. Although the overall evidence remains inconsistent, dietary modification may reduce migraine frequency, severity, and disability in some patients [5,7]. More recently, research has shifted from individual triggers to broader dietary patterns, with higher overall diet quality inversely associated with migraine outcomes [6]. However, these approaches have primarily focused on nutritional composition rather than the experiential aspects of eating.

While nutritional content is important, increasing attention has been directed toward diet-related quality of life (DRQOL), a multidimensional construct encompassing satisfaction, enjoyment, sensory aspects, and social dimensions of eating [8–10]. DRQOL has been shown to be relevant in various chronic conditions, including multiple sclerosis and osteoarthritis, highlighting its potential importance as a patient-centered outcome measure [11,12]. Although dizziness-specific patient-reported outcomes, such as the Dizziness Handicap Inventory (DHI), quantify dizziness-related handicap, they do not capture diet-related experiences, including food avoidance, loss of enjoyment, and social restrictions surrounding eating, which may be clinically relevant in patients with dizziness and migraine. Despite accumulating evidence regarding dietary factors in migraine, the comprehensive assessment of DRQOL in patients with dizziness and balance disorders has not been sufficiently explored.

In particular, the relationship between DRQOL, migraine comorbidity, psychological factors such as anxiety and depression, and autonomic symptoms remains unclear. Given that dizziness, migraine, psychological distress, and autonomic dysfunction frequently coexist and may influence daily dietary experiences, a more holistic evaluation of DRQOL may provide clinically meaningful insights beyond conventional dietary assessments.

The present study aimed to comprehensively examine the associations between DRQOL and migraine-related indicators, psychological factors, and autonomic symptoms in patients with dizziness and balance disorders, to inform more integrated and patient-centered management strategies for this complex patient population.

2. Materials and Methods

This was a retrospective study conducted at a single institution. Patients under 65 years referred to the Vertigo Outpatient Clinic at JR Tokyo General Hospital between January 2023 and November 2025 were included in this study. The clinical study was approved by the regional ethical standards committee of JR Tokyo General Hospital (approval code: R06-21; approval date: 28 January 2025). The information for this study was disclosed, and the participants could choose to opt-out. An opt-out informed consent protocol was utilized to collect participant data for research purposes. Diagnoses were made in accordance with established diagnostic criteria, including the Bárány Society criteria where applicable (for Ménière's disease and vestibular migraine). Data on scores of questionnaires regarding psychological symptoms were collected. Questionnaires administered included Dizziness Handicap Inventory (DHI) [13], Hospital Anxiety and Depression Scale (HADS) [14], Self-rating Depression Scale (SDS), OD checklist score [15-17], POUNDing (Pulsating, duration of 4–72 h, Unilateral, Nausea, Disabling) [18], Migraine Disability Assessment (MIDAS) [19], 4-item migraine screener (headache exacerbation in daily performance, nausea, light-sensitivity, and hypersensitivity to odors) [20]. In addition, participants reported the number of headache days over the past 3 months (range, 0–90) and headache intensity of the most recent episode, assessed using an 11-point numeric rating scale (NRS; 0 = no headache, 10 = worst imaginable headache). The DRQOL questionnaire consists of the following 18 items [(1) Did you find your meal delicious? (2) Did you feel satisfied after your meal? (3) Did you enjoy the colors and presentation of your meal? (4) Did you enjoy the aroma of your meal? (5) Did you eat your meal at the appropriate temperature (i.e., hot foods served hot and cold foods served cold)? (6) Did you eat your meal with a pleasant texture in a desirable state? (7) Did you eat the amount you wanted? (8) Did you consume a variety of foods? (9)

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Did you eat foods you like? (10) Did you have your meal with family or friends? (11) Did you eat in a relaxed atmosphere? (12) Did you say "delicious" while eating your meal? (13) Did you use your preferred tableware during your meal? (14) Did you enjoy your meal? (15) Did you feel full after your meal? (16) Do you still enjoy the taste of your hometown or home-cooked meals? (17) Do you often eat seasonal foods? (18) Do you regularly attend seasonal events or traditions (e.g., New Year, Hina Matsuri, Moon Viewing)?], with respondents selecting from five options [1: Always, 2: Almost always, 3: Sometimes, 4: Rarely, and 5: Never], and the total score is calculated (maximum 90, minimum 18) [21,22]. Higher DRQOL scores indicate worse DRQOL. All of these evaluations were conducted using self-administered questionnaires.

