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ORIGINAL ARTICLES

CASE REPORTS

galenos yayınevi

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Reviewing the articles' conformity to the publishing standards of the Journal, typesetting, reviewing and editing the manuscripts and abstracts in English and publishing process are realized by Galenos.

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European Journal of Geriatrics and Gerontology

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Aims and Scope

European Journal of Geriatrics and Gerontology is an international, open access, scientific, peer-reviewed journal in accordance with independent, unbiased, and double-blinded peer-review principles of the Academic Association of Geriatrics. It is a double peer-reviewed journal published quarterly in April, August and December electronically. The publication language of the journal is English.

Our mission is to provide practical, timely, and relevant clinical and basic science information to physicians and researchers practicing the geriatrics and gerontology worldwide. Topics of European Journal of Geriatrics and Gerontology include;

Aging
Aging Biology
Alzheimer's Disease
Biogerontology
Bone health in older people
Cell Biology
Clinical Geriatrics
Clinical Geropsychology
Cognitive Disorders
Demography of Older Populations
Dental and Oral Health
Delirium
Diabetes Mellitus
Dizziness
Disability
Drugs & Aging
Experimental Gerontology
Economics of ageing
Falls
Frailty
Geriatrics
Geriatric Bioscience
Geriatric Care Management
Geriatric Depression
Geriatric Emergency Medicine
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Geriatric Occupational Therapy
Geriatric Ophthalmology
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Geriatric Rheumatology
Geriatric Trauma
Geriatric Urology
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Gerontechnology
Hypertension
Healthy Aging
Home and Community-Based Services
Incontinence
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Orthogeriatrics
Polypharmacy
Parkinsons Disease
Parkinsonian syndromes
Pressure Sores
Psychological Gerontology
Sarcopenia
Sleep Disorders
Syncope
Social Gerontology
Stroke Medicine

Special features include rapid communication of important timely issues, surgeon' workshops, interesting case reports, surgical techniques, clinical and basic science review articles, guest editorials, letters to the editor, book reviews, and historical articles in geriatrics and gerontology.

The target audience of the journal includes physicians working in the fields of geriatrics and gerontology and all other health professionals who are interested in these topics.

The evaluation and publication processes of the European Journal of Geriatrics and Gerontology are shaped in acceptance with the guidelines of ICMJE (International Committee of Medical Journal Editors), COPE (Committee of Publication Ethics), EASE (European Association of Science Editors), and WAME (World Association of Medical Editors). The journal also is in conformity with the Principles of Transparency and Best Practice in Scholarly Publishing (doaj.org/bestpractice).

European Journal of Geriatrics and Gerontology is indexed in the TUBITAK/ULAKBIM, EBSCO, Index Copernicus, Gale, ProQuest, J-Gate, CABI, Türk Medline and Turkey Citation Index.

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Ethical Policy

Peer Review, Publication Ethics and Malpractice Statement

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Submission is considered on the conditions that papers are previously unpublished and are not offered simultaneously elsewhere; that authors have read and approved the content, and all authors have also declared all competing interests; and that the work complies with the Ethical Approval and has been conducted under internationally accepted ethical standards. If ethical misconduct is suspected, the Editorial Board will act in accordance with the relevant international rules of publication ethics (i.e., COPE guidelines).

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Submitted manuscripts are subjected to double-blinded peer-review. The scientific board guiding the selection of the papers to be published in the journal consists of elected specialists of the journal and, if necessary, selected from national and international experts in the relevant field of research. All manuscripts are reviewed by the editor, section associate editors and at least three internal and external expert reviewers. All research articles are interpreted by a statistical editor as well.

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Instructions for Authors

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Cognitive Disorders
Demography of Older Populations
Dental and Oral Health
Delirium
Diabetes Mellitus
Dizziness
Disability
Drugs & Aging
Experimental Gerontology
Economics of ageing
Falls
Frailty
Geriatrics
Geriatric Bioscience
Geriatric Care Management
Geriatric Depression
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Geriatric Rheumatology
Geriatric Trauma
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Geriatric Syndromes
Gerontechnology
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Healthy Aging
Home and Community-Based Services
Incontinence
Long-Term Care
Orthogeriatrics
Polypharmacy
Parkinsons Disease
Parkinsonian syndromes
Pressure Sores
Psychological Gerontology
Sarcopenia
Sleep Disorders
Syncope
Social Gerontology
Stroke Medicine

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The European Journal of Geriatrics and Gerontology accepts invited review articles, research articles, brief reports, case reports, letters to the editor, and images that are relevant to the scope of geriatrics and gerontology, on the condition that they have not been previously published elsewhere. Basic science manuscripts, such as randomized, cohort, cross-sectional, and case control studies, are given preference. All manuscripts are subject to editorial revision to ensure they conform to the style adopted by the journal. There is a double blind kind of reviewing system.

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Preparation of Manuscript

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Technical and other assistance should be provided on the title page.

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CONSORT statement for randomized controlled trials (Moher D, Schultz KF, Altman D, for the CONSORT Group. The CONSORT statement revised recommendations for improving the quality of reports of parallel-group randomized trials. JAMA 2001; 285: 1987-91) (http://www.consort-statement.org/);

PRISMA statement of preferred reporting items for systematic reviews and meta-analyses (Moher D, Liberati A, Tetzlaff J, Altman DG, The PRISMA Group. Preferred Reporting Items for Systematic Reviews and Meta-Analyses: The PRISMA Statement. PLoS Med 2009; 6(7): e1000097.) (http://www.prisma-statement.org/);

STARD checklist for reporting studies of diagnostic accuracy (Bossuyt PM, Reitsma JB, Bruns DE, Gatsonis CA, Glasziou PP, Irwig LM, et al., for the STARD Group. Towards complete and accurate reporting of diagnostic accuracy studies: the STARD initiative. Ann Intern Med 2003;138:40-4.) (http://www.stard-statement.org/);

STROBE statement, a checklist of items that should be included in reports of observational studies (http://www.strobe-statement.org/);

MOOSE guidelines for meta-analysis and systemic reviews of observational studies (Stroup DF, Berlin JA, Morton SC, et al. Meta-analysis of observational studies in epidemiology: a proposal for reporting Meta-analysis of observational Studies in Epidemiology (MOOSE) group. JAMA 2000; 283: 2008-12).

Title Page

Title: The title should provide important information regarding the manuscript's content.

The title page should include the authors' names, degrees, institutional/professional affiliations, a short title, abbreviations, keywords, financial disclosure statement, and conflict of interest statement. If a manuscript includes authors from more than one institution, each author's name should be followed by a superscript number that corresponds to their institution, listed separately. Please provide contact information for the corresponding author, including name, e-mail address, and telephone and fax numbers.

Running Head: The running head should not be more than 40 characters, including spaces, and should be located at the bottom of the title page.

Word Count: A word count for the manuscript, excluding abstract, acknowledgements, figure and table legends, and references, should be provided, not exceeding 3000 words. The word count for an abstract should not exceed 250 words.

Conflict of Interest Statement: This statement must be included in each manuscript to prevent potential conflicts of interest from being overlooked. In case of conflicts of interest, every author should complete the ICMJE general declaration form, which can be obtained at: http://www.icmje.org/coi_disclosure.pdf.

Abstract and Keywords: The second page should include an abstract that does not exceed 250 words. Moreover, as various electronic databases integrate only abstracts into their index, significant findings should be presented in the abstract.

Abstract

Objective: The abstract should state the objective (the purpose of the study and hypothesis) and summarize the rationale for the study.

Materials and Methods: Important methods should be written, respectively.

Results: Important findings and results should be provided here.

Conclusion: The study's new and important findings should be highlighted and interpreted.

Other types of manuscripts, such as case reports, reviews and others, will be published according to uniform requirements. Provide at least 3 keywords below the abstract to assist indexers. Use terms from the Index Medicus Medical Subject Headings List (for randomized studies, a CONSORT abstract should be provided (http://www.consort-statement.org).

Original Articles

Original articles should have the following sections;

Introduction: The introduction should include an overview of the relevant literature presented in summary form (one page), and whatever remains engaging, unique, problematic, relevant, or unknown about the topic must be specified. The introduction should conclude with the rationale for the study, its design, and its objective(s).

Materials and Methods: Clearly describe the selection of observational or experimental participants, such as patients, laboratory animals, and controls, including inclusion and exclusion criteria and a description of the source population. Identify the methods and procedures in sufficient detail to allow other researchers to reproduce your results. Provide references to established methods (including statistical methods), provide references to brief modified methods, and provide the rationale for using them and an evaluation of their limitations. Identify all drugs and chemicals used, including generic names, doses, and routes of administration. The section should include only available information when the plan or protocol for the study was devised on STROBE (http://www.strobe-statement.org).

Statistics: Describe the statistical methods used in enough detail to enable a knowledgeable reader with access to the original data to verify the reported results. Statistically essential data should be given in the text, tables and figures. Provide details about randomization, describe treatment complications, provide the number of observations, and specify all computer programs used.

Results: Present your results in logical sequence in the text, tables, and figures. Do not present all the data provided in the tables and/or figures in the text; emphasize and/or summarize only essential findings, results, and observations in the text. Clinical studies provide the number of samples, cases, and controls included in the study. Discrepancies between the planned number and obtained number of participants should be explained. Comparisons and statistically significant values (i.e. p-value and confidence interval) should be provided.

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Discussion: This section should include a discussion of the data. New and noteworthy findings/results and the conclusions they lead to should be emphasized. Link the conclusions with the study's goals, but avoid unqualified statements and conclusions not completely supported by the data. Do not repeat the findings/results in detail; important findings/results should be compared with those of similar studies in the literature, along with a summarization. In other words, similarities or differences in the obtained findings/results with those previously reported should be discussed.

Study Limitations: Limitations of the study should be detailed. In addition, an evaluation of the implications of the obtained findings/results for future research should be outlined.

Conclusion: The conclusion of the study should be highlighted.

References

Cite references in the text, tables, and figures with numbers in parentheses. Number references consecutively according to the order they first appear in the text. Journal titles should be abbreviated according to the style used in Index Medicus (consult List of Journals Indexed in Index Medicus). Include among the references any paper accepted but not yet published, designating the journal and followed by, in press. Authors are solely responsible for the accuracy of all references.

Examples of References:

1. List All Authors

Bonanni E, Tognoni G, Maestri M, Salvati N, Fabbrini M, Borghetti D, DiCoscio E, Choub A, Sposito R, Pagni C, Iudice A, Murri L. Sleep disturbancesin elderly subjects: an epidemiological survey in an Italian district. Acta Neurol Scand 2010;122:389-397.

2. Organization as Author

American Geriatrics Society 2015 Updated Beers Criteria Expert panel. American geriatrics society 2015 updated Beer criteria for potentially inappropriate medication use in older adults. J Am Geriatr Soc 2015;63: 2227-2246.

3. Complete Book

Ham RJ, Sloane PD, Warshaw GA, Potter JF, Flaherty E. Ham's primary care geriatrics: a case-based approach, 6th ed. Philadelphia, Elsevier/Saunders, 2014.

4. Chapter in Book

BG Katzung. Special Aspects of Geriatric Pharmacology, In:Bertram G. Katzung, Susan B. Masters, Anthony J. Trevor (Eds). Basic and Clinical Pharmacology. 10th edition, Lange, Mc Graw Hill, USA 2007, pp 983-90.

5. Abstract

Reichenbach S, Dieppe P, Nuesch E, Williams S, Villiger PM, Juni P. Association of bone attrition with knee pain, stiffness and disability; a cross-sectional study. Ann Rheum Dis 2011;70:293-8. (abstract).

6. Letter to the Editor

Rovner B. The Role of the Annals of Geriatric Medicine and Research as a Platform for Validating Smart Healthcare Devices for Older Adults. Ann Geriatr. 2017;21:215-216.

7. Supplement

Garfinkel D. The tsunami in 21st century healthcare: The age-related vicious circle of co-morbidity - multiple symptoms - over-diagnosis - over treatment - polypharmacy [abstract]. J Nutr Health Aging 2013;17(Suppl 1):224-227.

Case Reports

Case reports should be structured as follows:

Abstract: An unstructured abstract that summarizes the case.

Introduction: A brief introduction (recommended length: 1-2 paragraphs).

Case Presentation: This section describes the case in detail, including the initial diagnosis and outcome.

Discussion: This section should include a brief review of the relevant literature and how the presented case furthers our understanding of the disease process.

Review Articles

Review articles should not include more than 100 references. Reviews should include a conclusion in which a new hypothesis or study about the subject may be posited. Do not publish methods for literature search or level of evidence. Authors who will prepare review articles should already have published research articles on the relevant subject. There should be a maximum of two authors for review articles.

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Authors can submit for consideration an illustration and photos that are interesting, instructive, and visually attractive, along with a few lines of explanatory text and references. Images in Geriatrics and Gerontology can include no more than 500 words of text, 5 references, and 3 figures or tables. No abstract, discussion or conclusion is required, but please include a brief title.

Letters to the Editor

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ORIGINAL RESEARCH

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Eur J Geriatr Gerontol 2023;5(2):90-94

Inflammatory Markers and Severity of Osteoporosis in Older Adults

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Abstract

Objective: Osteoporosis is a chronic disease that is prevalent in older adults and characterized by an imbalance between bone formation and destruction. Recently, many studies have been conducted to reveal the relationship between inflammation and osteoporosis. Monocyte to lymphocyte ratio (MLR) and neutrophil to lymphocyte ratio (NLR) have been shown to be predictive factors for disease activity, prognosis and survival in various inflammatory and malignant diseases. We aimed to determine whether there is a relationship between inflammatory markers and the severity of osteoporosis.

Materials and Methods: The mean age of 1.048 patients included in the study was 72.7±6.7 years and 87.9% were female. Osteoporosis was diagnosed by dual energy X-ray absorptiometry (DXA) at the lumbar spine and left femur. Inflammation was assessed by blood tests including MLR, NLR, C-reactive protein, erythrocyte sedimentation rate (ESR) and uric acid.

Results: MLR, NLR, ESR, and the proportion of female gender were higher in the lowest T-score group. MLR and NLR were found to be independently related to severity of osteoporosis according to the multivariate binary logistic regression analysis [p=0.032, odds ratio (OR)=3.513, and p=0.046, OR=1.218, respectively].

Conclusion: In our study, we revealed the relationship between osteoporosis and inflammation through different inflammatory parameters. We have shown that the two easily accessible parameters, MLR and NLR, may help evaluate bone mineral density in elderly osteoporotic individuals.

Keywords: Osteoporosis, monocyte to lymphocyte ratio, neutrophil to lymphocyte ratio, inflammation, older adults

Introduction

Osteoporosis is a chronic disease characterized by decreased bone mineral density (BMD) and deterioration of bone microarchitecture (1). Lower BMD scores are related to higher incidence of fractures (2). Many factors play a role in the development of osteoporosis. Loss of the bone protective role of estrogen and increase in proinflammatory cytokine levels are responsible factors in the development of postmenopausal osteoporosis, which is the most common type of osteoporosis (3).

Inflammation leads to osteoporosis through two main mechanisms. One of these mechanisms is that activated T lymphocytes stimulate osteoclast maturation by producing substances such as receptor activator of nuclear factor-κB ligand, tumor necrosis factor alpha (TNF-α), and some interleukins. In addition, marrow stromal cell-derived macrophage colony-stimulating factor stimulates the osteoclastic precursor cells, a member of the monocyte/macrophage family, and leads to differentiation into osteoclasts (4).

TNF-α, interleukin-1 (IL-1), IL-6, IL-11, IL-15, and IL-17 produced by macrophages and lymphocytes have been shown to induce the formation and activation of osteoclasts (5). The role of these cytokines has been investigated in inflammatory diseases associated with osteoporosis, such as rheumatoid arthritis (RA) and inflammatory bowel disease (6-8).

Previous studies stated that the increase in neutrophil to lymphocyte ratio (NLR) and monocyte to lymphocyte ratio

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(MLR) can be used in the evaluation of disease activity in RA and inflammatory bowel disease, as well as distinguishing osteoporotic adults from non-osteoporotics (9-13).

In this study, we evaluated the relationship between the severity of osteoporosis and MLR and NLR in elderly individuals.

Materials and Methods

Participants

A total of 1.048 individuals aged 65 and over (793 osteoporotic and 255 non-osteoporotic) was included in this retrospective study. The files and hospital electronic record system data of the participants (including comorbidities, medications, and laboratory results) were examined.

Patients with a previous or newly diagnosed fracture, primary bone disease other than osteoporosis, primary or metastatic bone tumor, parathyroid disease, renal impairment, and an active infection were excluded.

All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional research committee and with the 1964 Helsinki Declaration and its later amendments or comparable ethical standards. The study was approved by the Local Ethics Committee of Gaziantep University (no: 2020/422, date: 24.02.2021).

DXA Scan

DXA scans (using hologic scanners) were performed and BMD was measured for the left proximal femur and lumbar spine. A T-score of -2.5 or below at the femoral neck or lumbar spine was considered osteoporosis as stated by the World Health Organization. Participants were divided into 3 groups according to T-scores: A T-score of -3.5 and below (Group 1), a T-score between -2.5 and -3.5 (Group 2), and a T-score above -2.5 (Group 3).

Blood Sample

Blood samples were taken during the admission. Complete blood count including lymphocytes, neutrophils, monocytes, basophils, hemoglobin, platelets, median platelet volume, median corpuscular volume, median corpuscular hemoglobin concentration and biochemistry analysis including C-reactive protein (CRP), erythrocyte sedimentation rate (ESR), uric acid, albumin, alanine transaminase, aspartate transaminase, and glucose tests were performed.

Statistics

The variables were analyzed for the normality of their distribution using the Kolmogorov-Smirnov test. The independent samples t-test and Mann-Whitney U test was used to compare two independent groups of variables. The relationship between categorical variables was evaluated using the χ^2 test, the numerical variables using Spearman's rank correlation coefficient, and the significance of the difference between three or more non-normally distributed groups was evaluated using the Kruskal-Wallis H test. We used multivariate logistic regression to simulate a model to determine factors affecting the severity of osteoporosis. A p-value of <0.05 was accepted as statistically significant. SPSS version 22.0 (IBM, Armonk, NY) was used to analyze the data.

Results

The mean age of the 1.048 participants was 72.7±6.7 years and the proportion of female participants was 87.9%. Of the 793 patients with osteoporosis, 311 had a BMD T-score ≤-3.5. The proportion of female participants in the group with a T-score ≤-3.5 was higher than in the non-osteoporotic group (p=0.038).

There was no statistically significant difference between the groups in terms of the frequencies of rheumatic diseases, malignancy and glucocorticoid use. Group 1 had higher ESR levels than Group 2 (p=0.039). MLR and NLR levels were statistically significantly higher in Group 1 compared to Group 2 and 3 (p=0.028 and p=0.022 for MLR, p=0.002 and p=0.002 for NLR, respectively). Although MLR, NLR and ESR levels were found to be higher in Group 2 compared to Group 3, there was no statistically significant difference. The participants' socio-demographic characteristics, laboratory analysis results, and pairwise comparison results of numerical variables are shown in Tables 1 and 2, respectively.

A statistically significant weak negative correlation was found between MLR, NLR, and ESR levels and both the lumbar spine and the femur T-scores. MLR and NLR were found to be independently related to severity of osteoporosis according to the multivariate binary logistic regression analysis [p=0.032, odds ratio (OR)=3.513, and p=0.046, OR=1.218, respectively] (Table 3).

Discussion

The main finding of this study is that NLR and MLR are independent variables in predicting a lower T-score. Osteoporosis results from the imbalance between bone formation and bone resorption. It has been proven that many factors such as hormones, growth factors and interleukins, as well as inflammation, play a role in the etiopathogenesis of osteoporosis (14). MLR and NLR have been shown to be predictive factors for disease activity, prognosis and survival in various inflammatory and malignant diseases (15-19).

Although the predictive role of MLR in inflammatory diseases has previously been demonstrated, there are limited number of studies evaluating the relationship between MLR and osteoporosis. It has been shown that decreased lymphocyte to monocyte ratio (LMR) was associated with increased disease

Table 1. Participants' socio-demographic characteristics and laboratory analysis results

	Groups			Total (n=1048)	p
Variable	**Group 1 (n=311)**	**Group 2 (n=482)**	**Group 3 (n=255)**		
Gender					
Female	284 (91.3%)*	422 (87.6%)	215 (84.3%)*	921 (87.9%)	0.038*
Male	27 (8.7%)*	60 (12.4%)	40 (15.7%)*	127 (12.1%)	
Age†	73.2±7.3	72.1±6.2	73.3±7.0	72.7±6.7	0.063
Comorbidities					
Hypertension	138 (44.4%)	218 (45.2%)	126 (49.4%)	482 (46.0%)	0.440
Diabetes mellitus	72 (23.2%)	114 (23.7%)	71 (27.8%)	257 (24.5%)	0.362
Rheumatic diseases	47 (15.1%)	79 (16.4%)	53 (20.8%)	179 (17.1%)	0.175
Coronary artery disease	43 (13.8%)	66 (13.7%)	49 (19.2%)	158 (15.1%)	0.105
Asthma/COPD	31 (10.0%)	35 (7.3%)	25 (9.8%)	91 (8.7%)	0.320
Cancer	11 (3.5%)	20 (4.1%)	9 (3.5%)	40 (3.8%)	0.874
GC-use	41 (13.2%)	62 (12.9%)	41 (16.1%)	144 (13.7%)	0.456
MLR†	0.30±0.14	0.28±0.12	0.27±0.10	0.28±0.13	0.010*
NLR†	2.21±0.92	2.07±0.97	1.89±0.62	2.07±0.89	0.001*
CRP†	5.38±6.72	4.73±5.83	4.53±5.12	4.86±5.94	0.983
ESR†	26.0±17.4	22.9±16.1	22.5±13.1	23.7±15.9	0.042*
Serum creatinine (mg/dL)†	0.71±0.16	0.72±0.17	0.73±0.17	0.72±0.17	0.105
Uric acid (mg/dL)†	4.77±1.56	4.97±1.47	4.95±1.56	4.90±1.52	0.116

†Data are presented as mean ± standard deviation. *p≤0.05. Group 1, patients with a T-score ≤-3.5; Group 2, patients with a T-score between -2.5 and -3.5; Group 3, patients with a - score >-2.5.
COPD: Chronic obstructive pulmonary disease, GC: Glucocorticoid, MLR: Monocyte-to-lymphocyte ratio, NLR: Neutrophil-to-lymphocyte ratio, CRP: C-reactive protein (mg/dL), ESR: Erythrocyte sedimentation rate (mm/hr)

Table 2. Pairwise comparison results between numerical variables

Variable	Group 2/Group 3 (p)	Group 1/Group 3 (p)	Group 1/Group 2 (p)
NLR	0.132	0.002*	0.002*
MLR	1.000	0.022*	0.028*
ESR	1.000	0.272	0.039*

*p<0.05. MLR: Monocyte-to-lymphocyte ratio; NLR: Neutrophil-to-lymphocyte ratio, ESR: Erythrocyte sedimentation rate. Group 1, patients with a T-score ≤-3.5; Group 2, patients with a T-score between -2.5 and -3.5; Group 3, patients with a T-score >-2.5

Table 3. Multivariate logistic regression analysis results of the independent variables for T-score ≤-3.5

Variable		T-score ≤-3.5
Gender (male vs. female)	r (95% CI)	0.614 (0.366; 1.029)
	p	0.064
ESR	r (95% CI)	1.008 (0.999; 1.017)
	p	0.085
NLR	r (95% CI)	1.218 (1.017; 1.469)
	p	0.046*
MLR	r (95% CI)	3.513 (1.025; 10.046)
	p	0.032*

*p<0.05. MLR: Monocyte-to-lymphocyte ratio, NLR: Neutrophil-to-lymphocyte ratio: CRP: C-reactive protein, ESR: Erythrocyte sedimentation rate, CI: Confidence interval

activity in RA patients (20). Increased MLR was also found to be independently associated with the severity of the coronary lesion in patients with myocardial infarction in another study (21).

Gao et al. (13) has shown that MLR, NLR and platelet to lymphocyte ratio (PLR) were higher in individuals with osteoporosis than in healthy individuals, and stated that MLR had a higher diagnostic value for osteoporosis than other parameters. However, unlike our study, the predictive value of MLR was not evaluated according to the T-score levels in osteoporotic participants in this study, and the participants were younger. In our study, MLR was superior to NLR in the prediction of lower T-scores.

Another important finding of our study was that NLR was also higher in patients with a T-score ≤-3.5. A study has shown that osteoporotic older adults had higher NLR levels compared to osteopenic and healthy groups (22). According to other studies carried out on women with postmenopausal osteoporosis, high NLR has been found to be a risk factor for osteoporosis (23,24).

As in these studies, a decrease in T-score was found to be related to an increase in NLR in our study. Our study included participants of both genders. Although the proportion of female participants were higher in the lowest T-score group, there was no independent effect of gender on T-score levels.

Although inflammation parameters such as white blood cell count, CRP and ESR levels are easy accessible in clinical practice, their specificity is not high (25). CRP is the most widely used parameter in clinical practice to show inflammation, but the results of studies evaluating the relationship between osteoporosis and CRP show variability. A higher ESR level was associated with the presence of osteoporosis in a study, but NLR level was found to be more predictive (22). Our results showed that ESR was not an independent determinant for lower T-scores according to logistic regression analysis.

Our study is unique for its feature evaluating the relationship of inflammation with T-score and including only elderly individuals. We found that patients with high MLR and NLR levels respectively had a 3.5-fold and 1.2-fold increase in the risk of having a T-score ≤-3.5.

Study Limitations

Our study has some limitations. We measured CRP, ESR, uric acid, MLR and NLR levels to assess inflammation, other parameters including proinflammatory cytokines such as IL-1, IL-6, TNF-α might also be considered. Due to the retrospective nature of the study, patients without a suspected fracture may not have been radiographically evaluated. A subgroup analysis of male osteoporosis could be performed if more male participants had been included. The strengths of our study are that it only included individuals over the age of 65 and included a large number of participants, and there was no significant difference between the groups in terms of chronic and inflammatory diseases that could affect MLR and NLR levels. Grouping osteoporotic patients according to T-scores enabled us to analyze the effect of osteoporosis severity on inflammation parameters more clearly.

Conclusion

The fact that MLR and NLR are easily accessible and cheap, and especially MLR has higher predictive value for lower T-scores, suggests that they may help evaluate the bone health in elderly osteoporotic individuals. Further researches supporting our results will bring a different perspective to the diagnosis of osteoporosis.

Ethics

Ethics Committee Approval: All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional research committee and with the 1964 Helsinki Declaration and its later amendments or comparable ethical standards. The study was approved by the Local Ethics Committee of Gaziantep University (no: 2020/422, date: 24.02.2021).

Informed Consent: Informed consent was obtained from all participants.

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ORIGINAL RESEARCH

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The Effect of Perceived Social Support Systems and Empowerment Approaches on the Quality of Life in Elderly Patients

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Abstract

Objective: This study investigated the effect of social support systems and strengthening approaches on the quality of life in elderly patients.

Materials and Methods: This cross-sectional study was conducted with 390 participants above the age of 65 receiving service at the Kayseri State Hospital Geriatric Care Center between September-October 2019. The World Health Organization quality of life scale module and multidimensional scale of perceived social support and the patient perceptions of empowerment scale were used as the data collection tools. The effect of multidimensional scale of perceived social support and the patient perceptions of empowerment scale on the quality of life was tested using structural equation modeling.

Results: It was determined that education, income, smoking, and chronic disease were significantly related to the quality of life of the elderly. When the effects of multidimensional scale of perceived social support on the quality of life were modeled, it was determined that social support and patient empowerment influenced the quality of life. In the model, patient empowerment significantly affected the quality of life with a standardized regression coefficient of 0.47 and a patient empowerment scale of 0.59.

Conclusion: Patient empowerment level has a significant effect on the quality of life of the elderly, with social support. Patient empowerment is an essential determinant of the quality of life in the elderly.

Keywords: Health-related quality of life, patient empowerment, perceived social support, patient involvement

Introduction

The quality of life (QOL) is seen as one of the universal objectives that societies aim to reach (1). In addition to the QOL effects on healthcare, there are physical, psychological, social, and multidimensional factors in measuring health-related QOL (2).

This study found that QOL, including physical health, psychological state, and social relationships, shape individuals' culture and value systems and are significantly related to empowerment and social support concepts. Individual desire and collaborative effort are linked in healthcare (3). Social support, which includes emotional, financial, and information support of individuals based on their communication networks and mutual liability, contributes to the comfort and lives of the elderly and protects them from various conditions (4). Social support is an important issue, especially for the elderly. The limitations of common life opportunities such as the loss of a loved one, retirement, physical disorders restricting their interaction, or chronic diseases might endanger the support networks of this age group (5).

Empowerment is the process of helping people to gain control over the factors affecting their lives. People empowered can obtain the capacity to influence other people around them and contribute to their well-being (6). Today, with the increasing elderly population, it is vital to ensure that patients control their lives to the extent possible to eliminate health problems due to chronic diseases and reduced competence (7). The elderly with chronic illnesses, as one of many vulnerable groups, should

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be empowered to enhance the QOL related to health and reduce hospitalization and healthcare costs (8).

The purpose of this study, conducted on patients receiving outpatient treatment at the Kayseri Geriatric Care Center in Kayseri, Turkey, was to evaluate the empowerment, perceived social support systems and QOL levels of the patients 65 and over with chronic diseases related to their demographic characteristics. In this context, social support and QOL factors such as the participants' socio-demographic features, health conditions, social networks, and level of patient empowerment were analyzed.

Materials and Methods

The cross-sectional study included 1.500 patients over the age of 65 who were treated between September and October 2019. In advance, 390 patients were selected for the sample using the Power Analysis and Sample Size program under the conditions of alpha =0.05, power =0.80, and error of 5% based on the study by Softa et al. (9). Patients selected for the sample units were chosen by the simple random sampling method, one of the probability sampling methods.

Data Collection Tools

The scale of World Health Organization Quality of Life Scale (WHOQOL-OLD), the patient perceptions of empowerment scale (PPES), and multidimensional scale of perceived social support (MSPSS) were used as data collection tools. The data collection was accomplished using face-to-face interviews with the participants after examinations in specially allocated areas in the polyclinics.

Personal Information Form

The form includes 11 questions about the socio-demographic features of the participants, such as age, gender, marital status, education level, social security, and income status (sufficient-not sufficient). In addition, the questionnaire contained informative data about physical disability, smoking, medications, prostheses, and diagnosed chronic disease.

World Health Organization QOL Scale WHOQOL-OLD Module

The WHOQOL-OLD was developed for use in epidemiological research and clinical intervention studies for the elderly. A Turkish validity and reliability study using WHOQOL-OLD was conducted by Eser et al. (10). Cronbach alpha values were 0.88 for sensory abilities, 0.68 for autonomy, 0.73 for past, present, and future activities, 0.76 for social participation, 0.75 for death and dying, and 0.82 for intimacy. The WHOQOL-OLD module consists of 24 5-point Likert scaled items assigned to six factors:

1. Sensory abilities (1st, 2nd, and 20th questions).

2. Autonomy (3rd, 4th, 5th, and 11th questions).

3. Past, present, and future activities (12th, 13th, 15th, and 19th questions).

4. Social participation (14th, 16th, 17th, and 18th questions).

5. Death and dying (6th, 7th, 8th, and 9th questions).

6. Intimacy (21st, 22nd, 23rd, and 24th questions).

The possible WHOQOL-OLD subscale scores were in the range of 4 to 20. By combining the individual scores, a total score was derived. As the score increased, the QOL also improved.

MSPSS

The MSPSS was developed by Zimmet et al. The validity and reliability of the scale in Turkey were assessed and its structural validity was evaluated by Eker and Arkar (11). In 2001, the factor structure, validity, and reliability of the reviewed form of multidimensional scale of social support was evaluated by Eker et al. (12). The internal consistency of the MSPSS and subscale scores was acceptable (Cronbach alpha coefficients =0.80-0.95) (12).

The scale subjectively assesses the efficiency of the social support received from three sources and includes 12 items. There are three groups related to the support sources, each consisting of four things. The three groups are:

1. Family (3rd, 4th, 8th, and 11th items).

2. Friends (6th, 7th, 9th, and 12th items).

3. A special person (1st, 2nd, 5th, and 10th items).

The scale is a 7-point Likert type, and the choices included entirely agree (7 points), mostly agree (6 points), agree (5 points), undecided (4 points), disagree (3 points), mostly disagree (2 points), and entirely disagree (1 point). Each subscale score was obtained by adding the points of the four items; the total score was obtained by adding all the subscale scores. The lowest score obtained from the subscales was 4, and the highest possible score was 28. The lowest possible score from the entire scale was 12, and the highest possible score was 84. The higher the score, the higher the perceived level of social support (11).

PPES

The PPES was developed by Small (2012) to reveal the patient empowerment level. The scale had 37 items under five subscales consistent with the Turkish validity and reliability analysis by Kaya and Işık (13). As a result of the analysis performed for the internal consistency of the overall scale and subscales of the Patient empowerment scale, the Cronbach alpha reliability coefficient of the broad scale was found to be 0.920. The scores

in the subscales of the MSPSS were 0.837 for identity, 0.746 for personal control, 0.764 for decision-making, 0.771 for knowledge and understanding, and 0.600 for enabling others. The scale is in 5-point Likert type, and the choices were strongly agree (5 points), agree (4 points), neutral (3 points), disagree (2 points), and strongly disagree (1 point).

Statistics

The results obtained from the research were presented by using descriptive criteria. Ordinal logistic regression was performed in the univariate and multivariate analysis of the factors affecting QOL. A multivariate regression analysis was conducted by creating three different models. In the first model, only the subscales of the MSPSS were analyzed. In the second model, the MSPSS and social support scale's total score was included in the analyses. In the third model, the subscales of the MSPSS, social support scale total score, and the variables found statistically significant in the univariate analysis were included. The results were presented as an odds ratio and a 95% confidence interval (CI). The purpose of applying three different multivariate analyzes is to better understand the effects of both sub-dimensions and total scores of the PPES and MSPSS scales on QOL. While revealing the effect of PPES on QOL, the effect of MSPSS was also evaluated together. In structural equation modeling analysis, the effect of MSPSS scale and PPES total scores on QOL was tested with path analysis. The direct, indirect (through PPES) and total effects of MSPSS on QOL are shown as standardized beta values. In addition, the Sobel test was used to test the mediating effect of patient empowerment (14). The direct and indirect effect values of the results obtained are depicted on a diagram.

Ethics Committee Approval

Approval of the study was obtained from the Kayseri University Ethics Committee (dated: 28.06.2019 and number: 15) and the Kayseri Provincial Directory of Health (dated 8.8.2019 dated and number 25655344/703.01). Finally, informed consent was obtained from the participants.

Results

Approximately 52.1% of the individuals included in the research group were females, 72.8% of whom were married. Of the total participants, 71.0% were in the age group of ≤74, with an average age of ± standard deviation 71.9±5.8; 57.7% of the patients were literate primary school graduates, 70.3% of whom had adequate income to cover their expenses.

The study found that 12.6% of the patients had physical disabilities, 8.2% used a prosthesis, 85.9% had chronic diseases, and 85.4% used medication regularly. In addition, 16.9% of the patients smoked, and 55.4% had never smoked (Table 1).

Based on the univariate analysis of the factors affecting the elderly, education, income, smoking, and chronic disease were significantly related to the QOL. In addition, patient empowerment subscales, social support subscales, and the total score indicated significant effects.