Excel Microsoft 365 Apps for enterprise (version 2511, Microsoft, Redmond, WA, USA) was used for processing data. Statistical analyses were performed using R version 4.5.2 software (R Core Team; R Foundation for Statistical Computing, Vienna, Austria, 2025) [23] with the following packages (version): tableone (0.13.2), pROC (1.19.0.1), readxl (1.4.5), corrplot (0.95), psyphy (0.3), Hmisc (5.2-5), devtools (2.4.6), ggplot2 (4.0.1), diptest (0.77-2), car (3.1-5), and Rmisc (1.5.1). Data are expressed as mean ± standard deviation (SD). Continuous variables were compared using the Mann–Whitney U test because of non-normal distributions, and categorical variables were compared using Fisher's exact test. Associations between questionnaire scores were assessed using Spearman's rank correlation coefficients. To account for multiple comparisons, p values were adjusted using the Holm method (11 parameters), and statistical significance was determined based on the adjusted p values. Multivariable logistic regression analysis was conducted to assess the combined discriminative ability of age, sex, and DRQOL for positive migraine screener. Receiver operating characteristic (ROC) curve analysis was used to evaluate the discriminative ability of DRQOL alone and to determine the optimal cutoff value based on the Youden index. The area under the ROC curve (AUC) and its 95% confidence interval were calculated using the DeLong method. To assess the modality of the DRQOL score distribution, Hartigan's dip test for unimodality versus multimodality was applied. A two-sided p value < 0.05 was considered statistically significant.

3. Results

A total of 156 patients were initially considered. After excluding those aged 65 years or older and those with missing data, 122 patients (56 men and 66 women) were included in the study, with a mean age of 40.4 ± 12.8 years. The distribution of diagnoses was as follows: benign paroxysmal positional vertigo (BPPV) in 18 patients, definite Ménière's disease (MD) in 11 patients, probable MD in 12 patients, sudden sensorineural hearing loss with vertigo in 1 patient, vestibular neuritis in 5 patients, peripheral vestibular disorder in 3 patients, idiopathic bilateral vestibulopathy (IBV) in 2 patients, congenital nystagmus in 2 patients, tension-type headache in 1 patient, migraine in 13 patients, vestibular migraine in 7 patients, psychogenic vertigo (functional dizziness) in 30 patients, and OD in 17 patients. Figure 1 presents the distributions of questionnaire scores and headache-related variables, including DHI, SDS, HADS (HADS-A and HADS-D), POUNDing, MIDAS, headache days, headache intensity, OD checklist score, and DRQOL score. The mean ± SD values were as follows: DHI, 34.7 ± 21.6; SDS, 44.8 ± 10.1; HADS-A, 8.2 ± 4.8; HADS-D, 6.2 ± 4.3; POUNDing, 1.7 ± 1.6; MIDAS, 1.6 ± 1.1; headache days, 12.6 ± 20.7; headache intensity, 3.3 ± 2.8; OD checklist score, 5.8 ± 2.7; and DRQOL score, 42.7 ± 15.0. The DRQOL scores showed a wide, approximately unimodal distribution, ranging from about 18 to 90 (mean ± SD: 42.7 ± 15.0), with Hartigan's dip test confirming the absence of multimodality ($D = 0.02$, $p = 0.97$). This wide distribution suggests substantial interindividual variability in DRQOL among patients with dizziness and balance disorders.

Correlations among questionnaire scores and headache-related variables are shown in Figure 2. DRQOL score demonstrated selective associations with psychological and autonomic measures while there were no significant correlations between with age or dizziness-related disability. Specifically, DRQOL score was significantly associated with depressive symptoms assessed by SDS ($\varrho = 0.58$, adjusted $p < 0.001$), HADS-A ($\varrho = 0.50$, adjusted $p < 0.001$), and HADS-D ($\varrho = 0.52$, adjusted $p < 0.001$). In addition, a significant association was observed between DRQOL score and OD checklist score (ϱ

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= 0.48, adjusted $p < 0.001$). These findings indicate that higher DRQOL scores were associated with a higher burden of psychological and autonomic symptoms.

In contrast, no significant associations were observed between DRQOL score and age ($\varrho = -0.01$, adjusted $p > 0.05$), DHI ($\varrho = 0.21$, adjusted $p > 0.05$), or migraine-related indices, including POUNDing, MIDAS, headache days over the past 3 months, and headache intensity of the most recent headache (all adjusted $p > 0.05$). These findings suggest that DRQOL score may be more closely related to psychological distress and autonomic symptom burden rather than headache frequency or intensity itself.

Importantly, although DRQOL score was not significantly correlated with DHI, both DRQOL score and DHI showed significant associations with psychological distress measures, suggesting that DRQOL and dizziness-related handicap may reflect distinct but partially overlapping psychosomatic dimensions.

In addition to DRQOL score, correlations were observed among psychological measures, including SDS with HADS-A ($\varrho = 0.72$, adjusted $p < 0.001$) and HADS-D ($\varrho = 0.74$, adjusted $p < 0.001$), as well as between HADS-A and HADS-D ($\varrho = 0.73$, adjusted $p < 0.001$). Migraine-related measures also showed robust interrelationships, with POUNDing score being significantly correlated with MIDAS, headache days, and headache intensity (all adjusted $p < 0.001$).

Notably, the OD checklist score showed significant correlations with a wide range of questionnaire scores and headache-related measures, including DHI, SDS, HADS-A, HADS-D, DRQOL, and multiple migraine-related indices, suggesting that OD checklist score may be associated with a broader symptom burden encompassing vestibular, psychological, autonomic, and headache-related domains. Among the assessed measures, OD checklist score demonstrated the broadest pattern of significant associations, suggesting its potential role as a global indicator of multisystem symptom burden in patients with dizziness and balance disorders.

Table 1 shows comparisons between patients stratified by migraine screener status. The migraine screener-positive group was significantly younger and included a lower proportion of males than the migraine screener-negative group. Patients who screened positive for migraine exhibited significantly higher scores across all vestibular, psychological, and headache-related measures, including DHI, SDS, HADS-A, HADS-D, POUNDing, MIDAS, headache days, headache intensity, and OD checklist score (all $p < 0.05$). In addition, DRQOL scores were significantly higher in the migraine screener-positive group, indicating greater impairment in DRQOL, with a magnitude comparable to that observed for other psychological and symptom-related measures. Although multiple questionnaire measures differed significantly between migraine screener-positive and migraine screener-negative groups, ROC analysis was conducted for DRQOL because it represents a comprehensive, patient-centered measure of diet-related quality of life. ROC curve analysis showed an area under the curve (AUC) of 0.65 (95% CI, 0.55–0.75, DeLong method), indicating modest discriminative ability. The optimal DRQOL cutoff was 46.5, with sensitivity 0.56 and specificity 0.73. This analysis was performed in an exploratory manner to evaluate the potential discriminative value of DRQOL as a summary measure. Given that the migraine screener-positive group was significantly younger and included a lower proportion of males (Table 1), we performed multivariable logistic regression analysis incorporating age, sex, and DRQOL as predictors of positive migraine screener to assess their combined discriminative capacity. ROC curve analysis of the multivariable model showed improved performance compared to DRQOL alone, with an AUC of 0.77 (95% CI, 0.69–0.86, DeLong method). All predictors (DRQOL, sex, and age) remained significant ($p < 0.05$). The model demonstrated a sensitivity of 0.74 and specificity of 0.75. The adjusted odds ratios (95% CI) were as follows: DRQOL, 1.03 (1.01–1.07); sex, 0.30 (0.12–0.69); and age, 0.96 (0.93–0.99). Variance inflation factors (VIF) indicated minimal multicollinearity among predictors: DRQOL, 1.01; sex, 1.00; and age, 1.01.