In the first of the multivariate analysis models created, patient empowerment subscales were analyzed together. Based on the results obtained, the subscales of identity, knowledge, and understanding, and enabling others had a significant effect

Table 1. The distribution of the individuals in the research group in terms of demographic-socio-cultural characteristics

Variables	Number	%
Gender		
Male	187	47.9
Female	203	52.1
Marital status		
Married	284	72.8
Not married	106	27.2
Age group		
≤74	277	71.0
≥75	113	29.0
Age X ± standard deviation	71.9±5.8	
Age median (min-max)	70.0 (65-98)	
Education status		
Illiterate	90	23.1
Literate and primary school	225	57.7
Secondary school and ↑	75	19.2
Income status		
Sufficient	274	70.3
Not sufficient	116	29.7
Physical disability		
Yes	49	12.6
No	341	87.4
Prosthesis use		
Yes	32	8,2
No	358	91.8
Chronic disease		
No	55	14.1
Yes	335	85.9
Medication used constantly		
Yes	333	85.4
No	57	14.6
Smoking		
Still smoking	66	16.9
Never smoked	216	55.4
Sometimes	33	8.5
Quitted	75	19.2

Table 2. Factors affecting the quality of lives of the elderly

Variables		Model 1	Model 2	
	Approx OR (95% CI)	Adj, OR (95% CI)	Adj, OR (95% CI)	
Gender (female)	1.10 (0.78-1.55)	-	-	ni
Age (between 65-74)	1.22 (0.83-1.78)	-	-	ni
Marital status (married)	1.27 (0.87-1.86)	-	-	ni
Education status (illiterate)	Ref	-	-	Ref
(literate-primary school)	1.97 (1.29-3.01)**	-	-	1.11 (0.63-1.96)
(secondary school and above)	1.86 (1.09-3.19)*	-	-	1.44 (0.89-2.32)
Income status (sufficient)	2.67 (1.81-3.93)***	-	-	1.6 (1.06-2.41)*
Smoking (yes)	Ref	-	-	Ref
(never smoked)	2.55 (1.66-3.92)***	-	-	2.1 (1.37-3.21)**
(quitted)	2.31 (1.35-3.95)**	-	-	2.16 (1.25-3.73)**
Chronic disease (no)	2.87 (1.71-4.81)***	-	-	2.8 (1.67-4.71)***
Identity	2.66 (2.14-3.32)***	1.94 (1.35-2.81)***	1.56 (1.07-2.29)*	1.35 (0.91-2.01)
Personal control	2.47 (2.00-3.04)***	1.26 (0.88-1.8)	1.2 (0.83-1.73)	1.26 (0.86-1.83)
Decision making	1.51 (1.24-1.85)***	0.83 (0.64-1.08)	0.78 (0.59-1.02)	0.83 (0.63-1.08)
Knowledge and understanding	1.99 (1.61-2.45)***	1.38 (1.04-1.83)*	1.34 (1-1.78)*	1.36 (1.02-1.82)*
Enabling others	1.59 (1.33-1.91)***	1.26 (1.05-1.52)*	1.27 (1.05-1.53)*	1.2 (1-1.46)
SDO (special person)	1.07 (1.05-1.10)***	-	-	-
SDO (family)	1.15 (1.12-1.19)***	-	-	-
SDO (friend)	1.10 (1.07-1.13)***	-	-	-
SDO (total score)	1.04 (1.03-1.05)***	-	1.03 (1.02-1.04)***	1.03 (1.02-1.04)***

*p<0.05, **p<0.01, ***p<0.001. ni: Not included in the model, CI: Confidence interval, OR: Odds ratio
Model 1: Patient empowerment subscales were included in the analysis.
Model 2: Patient empowerment subscales and social support scale total score were included in the analysis.
Model 3: Patient empowerment subscales, social support scale total score and significant variables obtained from the univariate analysis were included in the analysis

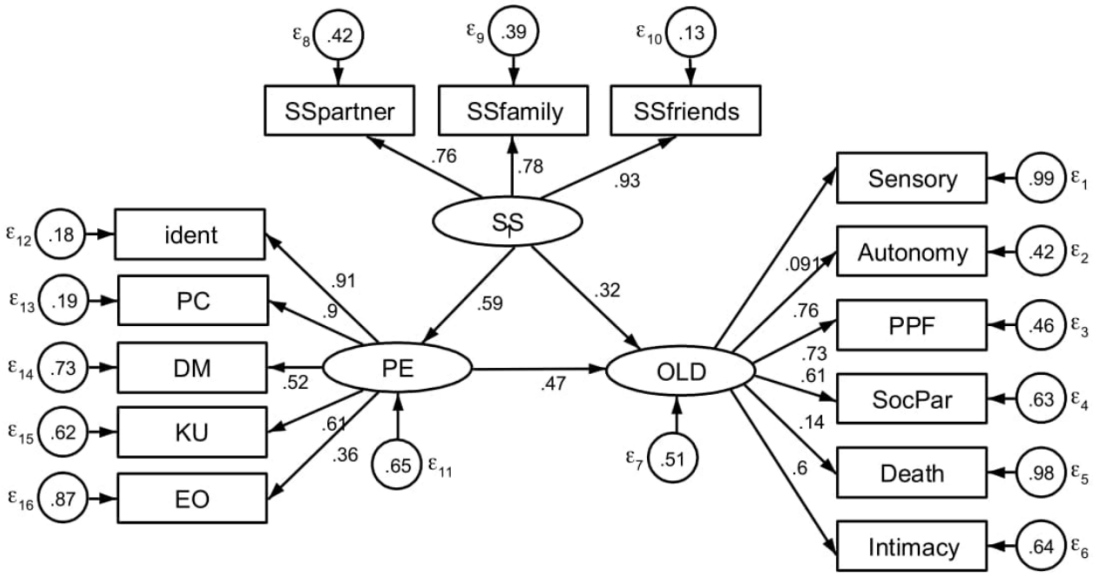

Figure 1. The effect of patient empowerment subscales and social support scale on the quality of life

PPES: Patient perception of empowerment scale, MSPSS: Multidimensional scale of perceived social support, WHOQOL OLD: World Health Organization quality of life scale, KU: Knowledge and understanding, DM: Decision making, EO: Enabling others, PC: Personal control

on QOL. A one-unit increase in the patient empowerment subscales significantly improved QOL 1.94 (95% CI 1.35-2.81) times in identity subscale, 1.38 (95% CI 1.04-1.83) times in knowledge and understanding subscale, and 1.26 (95% CI 1.05-1.52) times in enabling others subscale. It was determined that social support, included in Model 2, also improved the QOL 1.03 (95% CI 1.02-1.04) times and patient empowerment subscales. The third model observed that income, rather than smoking or chronic disease, significantly affected QOL (Table 2).

When the effect of the MSPSS on the QOL was evaluated, both patient empowerment and social support affected QOL. When the standardized coefficient values were analyzed, patient empowerment affected QOL at the level of 0.47, and social support was 0.32. In addition, the indirect effect of the standardized coefficient of the social support on QOL in terms of patient empowerment was 0.27. The model observed that patient empowerment had a total impact on the QOL with a standardized coefficient of 0.47 and social support of 0.59. The RMSEA value of this created measurement model was 0.12, CFI =0.83, with an SRMR value of 0.08.

The results obtained from the model revealed that patient empowerment created a significant and efficient structure for the elderly's QOL. The findings showed the critical and powerful effects of patient empowerment on the QOL of the elderly with social support. Patient empowerment in the elderly is an essential determinant of QOL (Figure 1). On the other hand, the indirect effect of social support on QOL through patient empowerment was analyzed with the Sobel test. It was found that the effect of social support on QOL through patient empowerment was not significant (Sobel test: 1.57; $p>0.05$). In other words, both patient empowerment and social support have independent effects on patients' QOL.

Discussion

Using the univariate analysis of the factors affecting the elderly, this study found that education, income, smoking, and chronic disease significantly affected QOL. The last model found that sufficient income, rather than smoking or chronic illness, significantly affected QOL.

In the elderly, social, economic, and physical factors are important variables affecting QOL (15). Previous studies found that income level and QOL are related (16,17). The positive effect of economic well-being on QOL consists of meeting basic needs and bringing positive results such as stronger social relations, increased self-confidence, and more care for the environment. Although the income levels of the elderly decrease compared to the active employment period, handicaps such as increased health expenditures and personal financial situation become even more critical in maintaining QOL. Many studies observed a negative relationship between chronic disease and QOL in the elderly (17-19). Factors such as acute or chronic conditions are likely to occur with advanced age and associated physical deficiencies. In addition, the reduced level of social interaction can lead to social withdrawal, negatively affecting QOL in the elderly. Symptoms of deprivation and the fear of death, and the loss of those of the same age also negatively affect QOL. Being away from an active work life due to retirement or being unwanted are additional factors that negatively affect QOL.

Our study determined that the smoking behavior of the elderly is one of the factors that negatively affect the QOL. Studies are revealing a negative relation between smoking and QOL (18,19). Smoking is a behavior that many people with personal challenges prefer and may lead to a low QOL. The physical and mental effects of smoking can also negatively affect QOL. A mutual cause-effect relationship between smoking behavior and low QOL has been widely documented. While poor QOL increases the tendency to smoke, smoking directly or indirectly (causing various health problems, exclusion in interpersonal relationships, financial loss, etc.) has a negative effect on QOL.

In this study, one of the factors that positively affected the QOL of the elderly was education. As education status decreases, the QOL also decreases. In many similar studies, a relation between education level and the QOL of the elderly was demonstrated, including the link between a low educational level and poor QOL (16,20). It is possible to explain this result in several aspects. It is common for economic status to be relatively better with an increased education level. A prosperous financial position will affect the QOL positively. A high level of education will positively affect QOL because it increases the capacity of individuals to be self-sufficient, organize interpersonal relations better, and acquire a variety of interests that will influence their life. In other words, it will broaden their horizons.

This study revealed that both patient empowerment and social support positively affect QOL. As with this study, some studies were conducted on a variety of patient groups. It was reported that patient empowerment increased QOL (21,22). In a study analyzing the effect of training based on the family-oriented empowerment model on the QOL of the elderly with chronic obstructive pulmonary disease (COPD), the study found that family-oriented empowerment programs increased the QOL of the elderly with COPD (23).

Some studies reported that social support affects the QOL of the elderly; this is a predictable result (24-26). A study by Say Şahin et al. (25) it was reported that there was a moderate positive correlation between social support scale, and that as the social support increases the satisfaction with life also increases. Boylu and Gunay (26) found that the perceived level of social support was a significant predictor of QOL.

Old age and disease are factors negatively affecting QOL. Individually, these conditions can magnify a poor QOL. In such a situation, social support and patient empowerment approaches will significantly contribute to these individuals. Implementing social support and patient empowerment programs in elderly patients will increase their sense of self-confidence and form the basis for an improved QOL. Further, such support will break the vicious circle of the restrictions due to disease, increase self-confidence, and strengthen social relations.

Study Limitations

One of the goals of this study was to create a model using multivariate analysis to test the social support and patient empowerment systems. Cause and effect relationships were investigated as a whole. In addition, the WHOQOL-OLD, MSPSS were used to evaluate QOL. The MSPSS and PPES are valid and reliable tools in Turkey.

One limitation of the study was that although the sample selection was performed by simple random sampling, the research method was based on cross-sectional data collection. This approach required that future studies be longitudinal to reveal cause and effect relationships more clearly.

Conclusion

This study concluded that increased income, smoking cessation, and successful treatment of chronic disease significantly affected the QOL of the elderly. The modeling results also revealed that social support and patient empowerment had a significant effect on the QOL of the elderly.

Perceived social support systems and patient empowerment in the elderly are among the most critical determinants of QOL. Based on these results, there is a tendency toward reduced QOL due to many negative factors (e.g., physical health, feelings of inadequacy, and social support deficiency) in the elderly. In such conditions, the importance of social support and patient empowerment practices becomes more evident as the means to increase the QOL.

There are some limitations as the study was conducted in Kayseri province and on individuals over 65 years of age. In this study, the "income status" of the participants was qualitatively classified as "sufficient-not sufficient". In studies to be conducted in this area, it is thought that the quantitative determination of the "income status" of the participants will strengthen the research results and attract the attention of researchers related to the subject in this direction.

Ethics

Ethics Committee Approval: Approval of the study was obtained from the Kayseri University Ethics Committee (dated: 28.06.2019 and number: 15) and the Kayseri Provincial Directory of Health (dated 8.8.2019 dated and number 25655344/703.01).

Informed Consent: Informed consent was obtained from the participants.

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Authorship Contributions

Concept: D.Ü., E.N.Y., H.B., F.A., Design: D.Ü., E.N.Y., H.B., F.A., Data Collection or Processing: E.N.Y., F.A., Analysis or Interpretation: D.Ü., H.B., Literature Search: D.Ü., E.N.Y., F.A., Writing: D.Ü., E.N.Y., H.B., F.A.

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The Coexistence Between Probable Sarcopenia, Undernutrition and Frailty in Geriatric Outpatients

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Abstract

Objective: Sarcopenia, undernutrition and frailty are three interrelated geriatric problems with strong associations with mortality and morbidity. This study assesses coexistence of probable sarcopenia, undernutrition and frailty in patients admitted to outpatient clinics in our country.

Materials and Methods: The study population consisted of participants over the age of 60 years who applied to the geriatric outpatient clinics of a university hospital between December 2012 and August 2021. All of the participants were screened for frailty using the FRAIL scale, while the mini nutritional assessment-short form was used for undernutrition screening. Hand grip strength was measured using a Jamar hydraulic hand dynamometer, based on the European Working Group on Sarcopenia in Older People definition regional cut-offs (<35 kg <20 kg in males and females, respectively).

Results: Included in the study were 438 participants with a mean age of 74+6.7, 129 of whom were male (29.5%). The prevalence of three clinical conditions (probable sarcopenia, undernutrition and frailty) was 48.8% (214), 24.2% (106) and 65.1% (285), respectively. Both probable sarcopenia and undernutrition were detected in 15.5% (68%), and 13.6% (60) of the sample had all three conditions.

Conclusion: The majority of patients in the study were either frail (65.1%), probable sarcopenic (48.8%) or undernourished (24.2%), and the coexistence of all three clinical conditions was significant, affecting 13.6% of the total (60). Our study is the first to investigate the overlaps of the three interrelated geriatric syndromes in patients who applied to geriatric outpatient clinics.

Keywords: Frailty, geriatrics, malnutrition, probable sarcopenia, sarcopenia

Introduction

Frailty is a condition characterized by vulnerability and non-resilience to stressors. It is a geriatric syndrome with various important components, including weakness, slowness, low levels of physical activity, exhaustion and weight loss (1,2). The prevalence of frailty varies depending on the screening tool and the features of the patient group (3,4). It is associated with negative clinical outcomes (5-9). Sarcopenia has been defined as the progressive and generalized loss of skeletal muscle mass and strength. Sarcopenia prevalence varies according to the screening tool and the population (8,9). Also, it is associated with negative clinical outcomes (5-9). The European Working Group on Sarcopenia in Older People (EWGSOP2) recently identified low muscle strength as the basic characteristic of probable sarcopenia, and recommended the use of regional cut-offs for the diagnosis of probable sarcopenia (9). The coexistence and bidirectional relationship of sarcopenia and frailty has been identified in various studies (6,10-14). Malnutrition or undernutrition are consequences of the insufficient consumption of nutrients, and are often associated with inflammatory catabolism (10), and lead to changes body composition. Accordingly, malnutrition plays a key role in the development of both sarcopenia and frailty (11,13,14).

Sarcopenia, frailty and malnutrition are common geriatric syndromes in older adults, and are associated with a wide range of health outcomes in older adults, such as falls, disability, fractures, longer hospitalization duration, recurrent hospitalization requirements, morbidity and mortality (9,10-

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14). These geriatric syndromes often coexist and have similar etiological associations, such as undernutrition, inflammation, hormonal changes, inadequate energy intake and decreased physical activity (10-14).

There have been various studies examining the prevalence of malnutrition, frailty and sarcopenia in specific patient groups and populations, older adult occupants of nursing homes, hospitalized patients and geriatric rehabilitation patients (14-19). Our aim in this study is to investigate the overlaps in these three important geriatric syndromes in geriatric outpatients.

Materials and Methods

Included in this retrospective study were patients aged ≥60 years who applied to the geriatric outpatient clinics of a university hospital between December 2012 and August 2021. During this period, geriatric outpatients underwent a comprehensive geriatric evaluation where possible, although some could not be fully assessed for such reasons as the lack of available staff, refusal to give consent and factors relating to the general condition of the patient (stroke, neuropathy, severe peripheral artery disease, severe hearing problems, severe vision problems, advanced dementia, acute severe illness, deterioration in general condition). Patients who could not undergo a comprehensive geriatric evaluation for the stated reasons were excluded from the study. All patients aged 60 years and older, who agreed to participate in a comprehensive geriatric evaluation and were able to perform a comprehensive geriatric evaluation, were included in the study. All measurements were performed by a single physical therapist trained in comprehensive geriatric assessment. The data of 438 patients who could be included in the study were accessed. Prior approval for the study was granted by the İstanbul University, İstanbul Faculty of Medicine Clinical Research Ethics Committee (no: 905439/13.05.2022). The patients' demographic characteristics, number of chronic diseases and drugs used on a regular basis, falls, urinary incontinence, fecal incontinence, constipation, chronic pain and sleep disorders were obtained from the patient files. Polypharmacy was defined as the use of five or more drugs per day (20). Functional capacity was assessed based on the six-item KATZ activities of daily living (ADL) scale and the eight-item LAWTON-BRODY instrumental activities of daily living scale (IADL) (21,22). The participants scored 0 points for activities that could not be performed or that could be performed with assistance, and 1 point for activities that could be performed independently. The ADL scale produces a summary score ranging from 0 (low function, dependent) to 6 (high function, independent), while the summary score of the IADL scale ranges from 0 (low function, dependent) to 8 (high function, independent) (20).

Handgrip strength (HGS) was measured using a Jamar hydraulic hand dynamometer. For the measurement of muscle strength, the participants were seated in a standard backed chair and asked to squeeze the dynamometer as hard as they could for 2-3 seconds with their arms next to their body and their elbow flexed 90°. Measurements were repeated three times for the two hands and the highest values were recorded (23). Probable sarcopenia was defined based on low HGS using the definition of the EWGSOP2. Low HGS was evaluated by regional cut-offs (<35 kg and <20 kg) (8,9). The probable sarcopenia group was defined HGS, which was evaluated by regional cut-offs (<35 kg and <20 kg).

Frailty was screened using the 5-item FRAIL scale, which measures fatigue, resistance, ambulation, illnesses and weight loss. The participants who scored 0 were considered robust, while 1-2 indicated pre-frail and 2-3 indicated frail (24). Prefrail and frail participants assessed of frailty group.