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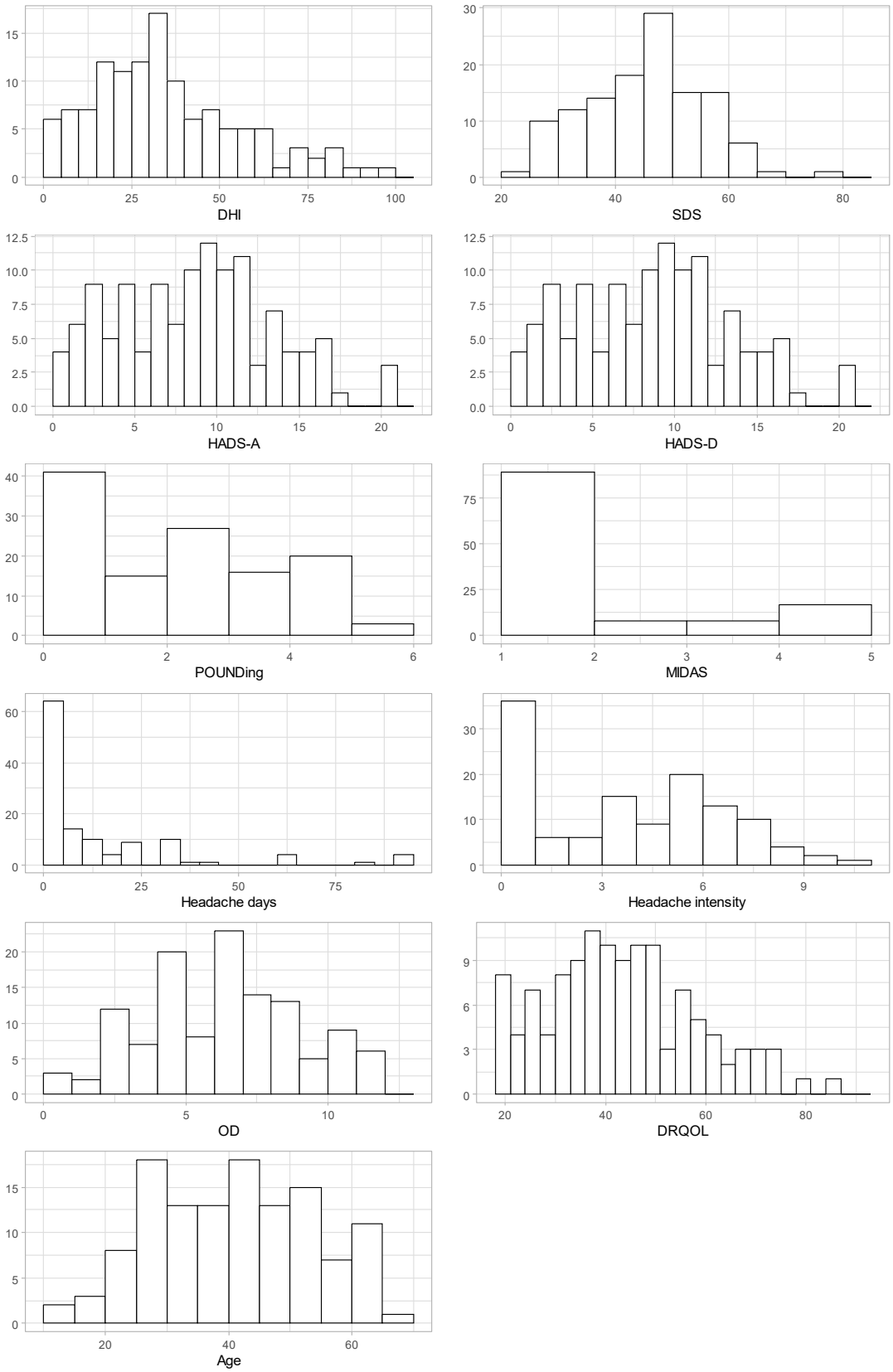

Figure 1. Distribution of questionnaire scores and headache-related variables. DHI, SDS, HADS (HADS-A and HADS-D), POUNDing, MIDAS, headache days, headache intensity, OD checklist score, and DRQOL score are shown.

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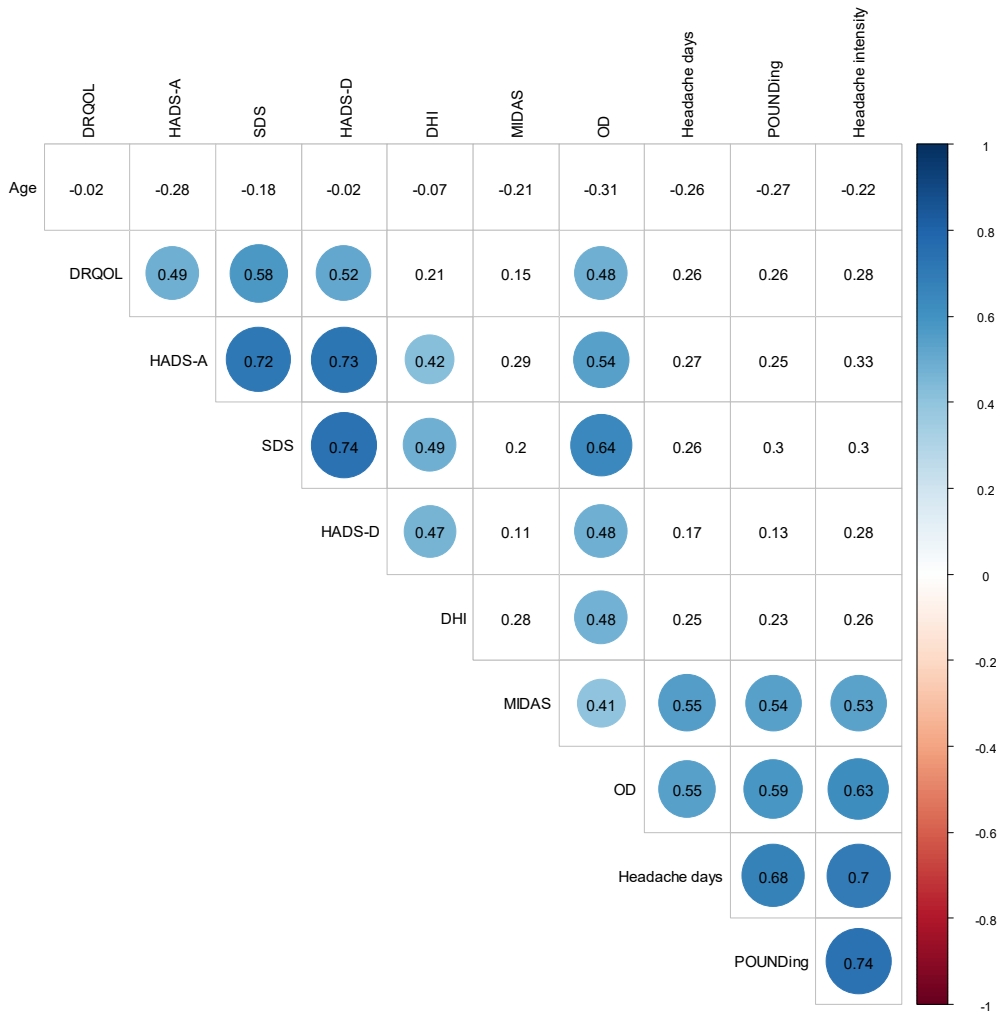

Figure 2. Correlation coefficients between questionnaire scores and headache-related variables. Numbers within the cells indicate correlation coefficients. Colored circles indicate statistically significant correlations between questionnaire scores and headache-related variables ($p < 0.05$, Holm-adjusted), with red representing positive correlations and blue representing negative correlations. The relationship between color intensity and correlation coefficients is shown in the vertical color bar on the right.

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Table 1. Demographic and clinical characteristics stratified by migraine screener status. Values are presented as mean ± standard deviation for continuous variables and number (percentage) for categorical variables. Continuous variables were compared using the Mann–Whitney U test, and categorical variables were compared using Fisher's exact test. P-values are presented as unadjusted and Holm-adjusted for multiple comparisons. The migraine screener was treated as a dichotomous variable (negative vs. positive).

	Migraine screener			
	Negative	Positive	Unadjusted p-value	Adjusted p-value
	n=79	n=43		
Sex = M (%)	45 (57)	11 (25.6)	0.002	0.005
Age	42.9 ± 12.3	36 ± 12.5	0.004	0.012
DRQOL	40 ± 14.3	47.8 ± 15.1	0.006	0.012
HADS-A	6.96 ± 4.55	10.5 ± 4.39	<0.001	<0.001
SDS	42.3 ± 10	49.4 ± 8.72	<0.001	0.003
HADS-D	5.52 ± 3.91	7.49 ± 4.59	0.014	0.021
DHI	28.7 ± 18.9	45.6 ± 22	<0.001	<0.001
MIDAS	1.16 ± 0.59	2.44 ± 1.33	<0.001	<0.001
OD	4.77 ± 2.51	7.7 ± 2.02	<0.001	<0.001
Headache days	7.82 ± 16	21.4 ± 25.3	<0.001	<0.001
POUNDing	1.06 ± 1.3	2.98 ± 1.18	<0.001	<0.001
Headache intensity	2.16 ± 2.46	5.49 ± 1.88	<0.001	<0.001

4. Discussion

In this study, DRQOL scores among patients with dizziness and balance disorders were significantly associated with psychological distress and autonomic symptom burden, but not with self-reported measures of dizziness-related disability or migraine indices. The positive correlations observed between DRQOL score and measures of anxiety, depression, and OD imply that greater psychological and autonomic burden is linked to poorer dietary well-being. In contrast, DRQOL score showed no significant association with age, DHI, or headache frequency and intensity.