Malnutrition screening was performed using the mini nutritional assessment-short form (MNA-SF), in which a score of 0-7 points indicate malnutrition, 8-11 points indicate risk of malnutrition and >11 points as normal nutritional status (25). Those with malnutrition and malnutrition risk were assigned to the undernutrition group.

Depressive mood was screened using the 30-item geriatric depression scale-long form, in which 0-10 points is defined as normal, 11-13 points as probable depression and ≥14 points as absolute depression (26).

For the assessment of chronic pain, the participants were asked if they had endured pain for more than six months. In the presence of pain, they were asked to give a score between 0 and 10 based on a visual analog scale (0: Least severe pain, 10: Most severe pain in their life) (27).

Statistics

The statistical assessment of the study data was carried out using IBM SPSS Statistics (Version 20.0. Armonk, NY: IBM Corp.). The normality of continuous data was analyzed with a Kolmogorov-Smirnov test. For the descriptive statistics, continuous variables were expressed as mean ± standard deviation, median and minimum-maximum values, while categorical variables were expressed as number (of subjects) and percentages. A chi-square test was used to identify any association between the categorical variables on the basis of a univariate analysis. The coefficient of the association between the dependent and independent variables was determined by a regression analysis. Data were expressed as odds ratio and 95% confidence interval. A p-value of <0.05 was considered statistically significant.

Results

The study was completed with 438 patients with a mean age of 74+6.7, 129 (29.5%) of whom were male. The prevalence of falls, urinary incontinence, fecal incontinence, constipation, sleep

disorders, depression, chronic pain were recorded as 40.6% (178), 42.9% (188), 4.8% (21), 30.8% (135), 40% (171), 43.2% (189) and 54.8% (240) respectively. The study population's median ADL and IADL scores were recorded as 6 and 8, respectively.

The prevalence of probable sarcopenia by standard cut-off 19.9% (87) when probable sarcopenia evaluated by regional cut-off its increased to was 48.8% (214) (Table 1). Summarized baseline features of study population according to probable sarcopenia (Table 2).

The prevalence of probable sarcopenia, undernutrition and frailty were 48.8% (214), 24.2% (106) and 65.1% (285) respectively, and 13.6% (60) of the patients suffered from all three conditions. Both probable sarcopenia and undernutrition were detected in 15.5% (68%) of the sample, 36.7% (161) were probable sarcopenic and frail, and 20.3% (89) were undernourished and frail (Figure 1).

Discussion

In the present study, the prevalence of probable sarcopenia, undernutrition and frailty were recorded as 48.8% (214), 24.2% (106) and 65.1% (285) respectively, and 13.6% (60) of the patients suffered from all three conditions.

Table 1. Demographic characteristics of patients and prevalence of probable sarcopenia, frailty, undernutrition and geriatric syndrome

Age	**74+6.7**
Sex Female Male	 70.5% (309) 29.5% (129)
No of medications*	**5 (0-17)**
Polypharmacy	**59.4% (260)**
No of diseases*	4 (0-10)
Falls	**40.6% (178)**
Urinary incontinence	42.9% (188)
Fecal incontinence	**4.8% (21)**
Constipation	30.8% (135)
Sleep disorders	**40% (171)**
ADL*	6 (1-6)
IADL*	**8 (0-8)**
Probable sarcopenia (35/20)	48.8% (214)
Probable sarcopenia (27/16)	**19.9% (87)**
Frailty	65.1% (285)
Undernutrition (MNA-SF)	**24.2% (106)**
Depression (GDS)	43.2% (189)
Chronic pain	**54.8% (240)**

Data are given as mean ± standard deviation or number (percentage) as applicable.
*Data are given as median.
MNA-SF: Mini nutritional test-short form, GDS: Geriatric depression scale, ADL: Activities of daily living, IADL: Instrumental activities of daily living

Although there is other almost studies evaluating the co-occurrence of these important syndromes, they were generally conducted with nursing home residents, hospitalized patients or specific patient groups, such as those with cirrhosis or hip fracture (15-17,19,28). To date, there has been no study investigating the overlap of these three geriatric syndromes, while a single study in our country has been conducted in which probable sarcopenia was examined based on the standard cut-off and its relationship with other geriatric syndromes (28). The study recorded the prevalence of probable sarcopenia (standard cut-off), malnutrition and frailty prevalence to be 12.7%, 23.5% and 40.3%, respectively, which are similar to those in the present study. We believe that the differences in the probable prevalence of sarcopenia in the two studies can be attributed to the fact that regional cut-off values were not used (28). The recommended EWGSOP2 standard cut-off values were based on a British cohort, and were defined as 27/16 kg in men and women, respectively (7), although each population may be subject to regional cut-off values. For this reason, it is suggested by EWGSOP2 that each population should have a population specific cut-off value and be evaluated accordingly (9).

Table 2. Characterises data of study population according to probable sarcopenia

	Probable sarcopenia (+) (n=214)	Probable sarcopenia (-) (n=224)	Total population (n=438)
Age	**77.4+6.8**	**73.1+6.3**	**74+6.7**
Female	67.3% (144)	73.7% (165)	70.5% (309)
Male	**32.7% (70)**	**26.3% (59)**	**29.5% (129)**
No of medications*	6 (0-17)	5 (0-17)	5 (0-17)
Polypharmacy	**65.4% (140)**	**53.6% (120)**	**59.4% (260)**
No of diseases*	4 (0-8)	3 (0-10)	4 (0-10)
Falls	**44.1% (94)**	**37.5% (84)**	**40.6% (178)**
Urinary incontinence	46.3% (99)	39.7% (89)	42.9% (188)
Fecal incontinence	**5.6% (12)**	**4% (9)**	**4.8% (21)**
Constipation	35% (75)	26.9% (60)	30.8% (135)
Sleep disorders	**43.9% (94)**	**44.4% (77)**	**40% (171)**
ADL*	6 (1-6)	6 (2-6)	6 (1-6)
IADL*	**5 (0-8)**	**8 (0-8)**	**8 (0-8)**
Frailty	75.2% (161)	55.4% (124)	65.1% (285)
Undernutrition (MNA-SF)	**31.8% (68)**	**17% (38)**	**24.2% (106)**
Depression (GDS)	49.5% (106)	37.1% (83)	43.2% (189)
Chronic pain	**55.1% (118)**	**54.5% (122)**	**54.8% (240)**

Data are given as mean ± standard deviation or number (percentage) as applicable.
* Data are given as median.
MNA-SF: Mini nutritional test-short form, GDS: Geriatric depression scale, ADL: Activities of daily living, IADL: Instrumental activities of daily living

For example, the regional threshold values for probable sarcopenia specific to our population were determined as 35/20 kg, which is higher than the standard threshold values (8).

In a study of 100 patients who presented to internal medicine outpatient clinics, sarcopenia was identified in 42%, frailty in 33%, cachexia in 32% and malnutrition in 15%. The authors identified at least one syndrome in 63% of this group of outpatients, among which 32% were detected with one syndrome, 11% with two syndromes, 12% with three syndromes and 8% with four syndromes, although most of the sample were gastroenterological and oncological patients (64%) (16). The present study, unlike other studies, was not performed solely with hip fracture or gastroenterological-oncological patient groups. Malnutrition, frailty and sarcopenia are likely to be higher among in-patient groups with hip fractures or those followed up with oncological and gastroenterological problems. Although our study sample consisted of outpatients, the prevalence of sarcopenia was found to be higher, which we attributed to the fact that the diagnostic criteria suggested by EWGSOP2 were used rather than the EWGSOP1 diagnostic criteria, unlike in the study by Gingrich et al. (16).

The importance of low muscle strength and regional cut-off values in diagnosing is thus revealed. We believe that the differences in the prevalence of malnutrition and frailty may be attributed to the different tools used for the screening of the two syndromes, and so the results of these studies may not accurately reflect the prevalence of the syndromes in the older people who applied to the outpatient clinic.

In a meta-analysis of 8.868 patients (62% women) examining the associations and relationships of probable sarcopenia, malnutrition and frailty in hospitalized patients, 84% of the sample were frail (prefrail + frail), 37% had probable sarcopenia and 66% had malnutrition (malnutrition + malnutrition risk) (15), although the coexistence of all three syndromes was not examined in the study. The results of the study are similar to those of the present study, except the prevalence of malnutrition. Considering the acute and chronic conditions that require hospitalization, the higher prevalence of malnutrition in this study group can be considered an expected result. The prevalence of probable sarcopenia in our study of outpatients was similar to that recorded in this met analysis of hospitalized patients, in whom the prevalence of probable sarcopenia can be expected to be higher. We believe that this is probably an indication of our superior probable sarcopenia screening based on population-specific cut-off values. It is worthy of note that these three syndromes are associated with a high rate these syndromes in the geriatric patient group making routine visits to the outpatient clinic. Faxén-Irving et al. (17) investigated the prevalence and overlap of malnutrition, sarcopenia and frailty in 92 nursing home residents in a cross-sectional descriptive study. In this nursing home study, 1/3 of the participants were found to be at risk of sarcopenia based on the results of the application of the SARC-F questionnaire, 33% were found to be undernourished and 50% to be frail (frail + prefrail). After confirmatory tests, an association between the three syndromes was detected in 7% (6) of the participants. Similar to this study, the patient group in the present study consisted of predominantly women. In addition, in our study, sarcopenia was evaluated using hand grip strength as a more reliable than SARC-F questionnaire method. Although our study was based on an outpatient sample, the prevalence of probable sarcopenia, frailty and malnutrition were similar to those recorded in Faxén-Irving et al. (17) This difference was ensured by the use of regional cut-off values as suggested by EWGSOP2 (9). The results of our study emphasize the importance of the coexistence and prevalence of these three syndromes, which is higher prevalence's than expected not only in nursing home residents but also in outpatients, and also reveals the need to carefully screen for the others when any of the three syndromes are encountered.

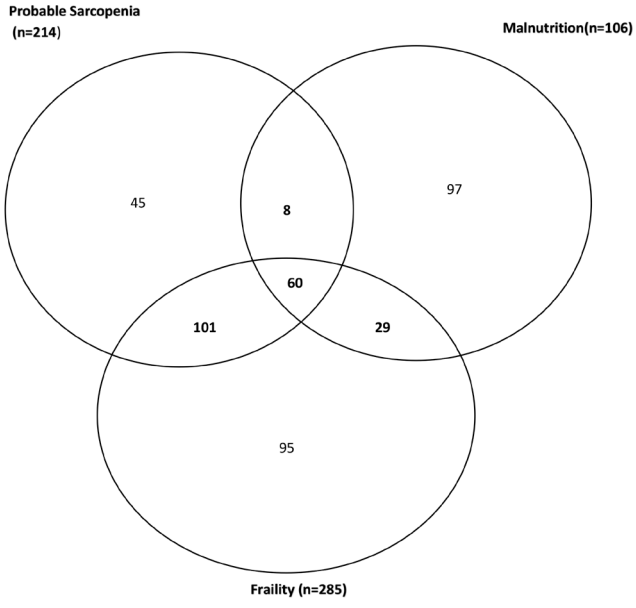

Figure 1. The coexistence between probable sarcopenia, undernutrition and frailty is shown with a schematic

Our study draws attention to the coexistence of three important geriatric syndromes associated with significant mortality and morbidity in elderly patients.

The strength of our study lies in its focus on the geriatric patient population and its revealing of cases of probable sarcopenia that may be hidden when regional thresholds are not applied. Besides, a review of literature reveals this to be the first study to evaluate the overlap of these three geriatric syndromes. For the purposes of the study, the regional cut-off values recommended by EWGSOP2 were used to define probable sarcopenia (9).

Study Limitations

There are some important limitations to our study, such its retrospective design and that lack of patient follow-up data.

Conclusion

Our study reveals malnutrition, probable sarcopenia and frailty to be common not only in hip fracture patients, nursing home residents or inpatients, but also in routine geriatric patient populations. It emphasizes the importance of screening for the presence of the other conditions when one of these three geriatric giants is encountered in outpatients. It has been shown that the use of regional cut-offs in the evaluation of probable sarcopenia may reveal cases that would otherwise remain hidden.

Ethics

Ethics Committee Approval: The data of 438 patients who could be included in the study were accessed. Prior approval for the study was granted by the İstanbul University, İstanbul Faculty of Medicine Clinical Research Ethics Committee (no: 905439/13.05.2022).

Informed Consent: Retrospective study.

Peer-review: Externally peer-reviewed.

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ORIGINAL RESEARCH

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The Effect of Environmental Modifications on Preventing Delirium for the Elderly Patients in the Intensive Care Unit: A Non-randomized Controlled Trial

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Abstract

Objective: The study aimed to examine the effect of environmental modifications on preventing delirium for the elderly patients in the intensive care unit. A quasi-experimental study with non-randomized independent two groups.

Materials and Methods: The study was conducted at a hospital in Bolu, Turkey. The sample was constituted of 60 patients who met the inclusion criteria. In the intervention group (30 patients), the sound level of the environment was improved, the bright light, a largely written calendar and clock were used, and were allowed to use their glasses or hearing aids if they had. No extra regulation has been made regarding the temperature or humidity of the environment.

Results: Mean humidity level and the mean sound level in the unit were different, while the mean of the temperature was similar between the groups. The mean sound level was higher in control group. In the intensive care unit, the frequency of delirium was 56.7%, and the risk of delirium was 2.32 times higher in the control group.

Conclusion: The study provides scientific evidence to reduce the risk of delirium by a specific care bundle include nursing interventions for elderly patients in intensive care units.

Keywords: Delirium, environment, elderly, intensive care, nursing

Introduction

Delirium is a mental state disorder characterized by impairment of cognitive functions, inadequate attention, decreased or increased psychomotor activity, and changes in the sleep-wake cycle (1). Various risk factors, including age, physiological problems, and environmental conditions, prepare and trigger the development of delirium in older intensive care unit (ICU) patients (2-4).

Delirium progresses with a wide variety of variables. In the literature, delirium in older ICU patients was found to have broad range of frequency (30-73.4%) (5-10). Although different intensive care environments, study samples, methods, and instruments used to measure delirium cause this situation, delirium may frequently occur in patients over 65 years of age, in hospitals, and especially in ICUs. Although delirium is a reversible condition, it can also lead to various complications such as long-term cognitive and functional impairment, prolonged hospitalization, and institutionalization. Since delirium is frequent in this patient group, difficult to diagnose because it is confused with dementia and increases the risk of mortality and morbidity and the cost of care, delirium is a fundamental health problem (11). There is no golden bullet for the treatment of delirium, that is why the prevention of delirium is the most effective strategy (5).

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Especially, some studies emphasized environmental factors' considerable importance. Arenson et al. (12) stated that the environment has an effect on delirium after cardiovascular surgery. Exposure of patients to high noise levels in ICUs may contribute to sleep disturbance and delirium development (13,14). In studies where sound levels were measured in hospital environments, it has been reported that the noise level reached 75 dB (A) during the day and over 40 dB (A) at night (14,15).

Van Rompaey et al. (16) investigated the effect of noise on sleep quality and delirium risk and found that the use of earplugs at night improved sleep quality and decreased delirium frequency. Based on this information, it can be said that both excessive and insufficient environmental stimuli cause or worsen delirium. The ICU nurses play a key role in the management of environmental stimuli. As stated within the scope of the "Delirium Management" in the Nursing Interventions Classification System, nurses make many interventions to eliminate or reduce the risk of delirium development such as using photographs of the patients' relatives, calendars, and clock, ensuring a calm and relaxing environment, appropriate lighting and reducing noise (17-19).

Considering the relevant literature, it was seen that the importance of environmental modifications was emphasized, but only environmental modifications such as noise level and bright light were evaluated, and there was no comprehensive study investigating the effect of delirium by controlling environmental modifications for older patients. This study was conducted to examine the impact of a specific care bundle including many nursing interventions about environmental modifications on delirium.

Materials and Methods

Study Design

This research was carried out in the anesthesia and reanimation ICU at a public hospital. The study design was a quasi-experimental study with non-randomized independent two groups. A routine care was provided to the control group. The intervention group implemented a specific care bundle that included nursing interventions to prevent a delirium. The delirium was measured during the patients' stay in ICU.

Sample

The sample size of the study was determined according to the power analysis. During the study, the first 30 patients who were treated in the ICU, who had the inclusion criteria and volunteered to participate in the study constituted the control group, and the next 30 patients were the intervention group. The inclusion criteria were an age 65 years and over, being in the ICU for at least 48 hours, having eight or over for Glasgow Coma scale (GCS) score, 3 or over for Richmond agitation sedation scale (RASS) scores, not being diagnosed with psychiatric disorder such as Dementia/Alzheimer's or substance addicts, no any electrolyte imbalances and no severe visual or hearing problems.

The Instruments for Data Collection

Patient information form: The form, which was prepared by the researchers by reviewing the literature (7-9,17,20-24), consisted of 16 questions including the descriptive characteristics of the patients and some follow-up data in the ICU.

GCS: It was used to evaluate the consciousness of patients and consists of three parts: Eye-opening, motor, and verbal response. The response of the patients to the stimuli given in these three areas is evaluated and scored. GCS score must be 8 and over to apply CAM-ICU scale to patients. If the score was 8 or less the patient was considered comatose and cannot be evaluated.

RASS: It was used to assess the patient's agitation state. RASS indicates whether the patient is under deep sedation or fully conscious. The total score is between -5 and +4. If the score was -4 and -5 the patient was considered unconscious and the CAM-ICU scale was not applied to the patient.

The confusion assessment method for the intensive care unit (CAM-ICU): The CAM, developed by Inouye et al. (25) was modified by Ely et al. (26) to use for ICU patients. Turkish validity and reliability study of the scale was performed by Akıncı et al. (5) and its reliability was found 0.96.

In the study, this scale was preferred for the diagnosis of delirium because of being use easily by other health professionals than the psychiatrist, an instrument recommended by the clinical guidelines (8), and being available to the valid and reliable Turkish version of the scale.

The scale was a first time filled in 24 hours of the patient's admission to the ICU. Then, an evaluation was made once a day. It was marked (+) if delirium developed in the patient, and (-) if there was no. If the answers in the first subtitle were no, it was accepted that the patient did not have delirium.