Interestingly, patients who screened positive for migraine reported significantly higher DRQOL scores than those who did not, and receiver operating characteristic (ROC) analysis revealed modest discriminative ability of DRQOL score in identifying positive migraine screener (AUC = 0.65). The optimal cutoff value of 46.5 balanced sensitivity and specificity but should be interpreted cautiously. This threshold emerged from a relatively small, single-center sample and requires external validation before clinical application. The finding supports the potential utility of DRQOL score as a complementary indicator within a multidimensional assessment framework for patients presenting with dizziness, particularly given the well-established link between migraine and vestibular symptoms [3,4].

DRQOL appears to vary along a continuum of symptom burden, reflecting substantial interindividual variability rather than discrete clinical phenotypes; these interpretations should be considered hypothesis-generating and warrant prospective validation. Patients with low DRQOL scores (around 18) may experience no disruption to their eating behaviors, as milder dizziness or migraine symptoms allow them to maintain enjoyment and satisfaction in daily meals. In contrast, those with higher scores (approaching 90) may suffer from pronounced anxiety, nausea, rigid food avoidance, or autonomic dysfunction, all of which collectively impair sensory pleasure, social engagement, and emotional comfort related to eating [1,2]

The absence of a significant correlation between DRQOL score and DHI ($\rho = 0.21$, adjusted $p > 0.05$) despite both scales being associated with psychological distress suggests that they capture

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distinct domains of patient experience. While DHI primarily reflects functional limitations due to vestibular dysfunction, DRQOL appears to tap into psychosomatic aspects of eating, such as food-related anxiety, altered appetite, and diminished enjoyment of meals. This distinction underscores the value of DRQOL score as a non-redundant, patient-centered outcome that complements conventional vestibular assessments.

Although migraine screener-positive patients reported higher headache intensity than migraine screener-negative patients, headache intensity itself was not significantly correlated with DRQOL score after correction for multiple comparisons. This pattern suggests that DRQOL may be influenced more by the broader psychological and somatic context (e.g., anxiety, nausea, dietary restrictions) than by headache pain alone. The difference in DRQOL score may therefore reflect the cumulative impact of multiple migraine-related factors rather than pain severity in isolation.

OD demonstrated particularly broad associations across vestibular, psychological, autonomic, headache-related, and diet-related domains. Its correlation with DRQOL ($\rho = 0.48$, adjusted $p < 0.001$) likely stems from shared pathophysiological mechanisms, including autonomic dysfunction and altered cerebrovascular regulation. Patients with prominent orthostatic symptoms often experience gastrointestinal discomfort, nausea, and appetite dysregulation, all of which can directly impair dietary quality of life. These findings highlight the importance of evaluating and managing orthostatic symptoms in patients with dizziness who also report dietary concerns.

These findings were derived from a questionnaire-based analytical approach emphasizing dimensional symptom severity rather than categorical diagnoses. Although all participants were diagnosed using established criteria, our analyses focused on associations among self-reported symptoms across psychological, autonomic, vestibular, and dietary domains. Consequently, the observed relationships reflect the co-occurrence of subjective symptom burden within individuals seeking care for dizziness, rather than differences between discrete diagnostic entities. This dimensional framework can be particularly suitable for DRQOL, which captures experiential aspects of eating that are likely more closely related to psychological and somatic distress than to specific disease diagnoses.