Noise-temperature-humidity monitoring form: This form was developed by the researchers. It was used to record the mean of the noise-temperature-humidity levels measured by the device during the day. The noise level in ICU was measured by a decibel meter funding by Bolu Abant İzzet Baysal University Scientific Research Projects Unit. Temperature and humidity levels were measured by a temperature and humidity meter existing in the ICU.

Data Collection

Control group: The first 30 patients meeting the inclusion criteria were included in the control group. The group took a routine care in ICU. The routine care includes nursing practices such as informing the patient about the procedures, providing the patient's orientation, addressing the patient by name,

and allow their relatives to visit. No additional regulation had been made for these patients in the ICU environment. While collecting the first data from the patients, each of the data collection instruments was used simultaneously. CAM-ICU was evaluated daily. RASS and GCS scores are needed for CAM-ICU evaluation and have to be sufficient. Thus, RASS, and GCS were also measured daily.

Intervention group: For the next 30 patients who were treated in the ICU and met the inclusion criteria, the sound level of the environment was controlled by reducing the volume of the device alarms, by speaking in a low voice during the delivery, or making the conversations in a different environment rather than around the patient. The indoor humidity level was between 30-60% in line with the recommendation of WHO. In our study, no tools were used to humidify the environment. The control group data were collected between September-April and intervention group data was collected between May-July in accordance with the records kept in the ICU to maintain the humidity level of the environment at the desired levels in the intervention group. In addition, patients were allowed to use glasses or hearing aids if they had, and a large written clock and calendar were hung somewhere they could easily see. Bright light (10.000 lux) was also applied for a total of two hours between 12:00-14:00 with a daylight lamp funding by the university scientific research projects unit. Patients were warned not to look directly at the lamp, and the device was placed 60-80 cm away from the patient and in such a way that the light would come to the patient at an angle of 60°. Besides all these environmental changes patients in the intervention group was always received full routine care. Data collection was evaluated similarly with the control group. The first researcher collected all data.

What is already known?

- Delirium is a problem quite common in older intensive care unit patients.
- Several predisposing factors, including age, physiological problems, and environmental conditions, prepare and trigger the development of delirium in this patient group.
- Delirium can lead to various complications such as long-term cognitive and functional impairment. These complications induce prolonged hospitalization, institutionalization, increased mortality and morbidity, and costs.
- Control of sound levels and light treatment could be effective to prevent delirium.

What this paper adds to existing literature and clinical practice?

- To control environmental stimuli with a specific care bundle in the study reduced the delirium risk by 2.32 times in older intensive care unit patients.
- The clinicians should consider the effect of humidity levels on delirium in this patient group.
- The randomized controlled studies are needed to examine the effect of humidity levels on delirium.

Statistics

The data were analyzed using the SPSS version 21. Numerical data analyzed with mean, standard deviation, minimum and maximum values while frequency and percentage distributions were used to analyze categorical data. The normality assumption from the parametric test assumptions was examined using the Shapiro-Wilks test. To examine whether the difference between the two groups was significant or not, the student t-test was used when the assumptions were provided, and the Mann-Whitney U test was used if not. Whether there is a difference between groups in variables that vary with time (in repeated measurements) was examined with the help of generalized linear models. The level of significance was taken as $p<0.05$.

Ethical Considerations

Ethical approval was obtained from the Ethics Committee of Bolu Abant İzzet Baysal University Human Research in Social Sciences (2017/9). Written permissions was obtained from the hospital administration for the application of the study, and from patients and/or patient relatives with the informed consent form.

Results

The mean age of the participants was 75.5±8.2. Approximately two-thirds of the patients (63.3%) were male and married (61.7%), and 40% were literate. 56.7% of the patients had chronic diseases. They had frequent hypertension (26.7%), chronic obstructive pulmonary disease (16.7%), and cancer (15%). The majority (88.3%) of the patients had experienced sleep problems (Table 1).

The mean of the APACHE II score was 17.3±3.9 in the control group and 16.8±4.0 was in the intervention group. The mean RASS value of the patients was calculated as 0.4±1.6. These ICU scores between the groups were not statistically different ($p>0.05$). However, a statistically significant difference was found between the control group and intervention group in terms of the mean of the GCS points ($p=0.004$) (Table 2).

When the environmental factors between the groups were examined, it was found that the mean humidity level in the ICU was 33.5±4.8 in the control group and 35.7±4.5 was in the intervention group. The mean sound level in the ICU was 56.3±2.6 dB in the control group and 50.3±2.1 dB was in the intervention group. These differences between the groups were found to be statistically significant ($p<0.001$) (Table 3).

It was determined that 56.7% of ICU patients participating in the study developed delirium. When the frequency of delirium

Table 1. The comparison of the socio-demographic and medical characteristics of the groups

Characteristics	Control group	Intervention group	Total	p
Age (x̄) ± SD	74.7±8.5	76.7±8.0	75.5±8.2	0.31
Gender	**n (%)**	**n (%)**	**n (%)**	
Female	12 (40)	10 (33.3)	22 (36.7)	0.59
Male	18 (60)	20 (66.7)	38 (63.3)	
Marital status				
Married	15 (50)	22 (73.3)	37 (61.7)	0.06
Single	15 (50)	8(26.7)	23 (38.3)	
Education status				
Illiterate	7 (23.3)	3 (10)	10 (16.7)	0.08
Literate	10 (33.3)	14 (46.7)	24 (40)	
Primary school	10 (33.3)	13 (43.3)	23 (38.3)	
Secondary school	3 (10)	0	3 (5)	
Presence of chronic diseases				
Yes	17 (56.7)	17 (56.7)	34 (56.7)	1
No	13 (43.3)	13 (43.3)	26 (43.3)	
Current chronic diseases				
Hypertension	10 (33.3)	6 (20)	16 (26.7)	0.24
COPD	5 (16.7)	5 (16.7)	10 (16.7)	1
Cancer	6 (20)	3 (10)	9 (15)	0.47
Diabetes	2 (6.7)	6 (20)	8 (13.3)	0.25
Stroke	1 (3.3)	2 (6.7)	3 (5)	1
Heart failure	2 (6.7)	1 (3.3)	3 (5)	1
Other*	3 (10)	1 (3.3)	4 (13.3)	0.39
Sleeping problems				
Yes	24 (80)	29 (96.7)	53 (88.3)	0.10
No	6 (20)	1 (3.3)	7 (11.7)	
Mechanical ventilation				
Yes	7 (23.3)	10 (33.3)	17 (28.3)	0.39
No	23 (76.7)	20 (66.7)	43 (71.7)	
Mechanical ventilation days (x̄) ± SD	5.4±4.5	2±0.9	3.4±3.3	0.08
Hospitalization days (x̄) ± SD	8.4±6.1	7.9±3.7	8.1±5.0	0.81

*AF (n=1; 1.7%), lymphedema (n=1; 1.7%), renal failure (n=1; 1.7%), volvulus (n=1; 1.7%), SD: Standard deviation, COPD: Chronic obstructive pulmonary disease, AF: Atrial fibrillation

Table 2. The comparison of ICU scores between the groups

ICU scores	Control group (x̄) ± SD (min-max)		Intervention group (x̄) ± SD (min-max)		p
APACHE II	17.3±3.9 (10-25)		16.8±4.0 (10-25)		0.61
GCS	12.5±1.9 (8-15)		13.8±1.1 (11-15)		**0.004**
	B	**Std. error**	**Exp (β)**	**Confidence interval**	**p**
RASS	-0.2	0.4	0.8	0.3-1.8	0.59

SD: Standard deviation, ICU: Intensive care unit, APACHE II: Acute physiology and chronic health evaluation II, GCS: Glasgow Coma scale, RASS: Richmond agitation sedation scale

development in the control and intervention groups was examined, it was observed that 86.7% of the patients in the control group and 26.7% of the patients in the intervention group developed delirium. This difference between the groups was found to be statistically significant (p=0.026) (Table 4).

Besides, the risk of developing delirium in the control and intervention groups was compared using the generalized estimation equations test. Accordingly, it is seen that the risk of developing delirium was 2.32 times higher in the control group compared to the intervention group, and this was statistically significant [β=0.84, SE =0.37, Exp. (β) =2.32 confidence interval =1.107-4.88, p=0.026].

Discussion

In the literature, it is stated that some chronic diseases such as hypertension, diabetes, and situations such as cardiac surgery and use of mechanical ventilation in addition to various medical and metabolic problems, contribute to the development of delirium (4-5,13,27-32). These situations were not taken into account in the selection of the sample, since it was preferred that the sample of the study consisted of the older ICU patients, and it was considered that there was at least one chronic disease in elderly patients and mechanical ventilation support was generally used in the intensive care setting. Nevertheless, no significant difference was found between the control and intervention groups in terms of socio-demographic and medical characteristics of the participants. This finding was evaluated as important in terms of the reliability of the study results and interpreted as the randomly formed groups were homogeneous.

Table 3. Comparison of the environmental factors of the ICU between the groups

	Control group ($\bar{x}$) ± SD (min-max)	Intervention group ($\bar{x}$) ± SD (min-max)	Total ($\bar{x}$) ± SD (min-max)	p
Temperature (°C)	24.2±0.4 (23.2-24.9)	24.1±0.6 (23.5-26.3)	24.1±0.5 (23.2-26.3)	0.06
Humidity (%)	33.5±4.8 (30.2-48.4)	35.7±4.5 (33-55)	34.6±4.7 (30.2-55)	**0.00**
Sound (dB)	56.3±2.6 (48.9-59.9)	50.31±2.1 (45.6-54.8)	53.3±3.8 (53.5-59.9)	**0.00**

SD: Standard deviation, ICU: Intensive care unit, dB: Decibel

Table 4. Comparison of delirium development frequency in control and intervention groups

	Delirium		
Group	**Yes n (%)**	**No n (%)**	**p**
Control group	26 (86.7)	4 (13.3)	0.026
Intervention group	8 (26.7)	22 (73.3)	
Total	34 (56.7)	26 (43.3)	

*The row percentage was calculated

The ICU scores of the patients were calculated since their admission to the ICU. APACHE II score was calculated by the intensive care physician and recorded in the patient file. We obtained this score from the patients' scale however, GCS and RASS scores were monitored daily. Therefore, repeated measurements were obtained for GCS and RASS scores, and the mean of these measurements was used in statistical analysis. GCS was significantly different in both control and intervention groups while there was no significant difference between the groups in terms of APACHE II and RASS scores. Accordingly, GCS scores were higher in the patients in the intervention group, and it is thought that this situation may cause the effect of environmental modifications in the ICU. Both control and intervention groups had no baseline GCS and RASS values since measurements were not made before routine care or study interventions were performed. In the study, the mean of repeated measurements for GCS and RASS into the day were analyzed. In addition, it was not possible to determine whether the baseline GCS and RASS values were similar in both groups, as attempts were made to partially provide orientation during routine care.

The fact that the APACHE II and RASS scores were not different supported that our sample indicated similar characteristics. In studies on the subject in the literature, whereas the APACHE II score was found to be associated with delirium (23,33), it was observed that GCS and RASS scores were not evaluated.

In our study, it was found that delirium developed in one of every two patients and this was statistically significant. McNicoll et al. (8) stated in their study that the frequency of delirium was 31%, this frequency was 40% in the intensive care period and reached 70% in the older patients. In other studies, were used CAM-ICU for delirium, it was observed that the frequency of delirium varied between 11-75.6% (9,11,34-36). These different results may be due to the characteristics of the sample or the different scales used to diagnose delirium.

The importance of environmental modifications such as temperature, light, and sound to prevent delirium in ICU is emphasized in some studies (8,37,38). In the study, despite taking the necessary precautions, the mean of sound level in the ICU exceeded the level determined by WHO for 40 dB (A) during the day and 35 dB (A) at night (39). However, similar to the literature (16,40), reducing the sound level decreased the risk of delirium.

In the study, the effect of temperature level on delirium could not be examined very well since the temperature level in the ICU was controlled centrally while minimal temperature changes were determining between control and intervention groups. Unlike this result, although the humidity level was between 30-60% in line with the recommendation of WHO and the difference was no much more in both groups a significant relationship was found between the humidity level and delirium. The seasonal indoor humidity difference was related to the outdoor temperature, thermal insulation properties, and heating-ventilation systems of the hospital building. In the literature, many studies examining indoor air quality and low humidity recorded dry air or low humidity induce some skin, eyes, and airways problems, fatigue, infection, decrease sleep quality, and vocal fatigue (41,42). Sunwoo et al. (41) stated that the thermal comfort in the elderly was lower at low humidity levels than in the young. However, the effect of humidity level on delirium was examined for the first time in the current study. The findings from our study may arise from other variables/interventions evaluated in the study or sleep quality and/or thermal comfort related to relative humidity. Although it needs to be explained with specific experimental studies, it can be suggested to consider that the risk of delirium development may be high in patients in ICUs in autumn and winter months when humidity is lower. In our study, it was determined that there was a significant difference in terms of sound and humidity in the groups. As emphasized in the literature, it was also found that many attempts to control environmental stimuli reduced the delirium risk by 2.32 times.

Continuous lighting in ICUs causes the patients to lose their sleep-wake cycle. The natural light in caring environment, which nightingale also attaches importance to, can help patients correct their innate circadian rhythm and help them recover. However, ICUs are areas where daylight is insufficient and artificial lighting is preferred (43). Some studies stated that light treatment could be effective to prevent delirium (14,40,44-46). Adjusting the lighting environment is a non-invasive procedure that can improve the patient's quality of life without disturbing the medical care of the patient and reduces the duration of hospital stay (14,46). Since the effect of integrated landscaping on delirium was examined in our study, the effect of bright light application on delirium was not evaluated independently. However, indirectly, it can be said that it prevents the development of delirium together with other physical landscaping and practices aimed at providing stimuli.

Study Limitations

The study has some limitations. The sample study constituted of the non-complicated and non-randomized elderly patients in the ICU. Also, it was necessary to collect the data of the control group in the autumn and winter, and the data of the intervention group in the summer. Since we consider the seasonal humidity changes based on the previous ICU records. In both groups, we included every patient who met the sampling criteria until we reached the number of samples specified according to the power analysis. However, it can be said that the patients' similarity in terms of socio-demographic and medical characteristics increases the power of the study. In this study, the sleep quality of individuals was based on subjective reports of the patients, and the lack of use of any objective scales can be considered as a limitation of the study. However, in the study, the effect of humidity level on delirium was evaluated by using seasonal differences instead of using an ambient humidification device. In this study, the effect of environmental modifications on preventing delirium the elderly patients in the ICU are considered in combination. Hence, this study may shed light on the planning of various studies to examine the relationship between humidity and delirium.

Conclusion

In conclusion, there was no significant difference in terms of socio-demographic and medical characteristics of the patients in the intervention and control groups participating in the study. It was determined that GCS score and humidity level were higher and the sound level was lower in the intervention group. Delirium frequency and risk were reduced in improved ICU conditions.

In this study, the risk of developing delirium in older ICU patients can be reduced by a specific care bundle that include using calendars and clocks, ensuring that the environment is less noisy, allowing to use glasses or hearing aids if patients had and bright light intervention which are among important nursing initiatives.

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Ethics

Ethics Committee Approval: Ethical approval was obtained from the Ethics Committee of Bolu Abant İzzet Baysal University Human Research in Social Sciences (2017/9).

Informed Consent: Written permissions were obtained from the hospital administration for the application of the study, and from patients and/or patient relatives with the informed consent form.

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Authorship Contributions

Concept: A.A., A.K.Y., Design: A.A., A.K.Y., Data Collection or Processing: A.A., Analysis or Interpretation: A.A., A.K.Y., Literature Search: A.A., A.K.Y., Writing: A.A., A.K.Y.

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ORIGINAL RESEARCH

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Comfort and Quality of Life of Older Cardiac Patients: A Cross-sectional Study

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Abstract

Objective: A demographic transformation in favor of older people and the incidence of cardiovascular diseases requires considering the concepts of comfort and quality of life in older cardiac patients in all care settings. Thus, these concepts, closely related to the definition of health, conduce determination of the health care needs of older cardiac patients and the development of supportive approaches. The aims of the study were to determine the comfort and quality of life, examine the relationship between them, and to identify factors that affect the comfort and quality of life in older cardiac patients.

Materials and Methods: The cross-sectional study was conducted in the inpatient cardiology clinic of a university hospital in Bolu. Overall, 209 patients, who met the inclusion criteria, consisted of the sample. The general comfort questionnaire and quality of life index cardiac version-IV were used to collect data. Further analyzes were carried out with multivariate analysis of variance.

Results: Comfort and quality of life scores were 16.18±0.82 and 2.97±0.39, respectively. Physical, psycho-spiritual, environmental, and socio-cultural comfort closely correlated with quality of life ($p<0.05$). Multivariate analysis of variance showed that living place, perception of income status, frequency of hospitalization, dietary adherence, routine health checkup, and dizziness were common covariates of comfort and quality of life ($p<0.05$).

Conclusion: There was a correlation between all dimensions of comfort and quality of life. By improving the variables that affect comfort and quality of life together, patients' comfort can be provided and their quality of life can be increased.

Keywords: Aging, cardiac diseases, geriatric nursing, patient comfort, quality of life

Introduction

The average age of the global human population is increasing. The number of older people worldwide has risen to over one billion (13.5% of the global population) in 2021. Moreover, by 2030, one out of every six people is expected to be 60 and over (1). Turkey is among the aging countries because the proportion of the older population in the country rose by 22.5% in the last five years, and its ratio to the country's total population to 9.5%. This rapid demographic transformation has increased the expectation of healthy aging (2). However, an increase in the incidence of chronic diseases due to age-related physiological changes poses a grave challenge for healthy aging.

Cardiovascular diseases (CVDs) most significantly affect the mortality and morbidity rates in older people (3). Previous studies have demonstrated that an aging population is associated with the increasing prevalence of CVDs (4). As part of the normal aging process, the cardiovascular system undergoes non-pathological functional and structural changes, such as hypertrophy, a decrease in cardiac output, and an increase in peripheral vascular resistance (4,5). In addition, the cardiovascular system might also be affected by several non-modifiable (age, gender,

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and genetics) and modifiable (smoking, diabetes, obesity, etc.) factors. Thus, the emergence of life-threatening CVDs, such as hypertension, coronary artery disease (CAD), heart failure (HF), valvular diseases, and arrhythmias, which constitute approximately 39.6% of age-related diseases, is inevitable in older people (3,6,7). In addition, geriatric syndromes that develop with age, such as deterioration in neurological and cognitive functions, muscle wasting, functional limitation, polypharmacy, and comorbidities, may adversely affect cardiovascular recovery (8).