This study extends prior research on diet and migraine by shifting focus from specific food triggers or nutritional intake to the experiential dimensions of eating. Previous work has emphasized associations between migraine and individual dietary components (e.g., alcohol, caffeine, tyramine), irregular meal patterns, or specific dietary regimens (e.g., ketogenic, low-glycemic, Mediterranean diets) [5,7]. Although evidence remains limited, certain diets and food items may trigger migraine attacks in some individuals, and dietary modification has been reported to reduce attack duration, frequency, severity, and medication use [7]. Specific dietary factors, including alcohol, caffeine, chocolate, monosodium glutamate, nitrates, and tyramine, have been implicated as triggers in selected populations, while dietary interventions such as low-glycemic index diets, ketogenic diets, omega-3 supplementation, and Mediterranean dietary patterns have shown potential benefits [24]. In addition, a large-scale genome-wide association study using Mendelian randomization reported that intake of coffee, cheese, oily fish, alcohol (red wine), raw vegetables, muesli, and wholemeal/wholegrain bread was associated with a decreased risk of migraine, whereas consumption of white bread, cornflakes/frosties, and poultry was positively associated with migraine risk; additionally, intake of white bread, wholemeal/wholegrain bread, muesli, alcohol (red wine), cheese, and oily fish was linked to a higher risk of insomnia and major depressive disorder [25]. Dietary diversity has been linked to migraine burden, with individuals with less diverse diets tending to report higher frequency of migraine attacks [26]. Irregular meals and meal skipping have also been associated with increased migraine frequency [27]. Moreover, overarching dietary patterns such as the Mediterranean, Dietary Approaches to Stop Hypertension (DASH), Mediterranean-DASH Intervention for Neurodegenerative Delay (MIND), or low-glycemic diets are being studied for their potential to mitigate migraine symptoms via mechanisms including neuroinflammation, oxidative stress, regulation of vascular tone, and modulation of neuropeptides such as calcitonin gene-related peptide (CGRP) [28]. Although inconsistency is present in the literature and no consensus exists, the

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available data are promising in supporting beneficial dietary interventions for some migraine patients [5]. In a study assessing diet quality using dietary intake, higher diet quality was inversely associated with migraine frequency and migraine-related disability; additionally, higher diet quality was linked to reduced migraine severity, suggesting that improved diet quality may be associated with favorable migraine outcomes, including lower headache frequency, reduced severity, and decreased migraine-related disability [6]. However, these approaches often overlook the subjective, qualitative aspects of eating.

By contrast, DRQOL encompasses satisfaction, sensory pleasure, social engagement, and emotional well-being related to food, dimensions that are increasingly recognized as integral to overall quality of life (QOL) [29,30]. This approach reflects a broader perspective in which eating is viewed not merely as a means of obtaining nutrients but as an experiential process that contributes substantially to quality of life [8–10,31]. Accumulating evidence suggests that psychological and cognitive factors play a central role in shaping eating behavior. Experimental studies have demonstrated that remembered enjoyment of food can influence subsequent food choice and intake [32], and that figurative or evocative food descriptions can enhance anticipated enjoyment and preference for healthier options [33]. These findings support the relevance of evaluating diet-related quality of life as an experiential and psychological construct, rather than focusing solely on nutritional adequacy.

From a clinical standpoint, disease-specific instruments assessing DRQOL have been developed in other medical fields. For example, the Esophago-Gastric surgery and Quality of Dietary Life (EGQ-D), designed for patients undergoing esophagectomy or gastrectomy, has demonstrated good content and psychometric validity, supporting its utility as a disease-specific QOL measure [34]. Such instruments illustrate how DRQOL measures can capture aspects of daily life not adequately reflected by conventional clinical or nutritional indices. Although DRQOL has been examined in various chronic conditions, including multiple sclerosis [11] and osteoarthritis [12], comprehensive assessment of DRQOL in patients with dizziness and balance disorders remains limited. The present findings suggest that DRQOL may be particularly relevant in relation to migraine comorbidity and psychological factors such as anxiety, depression, and somatization.

Furthermore, eating pleasure has been conceptualized as comprising multiple dimensions, including visceral satisfaction related to hunger alleviation and epicurean pleasure derived from sensory and aesthetic appreciation of food. Prior work has shown that higher epicurean tendencies are associated with greater well-being without adverse effects on body mass index, suggesting that qualitative aspects of eating experiences may contribute positively to overall QOL [35]. These observations are consistent with the present findings, suggesting that DRQOL may reflect qualitative and psychological dimensions of dietary life closely linked to migraine-related symptom burden and psychological factors.

The intercorrelations among psychological measures (SDS, HADS-A, and HADS-D; all $\varrho > 0.7$) suggest substantial overlap in the constructs assessed by these instruments. From a practical standpoint, this raises the question of whether multiple psychological screening tools are necessary in routine clinical evaluation. However, each scale has distinct characteristics: HADS separately assesses anxiety and depression, while SDS provides a more comprehensive depressive symptom profile. The choice of screening instruments may depend on the specific clinical context and the primary outcomes of interest.