Although CVD-specific medical developments increase life expectancy, adding life to years rather than years to life has become the philosophy of healthy aging. Therefore, with the increasing life expectancy in older people, the care and treatment approaches are now more focused on providing comfort and improving the quality of life (QoL) (9). Comfort and QoL are not only indicators of health care quality but also the goals and expected results of holistic nursing care (10). Although they seem to be independent concepts, both offer a mutual structure for measuring physical, mental, social, and spiritual health (11). These two concepts, related closely to the World Health Organization definition of health, can provide an opportunity to determine the health care needs of older people and develop approaches that support them.

Previous studies that focused on the comfort needs or comfort care of older people, used commonly as a guideline Kolcaba's Comfort Theory (10,12-16). Kolcaba (17) examined in depth and explained comfort theory with a holistic view. She combined the levels of relief, ease, and transcendence aspects of the comfort concept with the physical, psychospiritual, environmental, and socio-cultural dimensions of health (17). Kolcaba et al. (18) stated that comfort theory is compatible with the values and domains of nursing, such as care, symptom management, interaction, holism, healing environment, identification of needs, and homeostasis. Therefore, comfort requirements are universal needs that must be met for individuals of all ages. In addition, meeting comfort needs is seen as one of the efficient ways of improving the QoL of older people (10). A thematic synthesis comprising 48 qualitative studies on older people showed that one of the core sub-dimensions of QoL perceived by individuals was emotional comfort (19). A limited number of studies on older people with CVDs have also shown an association between comfort level and QoL (20,21). Huiskes et al. (20) found that age, functional capacity, symptom burden, and decreased comfort levels were significant predictors of QoL in older people with HF. Taşkın Duman et al. (21) reported that comfort-based attempts in an older individual with atrial fibrillation were associated with relaxation at a level that could improve the QoL.

A few studies on cardiac patients focused on the comfort levels associated with intensive care treatment, interventional cardiology, and cardiac surgery (22-25). Some experimental studies have also demonstrated a relationship between anxiety and relaxation through therapeutic touch and music therapy in older people (10,12). A case study of an older person with atrial fibrillation showed positive effects of comfort interventions (21). To date, to the best of our knowledge, no studies have focused on the comfort needs and QoL of older patients with CVDs in a synchronized manner. Therefore, this study aimed to determine the comfort requirements and QoL of older people with CVDs. Through this study, we sought answers to the following questions:

- What are the comfort and QoL levels of older people with CVDs?
- What is the relationship between comfort and QoL?
- Which factors affect the comfort and QoL of older people with CVDs?

Materials and Methods

Study Population

The study followed a cross-sectional design and was conducted in accordance with the Strengthening the Reporting of Observational Studies in Epidemiology Statement guidelines for cross-sectional studies. The study was conducted between August 2018 and August 2019. We recruited patients from two inpatient cardiology clinics of a university hospital in Bolu, Turkey. The sample size was estimated using the G*Power v3.0.10 software. The parameters settings were as follows: alpha =0.05, power =0.80, effect size [cohen d] =0.6. These settings were similar to those used in a previous study focused on the assessment of comfort levels by gender as the primary endpoint in the Turkish population (22). Using these settings, the adequate sample size was estimated as 90 participants. Inclusion criteria were as follows: (a) Aged 65 and over, (b) having diagnosed with CVDs, (c) speaking and understanding Turkish, (d) ability to communicate verbally. Participants with hearing impairments and cognitive limitations were excluded.

Study approval was obtained from the Institutional Ethics Review Board (Bolu Abant İzzet Baysal University Clinical Researches Ethics Review, registered number 2018/96). The study was based on volunteerism and beforehand, the participants were informed about the procedure and their written consent was obtained. This study was conducted in adherence to the principles of the Declaration of Helsinki.

Data Collection and Tools

Data were collected with a 24-item questionnaire (including socio-demographic characteristics, history of CVDs, and the daily activities of life), comfort and QoL measurement tools.

The data were obtained through a face-to-face interview and recorded in a statistical program via a computer.

Comfort

The comfort level was measured using the Turkish-general comfort questionnaire (GCQ) (26). Kolcaba (27) developed the original scale to measure the comfort levels of an individual holistically with the guidance of the taxonomic framework of comfort theory. The GCQ comprises 48 items and a 4-point Likert structure that evaluates comfort dimensions and levels. Dimensions of comfort include physical (12 items), psycho-spiritual (13 items), environmental (13 items), and socio-cultural dimensions (10 items). The comfort levels include relief (16 items), ease (17 items), and transcendence (15 items). On the scale, 24 items were reversed because they had negative expressions. The score of the scale is obtained by the weighted sum of the responses to the items. Thus, the scores of the participants ranged from 48 to 192. The mean value is determined by dividing the total score obtained from the number of scale items. Comfort points range from 1-low comfort to 4-high comfort. The Cronbach's α value of the Turkish version of the scale was determined as 0.85 (26). In the current study, Cronbach's α value was evaluated as 0.91.

QoL

The QoL was measured using the Turkish-quality of life index (QLI) cardiac version-IV (28). The scale, originally developed by Ferrans and Powers (29), comprises two fundamental sections, each with 35 questions, and a 6-point Likert scale. The first section measures satisfaction with various aspects of life (ranging from 1-very dissatisfied to 6-very satisfied), and the second section measures the importance of aspects related to the person (ranging from 1-very unimportant to 6-very important). The scale evaluates four main dimensions (health and function, socio-economic, psychosocial/spiritual, and family) and the overall QoL (29). Each subsection was scored separately. The number 3.5 was subtracted from the response received for each item in satisfaction and importance sections. The responses given for both sections were multiplied by each other. Then, all the results from both sections were added. The overall score obtained after this process ranged between -15 and +15. To remove the negativity, 15 was added to the score obtained for each participant. For QLI cardiac version-IV, the total score for a participant ranged from 0 to 30. Higher scores indicated better QoL. The internal consistency reliability of QLI cardiac version-IV was supported by Cronbach's α values, which ranged from 0.73 to 0.99 (30). In the current study, we obtained Cronbach's α value of 0.92 for the overall scale, with the value ranging from 0.68 to 0.92 for the sub-dimensions.

Statistics

The data were analyzed using IBM SPSS Statistics 26.0 (SPSS Inc., 2019) package program. Descriptive statistics were represented as numbers, percentages, and mean and standard deviation. The normality of the numerical variables was assessed using the Kolmogorov-Smirnov test with skewness and kurtosis values of ±2. The mutual correlation of the dependent variables (comfort and QoL) with each other was determined by Pearson's correlation coefficient. Multivariate analysis of variance (MANOVA) was conducted to compare the mutual effect of independent variables (demographic, history of CVDs, and symptom-based characteristics) on dependent variables. MANOVA assumptions, multivariate normality and outliers, multicollinearity, were met. When the p-value of homogeneity of covariance matrices was >0.05 and Wilks' Lambda was <0.05, the Pillai trace criterion was used. In the study, the significance level was accepted as <0.05.

Results

Finally, 209 participants were recruited. The mean age was 72.9±7.6 years. Most of them were male (61.7%), more than half had a history of angina or myocardial infarction (59.8%), and most of them did not have routine exercise habits (87.1%) but routinely took care of their health (56.9%). Meeting friends/relatives (53.3%) and outdoor activities such as walking in the park (28.7%) were among the most common activities. The most common sleep problems experienced were difficulty falling asleep (15.2%) and frequent nighttime awakenings (24.5%) (Table 1). The most common symptoms were chest pain (85.6%) and dyspnea (68.4%); the severity of these perceived symptoms was low to moderate (chest pain 78%, dyspnea 60.8%) (Table 2).

Relationship Between Comfort Level and QoL

Overall, for all participants, mean GCQ and QLI cardiac version-IV scores were 16.18±0.82 and 2.97±0.39, respectively. Overall, GCQ and QLI cardiac version-IV scores had a positive medium-high correlation ($r=0.76$, $p<0.001$). Physical comfort positively and moderately correlated with the health and function sub-dimension of QLI cardiac version-IV ($r=0.51$, $p<0.001$). Psycho-spiritual, environmental, and socio-cultural comfort strongly correlated with the psycho-spiritual and the family sub-dimensions of QLI cardiac version-IV ($p<0.001$) (Table 3).

Multivariate Analysis

Among the assessed descriptive characteristics, residence, perceived income status, frequency of hospitalization, dietary adherence, routine health control, and dizziness were independently associated with GCQ and QLI cardiac version-IV scores ($p<0.05$). Village/county living ($p<0.001$, $\eta^2=0.07$) and higher-income perception ($p<0.001$, $\eta^2=0.06$) were found to be associated with better QLI cardiac version-IV and GCQ scores. Dietary adherence and routine health control were associated with high QLI cardiac version-IV and GCQ scores,

accounting for 11% and 26% of the variance, respectively. On the other hand, increased hospitalizations ($p<0.001$, $\eta^2=0.05$) and dizziness ($p<0.017$, $\eta^2=0.04$) were associated with poor QLI cardiac version-IV and GCQ scores (Table 4). No significant difference was found between other descriptive characteristics and comfort and QoL.

Discussion

To our knowledge, this was the first study in which both the comfort level and QoL of older people with CVDs were examined in a synchronized manner. Our findings showed that the study population exhibited high scores in terms of both sub-dimensions of and overall comfort. It is noteworthy

Table 1. Participant's characteristics (n=209)

Variables	n	%	Variables	n	%
Age (year)[‡]	72.92±7.60 (min-max: 63-95)		**Diagnosis**		
			MI/angina	125	59.8
			Pace maker/ICD	33	15.8
			HF	45	21.5
			Valve diseases	6	2.9
Gender			**Frequency of hospitalization**		
Female	80	38.3	No	80	38.3
Male	129	61.7	Once	87	41.6
			Twice	29	13.9
			At least three times	13	6.2
Education level			**Comorbid diseases (n=175)**[†]		
Primary school	160	76.6	Diabetes mellitus	60	34.3
Secondary school	42	20.1	Hypertension	88	50.3
At least university	7	3.3	Chronic renal failure	8	4.6
			Chronic respiratory diseases	15	8.6
			Thyroid diseases	4	2.2
Marital status			**Smoking**		
Married	170	81.3	User	28	13.4
Single	39	18.7	Smoking cessation	81	38.8
			Lifelong non-smoker	100	47.8
People living with			**Alcohol use**		
Alone	18	8.6	User	8	3.8
Wife	123	58.9	Alcohol cessation	53	25.4
Spouse and children	37	17.7	Rechabite	148	70.8
Children/grandchildren	31	14.8			
Living place			**Regular exercise status**		
Village	78	37.3	Yes	27	12.9
Township	90	43.1	No	182	87.1
Town	41	19.6			
Social security			**Dietary compliance**		
Yes	197	94.3	Yes	108	51.7
No	12	5.7	No	101	48.3
Access to health facility			**Regular health check up**		
Yes	180	86.1	Yes	119	56.9
No	29	13.9	No	90	43.1
Perception of income status			**Eligibility for health expenditures**		
Income less than expenses	36	17.2	Sufficient	167	79.9
Income equals expense	144	68.9	Insufficient	42	20.1
Income more than expenses	29	13.9			
Participation in social activities (n=317)[†]			**Sleep problems (n=237)**[†]		
Talking to friends/neighbors	169	53.3	No	99	41.8
Going to the coffee shop	53	16.7	Difficulty falling asleep	36	15.2
Park/beach activities	91	28.7	Frequent waking night	58	24.5
Artistic events	4	1.3	Wake-up early in the morning	11	4.6
			Napping during the day	33	13.9

[‡]Mean ± standard deviation,
[†]Multiple responses,
MI: Myocardial infarction, HF: Heart failure, ICD: Implantable cardioverter defibrillator

that there is limited evidence regarding the comfort levels of cardiac patients or older people with CVDs. A previous study on cardiac patients with an average age of 60 years and admitted to the coronary care unit reported that the comfort level was above average and that the comfort scores were significantly associated with age (24). In our study, the comfort level was lower than that of patients with an average age of 60 years in the Nural and Alkan's (24) study, however, we did not observe any significant difference in comfort levels on the basis of age. Our findings indicated that patient empowerment was needed to further increase their comfort levels. In a previous study, Krinsky et al. (31) handled patient discomfort owing to cardiac symptoms and reported that Kolcaba's Comfort Theory could be easily applied to cardiac patients. Sun et al. (32) reported that comfort nursing based on the collaborative care model improved the physical, mental, social, and emotional comfort levels of coronary heart disease patients. Healthcare professionals, especially in clinical settings, might need to tend to the physical comfort needs of the patients. It is noteworthy that the absence of physical discomfort may not always be associated with comfort. However, comfort care includes more holistic and multidimensional interventions, and it is related to aspects such as dignity, empathy, kindness, and compassion (33). It can be assumed that such an approach can positively affect the QoL of the patients, which has been reported to be closely related to the concept of comfort (11,34).

Table 2. Descriptive statistics of participants' symptom frequency and severity (n=209)

Symptoms	Symptom severity			
		Low	Moderate	Severe
	n (%)	n (%)	n (%)	n (%)
Chest pain	179 (85.6)	64 (30.6)	99 (47.4)	16 (7.6)
Dyspnea	143 (68.4)	57 (27.3)	70 (33.5)	16 (7.6)
Palpitation	117 (56)	40 (19.1)	66 (31.6)	11 (5.3)
Tiredness	110 (52.6)	46 (22)	52 (24.9)	12 (5.7)
Edema	28 (13.4)	9 (4.3)	18 (8.6)	1 (0.5)
Cyanosis	22 (10.5)	13 (6.2)	8 (3.8)	1 (0.5)
Nausea/vomiting	29 (13.9)	25 (12)	4 (1.9)	-
Dizziness	24 (11.5)	19 (9.1)	4 (1.9)	1 (0.5)
Sweating	40 (19.1)	20 (9.6)	15 (7.2)	5 (2.3)
Syncope	2 (1)	(1)	-	-

Table 3. General comfort questionnaire and Ferrans and Powers quality of life index cardiac version-IV means and correlations (n=209)

	Mean ± SD	Min-max	GCQ	GCQ-1	GCQ-2	GCQ-3	GCQ-4	QLI	QLI-1	QLI-2	QLI-3	QLI-4
†**GCQ**	2.97±0.39	2.02-3.81		0.65**	0.92**	0.85**	0.83**	0.76**	0.51**	0.62**	0.74**	0.66**
(1) Physical	2.72±0.46	1.33-3.75			0.56**	0.27**	0.27**	0.48**	0.51**	0.34**	0.36**	0.21**
(2) Psycho-spiritual	3.13±0.52	2-4				0.70**	0.70**	0.75**	0.50**	0.61**	0.73**	0.67**
(3) Environmental	2.99±0.49	1.92-3.77					0.78**	0.59**	0.30**	0.49**	0.66**	0.60**
(4) Socio-cultural	3.06±0.45	1.90-3.90						0.65**	0.34**	0.56**	0.66**	0.69**
†**QLI**	16.18±0.82	14.41-17.93							0.78**	0.83**	0.87**	0.77**
(1) Health and function	16.33±1.75	11.42-20.85								0.45**	0.48**	0.28**
(2) Socio-economic	17.10±1.78	13.78-20.47									0.70**	0.70**
(3) Psychosocial/ spiritual	18.63±2.52	12.32-24.75										0.79**
(4) Family	19.16±2.51	13.25-21.25										

**Correlation is significant at the 0.01 level (2-way),
†Scale total score,
GCQ: General comfort questionnaire, QLI: Ferrans and Powers quality of life index cardiac version-IV, Mean ± SD: Mean ± standard deviation

Table 4. Multivariate analysis of participants' characteristics with the general comfort questionnaire and the Ferrans and Powers quality of life scale cardiac version-IV

	General comfort questionnaire			Quality of life index				
Independent variable¶	**x (SD)**	**B**	**p**	**x (SD)**	**B**	**p**	**p^{Manova}**	**η^2**
Where (s)he lives†								
Village	3.03 (0.41)	0.72	<0.001	16.32 (0.78)	0.33	<0.001	<0.001‡	0.07
Township	3.04 (0.37)			16.32 (0.82)				
Town	2.70 (0.26)	0.73	<0.001	15.60 (0.60)	0.34	<0.001		
Perception of income status†								
Income less than expenses	2.88 (0.39)	-0.28	0.005	15.91 (0.78)	-0.94	<0.001	<0.001	0.06
Income equals expense	2.96 (0.39)			16.11 (0.78)				
Income more than expenses	3.16 (0.33)	-0.20	0.012	16.85 (0.69)	-0.74	<0.001		
Frequency of hospitalization†								
No	3.00 (0.38)	0.29	0.012	16.20 (0.76)	0.65	0.006	<0.001	0.06
Once	3.06 (0.38)	0.34	0.003	16.40 (0.82)	0.86	<0.001		
Twice	2.74 (0.34)	0.03	0.823	15.78 (0.76)	0.24	0.361		
At least three times	2.72 (0.36)			15.55 (0.71)				
Dietary compliance								
Yes	3.09 (0.40)	0.24	<0.001	16.43 (0.80)	0.50	<0.001	<0.001	0.11
No	2.85 (0.35)			15.92 (0.76)				
Regular health check up								
Yes	3.14 (0.37)	0.39	<0.001	16.52 (0.76)	0.77	<0.001	<0.001	0.26
No	2.75 (0.30)			15.75 (0.68)				
Dizziness								
Yes	2.78 (0.39)	-0.22	0.011	15.75 (0.84)	-0.49	0.005	0.017	0.04
No	3.00 (0.39)			16.24 (0.80)				

¶Statistically significant variables
†Bonferroni (post-hoc test)
‡Pillai's Trace, SD: Standard deviation

In the current study, the QoL of the study population was determined to be moderate. In addition, the comfort levels of the older people with CVDs were found to be closely associated with their QoL. The increased physical comfort also elevated their satisfaction level with respect to health and function. Improvement in the psycho-spiritual, environmental, and socio-cultural comfort levels increased the satisfaction levels with respect to their psychosocial/spiritual aspects and family-related life. Moreover, both correlation and multivariate analyses revealed that the same set of factors affected both comfort and QoL. Rural life, high-income perception, dietary adherence, and routine health control were associated with good QoL and comfort. On the contrary, increased hospitalization and dizziness reduced the QoL and comfort level. Socio-economic status and lifestyle preferences were the differentiating variables for comfort and QoL, as well as the variables associated with the disease.

In contrast to our findings on the factors affecting comfort, Nural and Alkan (24) identified that sufficient communication by physicians, education level, and having a companion were related to the comfort level. On the other hand, in agreement with our findings, Durmaz et al. (35) reported that marital and financial status, history of myocardial infarction, and difficulty in daily life activities were the main factors affecting the QoL of CAD patients. In a systematic review focusing on the QoL of cardiac patients, gender, age, educational status, marital status, number of hospitalizations, and duration of disease diagnosis were found to affect their QoL (36).

Several factors might affect the comfort level and QoL of older people with CVDs. Lifelong health habits, cardiac risk factors, comorbidities, psychosocial structure, and the interaction of culture are found to be responsible for the physiological changes in an individual with advancing age (37). The previous studies reported that the health care needs of elderly patients became more complicated with age-related biopsychosocial changes (38,39). CVDs increase also usually morbidity and mortality in older people. Among CVD cases, the patients with acute conditions usually warrant hospitalization, regardless of the presence of a chronic illness (37). It suggests that the need for hospitalization arises from the deterioration in physical health associated with the exacerbation of symptoms in acute cases. In addition, hospitalization is often an unpleasant experience and can increase vulnerability in the elderly, making them more susceptible to pain and discomfort (40). Moreover, conditions that require urgent invasive intervention, such as acute myocardial infarction, pose more danger to older people than young adults. Even with new and advanced treatment options, the potential non-cardiac health-related problems in older people with CVDs

might limit the treatment options or increase the risk of adverse effects associated with treatment (37). Furthermore, dizziness, which is considered a geriatric syndrome, introduces additional problems such as falls, obstacles in activities of daily living, and poor QoL (41). Even after discharge from the hospital, the living standards and health-related life choices of cardiac patients can affect their comfort levels.

Thus, when considering the heterogeneous nature of aging, comfort requirements that are often neglected and not properly met must be taken into account (40). This study can offer an opportunity to fill in the gaps in the care delivery of older people with CVDs. It is important for the nurses to more closely monitor the unmet needs related to care, as they represent the largest group among health professionals (42). Therefore, more studies focusing on the QoL and comfort levels of older people with CVDs are warranted as they might provide support to the nurses and help them implement evidence-based practices in patient care.

Study Limitations

The study had several limitations. First, data were obtained from a single center and cannot be generalized to all older people with CVDs. In addition, the indiscriminate inclusion of all cardiac conditions may have prevented the achievement of standardized measurement results. This disappointment could have been remedied by comparative analyzes of results for different CVDs. Second, all data used here are self-reported and may therefore be biased. We are faced with the fact that each individual's QoL and comfort needs and perceptions are different. More clinical research, including thematic analyzes, is needed to better explain and understand these parameters.

Conclusion

Our findings showed that older people with CVDs scored well in terms of both overall as well as sub-dimensions of comfort. However, the QoL was moderate for all sub-dimensions. Physical, psycho-spiritual, environmental, and socio-cultural comfort was found to be associated with QoL. The location of residence, perception of income status, frequency of hospitalization, dietary adherence, routine health control, and dizziness were independently associated with the general comfort and QoL. It is important to determine the comfort levels and QoL of older people with CVDs by using valid and reliable measurement tools. In addition, the factors affecting both comfort levels and QoL should be identified, and evidence-based initiatives should be implemented to further improve these aspects. Thus, more quantitative and qualitative studies are required to determine the cardiovascular comfort and QoL and to devise patient empowerment programs with the active participation of patients and their relatives in cardiovascular rehabilitation programs.

Ethics

Ethics Committee Approval: Study approval was obtained from the Institutional Ethics Review Board (Bolu Abant İzzet Baysal University Clinical Researches Ethics Review, registered number 2018/96). This study was conducted in adherence to the principles of the Declaration of Helsinki.

Informed Consent: The study was based on volunteerism and beforehand, the participants were informed about the procedure and their written consent was obtained.

Peer-review: Externally peer-reviewed.

Authorship Contributions

Concept: Ş.D.E., A.A.Y., Design: Ş.D.E., A.A.Y., Data Collection or Processing: Ş.D.E., E.G.Ş., Analysis or Interpretation: Ş.D.E., Literature Search: Ş.D.E., A.A.Y., E.G.Ş., Writing: Ş.D.E., A.A.Y., E.G.Ş.

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ORIGINAL RESEARCH

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Falls in Older Women and Men: Associated Factors and Sarcopenia

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Abstract

Objective: Falls are the fifth leading cause of death among the older adults, and most of the risk factors of falls are modifiable. We aimed to investigate the clinical factors associated with falls comprehensively, by evaluating the sarcopenia components separately, in each gender.

Materials and Methods: This is a cross-sectional study. Six hundred thirty-three female and 269 male outpatients, underwent a comprehensive geriatric assessment, were included. Falls, in the previous 12 months, were recorded. Geriatric evaluation regarding frailty, depression, nutrition, cognitive functions, and disabilities were done with related scales. SARC-F determined sarcopenia risk, and probable sarcopenia was defined according to handgrip strength. Skeletal muscle mass index and muscle performance were measured by bioimpedance analysis and physical performance tests, including 4-meter gait speed (4-m GS) and timed up and go (TUG) tests, respectively.

Results: In the study population 35.2% of female and 30.9% of male patients experienced falls. In multivariate analysis, probable sarcopenia in women [odds ratio (OR): 1.56, p=0.034] and longer TUG test performance in men (OR: 1.06, p=0.020) were independently related to falls. In addition, both in women and men urinary incontinence (OR: 1.62, p=0.016 and OR: 1.95, p=0.045, respectively), sarcopenia risk defined by SARC-F (OR: 2.74, p≤0.001 and OR:4.79, p≤0.001, respectively) and depression (OR: 1.56, p=0.025 and OR: 1.93, p=0.046, respectively) were independently related with falls.

Conclusion: Depression, incontinence, and sarcopenia risk were independent associated factors for falls in both genders. SARC-F appears to be effective in both genders in predicting the risk of falls. However, muscle strength in women and muscle performance in men get high impact for the falls.

Keywords: Falls, sarcopenia, older adults, depression, incontinence, SARC-F

Introduction

Falls are the fifth leading cause of death in the older adults and emerge as an important public health problem. One-third of individuals over the age of 65 experience falls each year, increasing to 40-50% of individuals over 80 (1). The falls' significant consequences include death and increased health expenditures, aside from fractures, institutionalization, dependency, the decline in functionality, and fear of falling. The factors that cause the falls are mainly divided into three sub-categories, including extrinsic, intrinsic, and behavioral reasons. The leading intrinsic causes include decreased physiological systems controlling musculoskeletal, cardiovascular, visual, and vestibular systems and proprioceptive deterioration due to normal aging and pathological processes such as arthritis, diabetes, cerebrovascular disease (CVD), incontinence, and impaired vision, which are frequently seen in older adults (2). Furthermore, falls are commonly underlined in the studies as a poor outcome of geriatric syndromes such as frailty, sarcopenia, incontinence, depression, and cognitive impairment, which are again prevalent in older adults. Moreover, falls are also defined

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as a geriatric syndrome due to their characteristic unfavorable consequences like in other geriatric syndromes such as sarcopenia and frailty (3,4). When the intrinsic and extrinsic factors that cause falls are cumulatively combined, falls are unfortunately inevitably experienced in a substantial percentage of vulnerable older adults (5). Even in low-energy falls, poor outcomes such as femoral fractures and intracranial hemorrhages can be observed in older individuals (6,7). The majority of the intrinsic factors precipitating falls are among the modifiable and preventable causes of falls (8). Sarcopenia, again one of the modifiable risk factors of falls, is associated with standing balance disorder (5). Sarcopenia is characterized by decreased muscle mass and strength, and physical performance. Sarcopenia and each of its components may act as an important risk factor for falls (9). Though falls in the older adults has been investigated extensively in many studies, risk factors related to gender differences and sarcopenia have been seldom researched (10,11).

In this study, we aimed to define the associated clinical factors of falls in each gender separately, with a comprehensive evaluation, by considering demographic features, comorbidities, geriatric syndromes, and sarcopenia components, including muscle mass, muscle strength, and physical performance, and risk of sarcopenia by the SARC-F scale.

Materials and Methods

Participants and Study Design

The study was designed as cross-sectional. Patients, admitted to the geriatric outpatient clinic of a tertiary hospital between February 2019, and January 2020 and were included in the study. Patients were subjected to a comprehensive geriatric assessment. A structured questionnaire, inquiring information related to demographic data, diseases, drugs, falls, and geriatric syndrome scales, was applied. Recruitment to the study was determined among patients at their first admission to the geriatric clinic who were able to cooperate and complete the mobility tests with their aids if needed, and the questionnaires regarding comprehensive geriatric assessment. Patients 60 years and older were included in the study. Patients excluded from the study were determined as 1) active cancer patients, 2) patients with infectious diseases, 3) patients with acute diseases of organ systems, 4) patients dependent on wheelchair, not able to perform mobility tests, 5) advanced dementia [mini-mental state examination (MMSE) score <10 points] and patients with moderate dementia unable to cooperate in questionnaire and mobility tests and 6) patients with missing data regarding mobility tests and questionnaire. Falls were questioned as an experience of fall in the last 12 months. Falls were defined as an unexpected event in which the participants come to rest on the ground, floor, or lower level. The Charlson comorbidity index (CCI) was calculated according to existing diseases (12). Diseases with a high risk of falling like Parkinson's disease, CVD, and diabetes (DM) were included in the analysis among the dependent variables. Serum levels of 25(OH) D and vitamin B12 were recorded. Anthropometric measurements, including weight (kg), height (cm), and waist circumference (cm), were made by using standard methods. Body mass index (kg/m^2) was calculated as weight in kilograms divided by height in meters squared. Study was approved by Local Ethics Committee and it conforms to the provisions of the Declaration of Helsinki (date/decision no: 20.02.2019/2019/136). Informed consent form was received from all patients with intact cognition, and proxies of patients with impaired cognition.

Assessment of Geriatric Syndromes

Frailty was assessed according to the 5-item FRAIL scale with components: fatigue, resistance, ambulation, illnesses, and loss of weight. Frailty scores range from 0-5 (1 point for each component; 0= best to 5= worst) and scores 3-5 represents frailty (13). Depression was evaluated with the geriatric depression scale. Fourteen points and above are considered as depression (14). The nutritional evaluation was done with mini nutritional assessment tool (MNA). Higher scores indicate better nutritional status (15). Disabilities in daily living activities (ADL) and instrumental activities of daily living (IADL) were stated by the Katz and Lawton scales, respectively. Lower scores notice more dependent status in both scales (16,17). Cognitive status was assessed with the MMSE (18). Higher scores state better cognitive function. Urge or mixed type of incontinence was determined as self-report.

Sarcopenia and Physical Function Assessments

By measuring muscle strength with a dynamometer, the definition of probable sarcopenia was made according to the revised European Working Group's recommendations on sarcopenia in older people (19). With the help of a Jamar dynamometer, consecutive measurements were made three times from the dominant hand with regular rest duration. The measurements' average was calculated, and probable sarcopenia was defined according to handgrip strength (HGS) <16 kg in women and <27 kg in men. Physical performance was evaluated by 4-meter gait speed (4-m GS) and timed up and go tests (TUG) (20). The 4-m GS was applied at the usual pace, and time to complete the 4-meter walking distance on a marked ground was recorded in seconds. The TUG test was applied at usual pace again on a marked ground, while patients were sitting on an armchair (46 cm height); with the directive word of "go", patients were instructed to stand up from the armchair, walk three meters, turn and walk back to the chair and sit down again. Time to complete TUG test was recorded in seconds. In each performance test, a shorter time to complete the test pointed out a better functional performance. The help of a bioimpedance analysis detetermined skeletal muscle mass (SMM). Skeletal muscle mass was calculated by Johnson's formulae by getting ohm data from bioimpedance (21). Skeletal muscle mass index (SSMI) was obtained by dividing

SMM by height in square meters. Sarcopenia risk was defined by the SARC-F scale. SARC-F has five items: strength, assistance walking, rising from a chair, climbing stairs, and falls. Each item scored from 0 to 2. A total score of ≥4 indicates sarcopenia risk (22).

Statistics

A descriptive analysis was performed between fallers and non-fallers. Data normality was assessed by examining the results of Shapiro-Wilks test, histogram and q-q plots. A two-sided independent samples t-test and Mann-Whitney U test were conducted to compare the differences between continuous variables. The Pearson chi-square test or Fisher's Exact test was used to comparing categorical variables. Univariate and multiple binary logistic regression analysis were used to identify the associated clinical factors among fallers in each gender separetely. Odds ratios (OR) were calculated with 95% confidence intervals (CI). Significant variables ($p<0.10$) in univariate analysis were taken in to multiple models, and the backward stepwise selection was performed using likelihood ratio statistic at $p<0.10$ stringency level. Two separate models were built for multivariate analysis in each gender. Model 1 included all significant variables ($p<0.10$) in univariate analysis, except sarcopenia risk defined by the SARC-F scale, in each gender. Model 2 included all significant variables ($p<0.10$) in Model 1 plus sarcopenia risk defined by SARC-F scale. While age is highly correlated with falls, it is included in all models independent of revealed p-value in univariate analysis. The Hosmer-Lemeshow test results indicated the built binary logistic regression models' appropriateness to predict the falls' related independent clinical factors. Correlation matrices among the dependent variables showed significant but low collinearity (all p-values <0.600). Analyses were conducted using SPSS version 22.

Results

A total of 902 patients (633F/269M) were included in the study. Prevalence of falls in the total population was 33.9%. Falls prevalence' among women and men were, 35.2%, and 30.9% respectively and this difference was not significant ($p=0.116$). CCI was higher among fallers in women ($p=0.068$). Patients with Parkinson's disease experienced more falls both in men and women ($p=0.063$, $p=0.025$, respectively). Total scores of scales related to MMSE, MNA, Katz, and Lawton were significantly lower in fallers than non-fallers in both genders. Patients with geriatric syndromes, including frailty, depression, and urinary incontinence, experienced significantly more falls in both genders. In women, fallers were more prevalent among patients with probable sarcopenia ($p=0.005$), while in men, fallers completed the TUG test in a longer time ($p=0.019$). SMMI and the serum levels of 25(OH)D and vitamin B12 did not differ between fallers and non-fallers in both genders. The patients' clinical characteristics among fallers and non-fallers are presented in Tables 1 and 2 for women and men, respectively. In model 1 multivariate analysis, depression (OR: 1.56, CI: 1.06-2.28, $p=0.025$) urinary incontinence (OR: 1.71, CI: 1.16-2.52, $p=0.007$) and probable sarcopenia (OR: 1.56, CI: 1.03-2.35, $p=0.034$) were independently related with falls in women, while depression (OR: 1.93 CI: 1.01-3.71, $p=0.046$) and longer TUG test performance (OR: 1.06, CI: 1.01-1.09, $p=0.020$) were independently related with falls in men. In model 2 multivariate analysis, when the sarcopenia risk defined by the SARC-F scale incorporated into model 1, both in women and men urinary incontinence (OR: 1.62, CI: 1.09-2.40, $p=0.016$ and OR: 1.95, CI: 1.01-3.76, $p=0.045$ respectively) and sarcopenia risk defined by SARC-F (OR: 2.74, CI: 1.85-4.06, $p\leq0.001$ and OR: 4.79, CI: 2.46-9.34, $p\leq0.001$, respectively) were independently related with falls. Results regarding multivariate analysis of both models are presented in Tables 3 and 4, for women and men respectively.

Discussion

In this study, we observed that falls were more prevalent among women, as in previous studies, though fall prevalence' was not differ significantly in men and women (23). Falls-related clinical risk factors unique to women, such as less muscle mass, loss of menopause-related bone mineral density, and being prone to geriatric syndromes such as depression and frailty, are triggering reasons that increase the risk of falls in women compared to men (11,23). As a result of a comprehensive assessment in each gender, we observed that depression, urinary incontinence, and sarcopenia risk defined by SARC-F were independently associated with falls in both genders. Gender-specific independent associated clinical factors for falls were prolonged TUG test performance in men and probable sarcopenia, defined by HGS, in women.

Plenty of gender-specific, fall-related risk factors has been identified in numerous studies. Nevertheless, in a few studies, the same fall-related risk factors were evaluated concurrently in each gender (10,11,23). Gale et al. (10) reported that severe pain and diagnosis of at least one chronic disease were independently associated with falls in both genders, meanwhile sex-specific risk factors were incontinence and frailty in women, older age, high levels of depressive symptoms, and the inability to perform a standing balance test in men (23). In another study, Gale et al. (10) observed that older age was the only factor associated with increased risk of incident falls in both genders. Gender-specific risk factors related to incident falls were depressive symptoms, incontinence, never having married in women, and greater comorbidity, higher levels of pain, and poorer balance in men (10).

In this study, while examining the relationship between falls and sarcopenia, instead of the operational definition of sarcopenia

in EWGSOP, we analyzed the three components of sarcopenia, muscle mass, muscle strength, and physical performance separately. In addition, sarcopenia risk was defined practically by the SARC-F tool, recommended in case findings, in revised EWGSOP (19). In studies, SARC-F was suggested as a valid and consistent tool for defining individuals at risk of sarcopenia-related unfavorable outcomes (24). Recently, in studies conducted with both Parkinson's patients and community-dwelling postmenopausal patients, SARC-F has been shown to be effective in predicting the risk of falls in different patient populations (25,26). In agreement, we observed a significant independent relationship between falls and sarcopenia risk defined by SARC-F after incorporating all falls-related variables in multivariate models in each gender. In accordance, a recent study has demonstrated a significant correlation between hip fracture and sarcopenia (SARC-F ≥4) (27). Certainly, a leading cause of fractures is falls, and consequently, an association between SARC-F and falls might also be anticipated as in our study.