Several limitations should be acknowledged. First, this was a single-center, cross-sectional study conducted in a real-world clinical setting, which limits generalizability and precludes causal inference. The study population was diagnostically heterogeneous, encompassing a wide range of dizziness-related conditions, including migraine-associated vertigo and psychogenic vertigo. While this heterogeneity reflects the complexity of patients typically encountered in routine dizziness clinics and supports the clinical relevance of DRQOL as a broadly applicable patient-reported outcome, it remains unclear whether poor diet-related quality of life contributes to migraine burden, whether migraine-related symptoms impair dietary experiences, or whether these relationships are

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bidirectional; therefore, reverse causality cannot be ruled out. Second, the inclusion of patients with psychogenic vertigo may have influenced the observed associations between DRQOL and psychological distress. Although this reflects real-world clinical case-mix, the possibility that correlations are partially driven by psychological factors cannot be excluded. Future studies incorporating subgroup or sensitivity analyses focused on patients with organic vestibular disorders are warranted to clarify the robustness of these relationships. Third, the absence of objective dietary measures, such as detailed food records or nutritional assessments, limits the ability to determine whether DRQOL scores reflect actual dietary behaviors or primarily subjective and psychological perceptions. Because all key measures were self-reported, common-method bias may have inflated observed associations. Finally, while the use of questionnaire-based symptom scores rather than diagnosis-based classifications limits diagnosis-specific conclusions, this approach is consistent with patient-centered outcome research and enables examination of symptom interrelationships across a broad severity spectrum, including subthreshold presentations that meaningfully affect daily functioning.

Despite these limitations, the present findings underscore the clinical relevance of DRQOL in patients with dizziness and migraine. Given its association with psychological distress, interventions aimed at improving DRQOL should incorporate psychological components, alongside nutritional counseling that preserves dietary enjoyment and social aspects of eating. Future longitudinal studies are warranted to evaluate the impact of such integrated approaches on DRQOL and clinical outcomes, and to clarify their relevance across different dizziness and balance disorders.

5. Conclusions

This study demonstrates that DRQOL in patients with dizziness and balance disorders is associated with psychological distress and autonomic symptom burden, and modestly discriminates positive migraine screener. While DRQOL was not significantly correlated with individual migraine severity indices such as headache frequency or headache intensity, its assessment may contribute to a broader understanding of patients' psychosomatic symptom burden and support patient-centered clinical evaluation that considers dietary experience alongside vestibular, autonomic, and psychological factors.

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Institutional Review Board Statement: This study was performed in line with the principles of the Declaration of Helsinki. Approval was granted by the regional ethical standards committee of JR Tokyo General Hospital (approval code: R06-21; approval date: 28 January 2025).

Informed Consent Statement: The information for this study was disclosed, and the participants could choose to opt-out. An opt-out informed consent protocol was utilized to collect participant data for research purposes.

Data Availability Statement: The data that support the findings of this study are available from the corresponding author, upon reasonable request with the permission of the research ethics committee.

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Conflicts of Interest: The authors declare no conflicts of interest.

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Abbreviations

The following abbreviations are used in this manuscript:

AUC	Area under the curve
BPPV	Benign paroxysmal positional vertigo
CGRP	Calcitonin gene-related peptide
CI	Confidence interval
DASH	Dietary Approaches to Stop Hypertension
DHI	Dizziness Handicap Inventory
DRQOL	Diet-related quality of life
EGQ-D	Esophago-Gastric surgery and Quality of Dietary Life
HADS	Hospital Anxiety and Depression Scale
HADS-A	Hospital Anxiety and Depression Scale – Anxiety subscale
HADS-D	Hospital Anxiety and Depression Scale – Depression subscale
IBV	Idiopathic bilateral vestibulopathy
MD	Ménière's disease
MIDAS	Migraine Disability Assessment Scale
MIND	Mediterranean-DASH Intervention for Neurodegenerative Delay
NRS	Numeric rating scale
OD	Orthostatic dysregulation
POUNDing	Pulsating, duration of 4–72 h, Unilateral, Nausea, Disabling
QOL	Quality of life
ROC	Receiver operating characteristic
SD	Standard deviation
SDS	Self-rating Depression Scale
VIF	Variance inflation factor

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