Muscle mass did not differ between fallers and non-fallers in our study, in both genders, though HGS was independently associated with falls in women, not in men. Our finding can be explained by the loss of muscle strength faster than muscle mass loss throughout life, and this loss is more pronounced in women (6). Although HGS does not directly reflect the lower extremity performance, it is significantly associated with climbing stairs, standing from a chair, and a six-minute walk test (28). Besides, growing evidence has demonstrated that muscle strength is more closely related to poor health-related outcomes such as fractures, falls, malnutrition, cognitive impairment, depression, sleep problems, and quality of life than to muscle mass (4,26). In a systematic review, muscle strength and gait/balance were implicated among the most highly correlated risk factors with falls (29). The TUG test has been suggested to assess gait and

Table 1. Characteristics of the patients among fallers and non-fallers with risk estimates, in women

Variables	Fallers n=223	Non-fallers n=410	p	*OR (95% CI)
Demographic characteristics				
Age	72.3 (8)	71.5 (7.2)	0.175	-
CCI	4.2 (1.5)	3.9 (1.4)	0.068	1.10 (0.99-1.22)
Number of drugs	4 (2-5)	3 (2-5)	0.282	1.03 (0.97-1.11)
DM, n %	111 (49.8)	194 (47.3)	0.306	1.15 (0.82-1.60)
PD, n %	8 (3.6)	4 (1)	0.025	3.55 (1.05-11.99)
CVD, n %	15 (6.7)	23 (5.6)	0.344	1.16 (0.59-2.28)
Geriatric syndromes				
Frailty, n %	96 (43.4)	137 (33.4)	0.008	1.49 (1.06-2.10)
Depression, n %	128 (59.3)	176 (43.9)	<0.001	1.88 (1.34-2.64)
MMSE, score	24.3 (4.9)	25.3 (4.2)	0.010	0.96 (0.92-0.99)
MNA, score	21.4 (4.6)	22.1 (4.2)	0.052	0.96 (0.93-1.00)
Urinary incontinance, n %	135 (60.5)	185 (45.2)	<0.001	1.84 (1.32-2.57)
Katz, score	10.6 (2.5)	11.3 (1.7)	<0.001	0.86 (0.79-0.93)
Lawton, score	11.3 (5.5)	12.9 (4.4)	<0.001	0.94 (0.90-0.97)
Anthropometric measures, physical performance and sarcopenia				
BMI kg/m²	31.0 (6.3)	31.4 (6.5)	0.570	0.99 (0.97-1.02)
Waist, cm	106.5 (12.9)	105 (15.4)	0.294	1.00 (0.99-1.02)
SMMI kg/m²	7.9 (2.5)	7.5 (1.4)	0.153	1.31 (0.95-1.35)
Probable sarcopenia, n %	71 (37.4)	95 (26.2)	0.005	1.70 (1.16-2.50)
4-m GS, s	5.4 (4-9)	5.45 (4-8.5)	0.913	1.02 (0.98-1.05)
TUG, s	12.0 (9.0-15.25)	11.3 (8.72-15.0)	0.300	1.01 (0.99-1.03)
Sarcopenia (SARC-F ≥4)	149 (66.8)	165 (40.2)	<0.001	3.01 (2.11-4.28)
Biochemical parameters				
25(OH)vit D	19.9 (14-27)	18.9 (12.5-27)	0.516	1.00 (0.99-1.01)
Vit B12	384 (286-560)	381 (285-539)	0.625	1.00 (1.00-1.00)

*Adjusted odd ratios (by age), mean (standard deviation), median (25^{th}-75^{th} percentile), p<0.05 is significant, CCI: Charlson comorbidity index, DM: Diabetes mellitus, PD: Parkinson's disease, CVD: Cerebrovascular disease, MMSE: Mini-mental state examination, MNA: Mini-nutritional assessment, BMI: Body mass index, SMMI: Skeletal muscle mass index, GS: Gait speed, TUG: Timed up and go test, OR: Odds ratio, CI: Confidence interval

Table 2. Characteristics of the patients among fallers and non-fallers with risk estimates in men

Variables	Fallers n=83	Non-fallers n=186	p	*OR (95% CI)
Demographic characteristics				
Age	74.7 (7.7)	73.8 (7.3)	0.403	-
CCI	4.7 (1.9)	4.5 (1.7)	0.557	1.04 (0.90-1.20)
Number of drugs	3 (1-5)	3 (1-5)	0.446	1.03 (0.94-1.14)
DM, n %	30 (36.1)	74 (39.8)	0.335	0.88 (0.51-1.50)
PD, n %	9 (10.8)	9 (4.8)	0.063	2.28 (0.86-6.06)
CVD, n %	5 (6)	10 (5.4)	0.516	1.09 (0.36-3.31)
Geriatric syndromes				
Frailty, n %	26 (31.3)	40 (21.5)	0.059	1.61 (0.87-2.98)
Depression, n %	34 (41.0)	40 (22.5)	0.002	2.41 (1.38-4.22)
MMSE, score	25.1 (4.5)	26.4 (3.6)	0.015	0.93 (0.88-0.99)
MNA, score	21.7 (4.5)	23.2 (4.0)	0.012	0.92 (0.86-0.98)
Urinary incontinance, n %	35 (42.2)	52 (28.0)	0.016	1.85 (1.08-3.19)
Katz, score	10.5 (2.5)	11.5 (1.5)	0.001	0.78 (0.68-0.90)
Lawton, score	11.2 (5.6)	13.0 (4.6)	0.005	0.93 (0.88-0.98)
Anthropometric measures, physical performance and sarcopenia				
BMI, kg/m²	28.0 (6.1)	27.8 (4.8)	0.772	1.01 (0.96-1.07)
Waist, cm	103 (14.0)	101.2 (12.8)	0.352	1.01 (0.99-1.04)
SMMI, kg/m²	9.5 (1.7)	9.8 (2.5)	0.598	0.95 (0.77-1.18)
Probable sarcopenia, n %	29 (37.2)	64 (37.9)	0.517	0.89 (0.49-1.60)
4-m GS, s	6.5 (4-8.25)	5.0 (3.6-7.1)	0.262	1.03 (0.97-1.10)
TUG, s	12 (8.0-17.0)	10.0 (7.0-13.4)	0.019	1.05 (1.01-1.08)
Sarcopenia, n % (SARC-F ≥4)	40 (48.2)	39 (21.0)	<0.001	3.62 (2.02-6.48)
Biochemical parameters				
25(OH)vit D	18.3 (13.5-23.7)	18.0 (13.4-25.4)	0.539	0.98 (0.95-1.01)
Vit B12	389 (268-583)	391 (269-516)	0.558	1.00 (1.00-1.00)

*Adjusted odd ratios (by age), mean (standard deviation), median (25^{th}-75^{th} percentile), p<0.05 is significant, CCI: Charlson comorbidity index, DM: Diabetes mellitus, PD: Parkinson's disease, CVD: Cerebrovascular disease, MMSE: Mini-mental state examination, MNA: Mini-nutritional assessment, BMI: Body mass index, SMMI: Skeletal muscle mass index, GS: Gait speed, TUG: Timed up and go test, OR: Odds ratio, CI: Confidence interval

Table 3. Binary logistic regression analysis for risk of falls in women

Variables	Multivariate			
	Model 1		Model 2	
	OR (95% CI)	p	OR (95% CI)	p
Age	-	-	-	-
CCI	-	-	-	-
PD	-	-	-	-
Frailty	-	-	-	-
Depression	1.56 (1.06-2.28)	0.025	-	-
MNA	-	-	-	-
MMSE	-	-	-	-
Incontinence	1.71 (1.16-2.52)	0.007	1.62 (1.09-2.40)	0.016
Katz	-	-	-	-
Lawton	-	-	-	-
Probable sarcopenia	1.56 (1.03-2.35)	0.034	-	-
Sarcopenia (SARC-F ≥4)	Not selected		2.74 (1.85-4.06)	<0.001

Model 1 included age, CCI: Charlson comorbidity index, PD: Parkinson's disease, MNA: Mini-nutritional assessment, MMSE: Mini-mental state examination, incontinence, Katz, Lawton and probable sarcopenia. Model 2 included sarcopenia (SARC-F ≥4) along with all variables in Model 1, OR: Odds ratio, CI: Confidence interval

Table 4. Binary logistic regression analysis for risk of falls in men

Variables	Multivariate			
	Model 1		Model 2	
	OR (95% CI)	p	OR (95% CI)	p
Age	-	-	-	-
PD	-	-	-	-
Frailty	-	-	-	-
Depression	1.93 (1.01-3.71)	0.046	-	-
MNA	-	-	-	-
MMSE	-	-	-	-
Incontinence	-	-	1.95 (1.01-3.76)	0.045
Katz	-	-	-	-
Lawton	-	-	-	-
TUG	1.06 (1.01-1.09)	0.020	-	-
Sarcopenia (SARC-F ≥4)	Not selected		4.79 (2.46-9.34)	<0.001

Model 1 included age, PD: Parkinson's disease, MNA: Mini-nutritional assessment, MMSE: Mini-mental state examination, incontinence, Katz, Lawton and timed up and go test (TUG). Model 2 included sarcopenia (SARC-F ≥4) along with all variables in Model 1, OR: Odds ratio, CI: Confidence interval

balance for evaluating the risk of falls in older individuals. It is also recommended to assess physical performance, as one of the sarcopenia components in EWGSOP (19). Here we observed that a longer time to complete the TUG test, as a low physical performance indicator, posed a significant association with falling in men, not women. Orwoll et al. (30) found that older men with the lowest activity/worst physical performance were at high risk for falling. Likewise, in the LIFE study, improved physical performance resulted in a reduction in men's serious fall injuries, but not in women (31). Our findings highlight the importance of muscle strength and physical performance in the definition of sarcopenia, in accordance with the literature (5). However, we did not observe an association between falls and the serum levels of sarcopenia related vitamins, 25(OH) D and vitamin B12.

In univariate analysis, we observed that frailty, depression, urinary incontinence, and lower scores in scales regarding nutrition, cognitive function, ADL, and IADL were significantly related to falls. The relationship between all these clinical conditions and falls has been established in previous studies (1,9-11). Multimorbidity defined by CCI was significantly associated with falls in the crude model in women, not in men, in line with the study of Chang and Do (11). After building models in each gender separately and including associated confounders, the multivariate analysis yielded the persistence of association of depression and urinary incontinence with falls, in both genders. Motor abnormalities leading to posture, balance, and gait impairments in patients with depression trigger falls (32). Moreover, in a prospective study, depressive symptoms increased the risk of falls, independent of antidepressant use and impaired executive functioning (33). Incontinence has been reported as a risk factor for falls for women in most previous studies (10,23). Gale et al. (23) attributed the loss of the relationship between falls and incontinence after multivariate analysis, which was significant in univariate analysis, to the low prevalence of incontinence in men. However, in our study, half of the women and one-third of the men had incontinence.

Study Limitations

Our study's strengths were that we evaluated the associated clinical factors of falls with a broad confounder with including geriatric syndromes and components of muscle markers related to sarcopenia in detail by considering the gender difference. Our study's limitations are; first, we did not group the drugs into the data in terms of the risk of falling; we only evaluated the number of drugs, whereas antidepressants, hypnotic drugs, etc., have a close relationship with falls. Second, we could not examine the relationship between sarcopenia and falls by defining operational sarcopenia according to EWGSOP. Very few patients whose SMMI was below the defined cut-off values and the prevalence of operational sarcopenia in both genders was too low to be included in the analyses. Third, the study design was cross-sectional; we could only argue about the associations between falls and related clinical factors, not the direct cause-effect relationship.

Conclusion

In conclusion there are similar associated factors in terms of falls for each gender as well as differences. Nevertheless, we did not observe a major difference in falls related clinical factors, between men and women. We observed that depression, incontinence, and sarcopenia risk were independently associated factors for falls in both genders. SARC-F appears to be effective in both genders in predicting the risk of falls. However, muscle strength in women and muscle performance

in men are substantial clinical factors for falls. While planning interventions to prevent falls, this discrepancy would be considered especially for exercise programs in each gender. Particularly exercise programs would be effective for improving sarcopenia and reducing depressive symptoms in older individuals. All the associated factors for falls, mentioned in the study, are modifiable and unfortunately commonly unnoticed in routine clinical evaluations in both genders, and consequently routine screening of these clinical syndromes in primary care would be cost-effective. The weighted effects of interventions, towards clinical factors associated with falls, on fall incidence should be investigated in future studies.

Ethics

Ethics Committee Approval: Study was approved by Local Ethics Committee and it conforms to the provisions of the Declaration of Helsinki (date/decision no: 20.02.2019/2019/136).

Informed Consent: Informed consent form was received from all patients with intact cognition, and proxies of patients with impaired cognition.

Peer-review: Externally peer-reviewed.

Authorship Contributions

Concept: F.F.Ö., S.A., T.S., N.Ş.D., B.M.G., Design: F.F.Ö., S.A., T.S., N.Ş.D., B.M.G., Data Collection or Processing: F.F.Ö., S.A., T.S., N.Ş.D., B.M.G., Analysis or Interpretation: F.F.Ö., S.A., T.S., N.Ş.D., B.M.G., Literature Search: F.F.Ö., Writing: F.F.Ö.

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ORIGINAL RESEARCH

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Evaluation of Elderly Patients' Knowledge and Awareness of Dental Implant Treatments Applying to Periodontology and Prosthodontics Departments

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Abstract

Objective: Dental implants are a great treatment choice for replacing lost teeth with benefits like strong chewing ability, long-term use, and natural tooth preservation. The aim of our study was to evaluate the knowledge and awareness of the geriatric population in our nation regarding their preference for dental implants in prosthetic treatments.

Materials and Methods: A cross-sectional study was carried out by questionnaires, assessing knowledge about implants and demographic information, administered to patients attending the periodontology and prosthodontic clinics who volunteered to participate. The collected data were imported to Statistical Package for Social Sciences and the chi-square and Fisher's Exact tests were utilized to evaluate categorical variables represented as a percentage of study participants.

Results: A total of 200 individuals were enrolled. A significant correlation was found between implant knowledge with age, education and income level. According to the survey's findings, 95.5% of the respondents were aware of implants in varying degrees, and for the majority of them, their dentist was their primary source of information, followed by friends, family, and electronic media. While the majority of participants claimed that the cost of implants prevented them from considering getting one, 33.5% of them believed that the type of implant was the most crucial element influencing the treatment's outcome.

Conclusion: The results of this survey reveal that most geriatric patients are aware of implant treatment, but lack correct information. Dentists must pay close attention to patient-based assessment and education to assist patients and families comprehend the benefits and drawbacks of implant therapy.

Keywords: Geriatrics, dental implants, knowledge, awareness

Introduction

One of the most significant health issues still facing the elderly population is tooth loss, despite all the advancements in restorative and oral health care (1). Although the treatment protocols in elderly individuals are similar to those in young people, age-related tissue changes in the oral cavity, systemic diseases, and social and economic conditions should be evaluated more carefully (2).

With their advantages such as high chewing efficiency, long-term use and preservation of natural teeth, dental implants are an ideal treatment option for replacing missing teeth (1,2). Dental implants are used safely in elderly individuals through careful diagnosis and effective treatment planning. Overdenture prostheses are preferred, especially in the geriatric population, as they require less cost and surgical area due to the placement of fewer implants (3). The need for dental restoration increases with age and reaches 97.4% over 85 (1). Still, the prevalence

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of dental implants has been reported to be lower in older individuals compared to other age groups (4).

Studies conducted in different countries has been shown that fear of operation, high cost, and long treatment period negatively affect the choice of implant treatment (2,5,6). In addition, the availability of correct information can also affect the treatment choice (1,5). Our study aims to evaluate the knowledge and awareness of the geriatric population in our country about dental implant preference in prosthetic treatments.

Materials and Methods

The study included 200 individuals over 65 years old who applied to the periodontology and prosthetic dentistry departments at the University of Health Sciences Turkey Gülhane Faculty of Dentistry between November 25 and December 25, 2022. Only those patients who expressed an interest in participating in the trial were notified and involved. Written and oral informed consent was obtained, and participants were asked to complete the study-related questionnaire. In addition to the fundamental questions (age, gender) that provide demographic data, many questions are asked to evaluate the knowledge and awareness of the participants about implants and implant treatment. The patients' usual therapy procedures proceeded after they completed the questionnaire forms. Partially filled forms were excluded from the study.

This study was approved by University of Health Sciences Turkey Gülhane Scientific Research Ethics Committee (project no: 2022-341).

Statistics

The collected data from all participants were imported to Statistical Package for Social Sciences (SPSS) for Windows software, version 26.0 (SPSS Inc., Chicago, IL, USA). Descriptive statistics for categorical variables in our study; expressed as number (n) and percentage (%). The chi-square and Fisher's Exact tests were used to compare the categorical demographic variables. The confidence interval was set to 80% and $p<0.05$ was considered statistically significant.

Results

A total of 200 participants' data were analyzed. Most of the participants (55.5%) were between the ages of 65-74, and 61% were women. The education level of the majority (61%) was high school and university, and 41% of the participants had a significantly less income level. The majority (67.5%) was found to reside with their family. The general descriptive statistics of the personal characteristics of the participants are given in Table 1.

Table 2 provides general descriptive statistics for the participants' knowledge and awareness of dental implants. As a result, 71% of the participants lack dental implants. Despite this, 57.5% of them are aware that the implant is composed of titanium, and 53.5% understand that it is a screw that is inserted into the bone. When asked about how well they were informed about dental implants, only 10.5% of individuals stated that they were well informed.

The relationship and distribution between "age groups" and "dental implant awareness and knowledge level" are given in Table 3. Accordingly, the presence of implants did not differ between age groups (p=0.066). The question of what a dental implant is differed from according to age groups ($p<0.05$). The 65-74 age range answered this question 69.2% with a screw placed in the bone in the absence of teeth. The answers given by the patients to the question to what extent they were informed about dental implants differed statistically according to age groups (p=0.001) and only 6 patients over the age of 85 stated that they were well and moderately informed. While the source of information about dental implant treatments showed a statistically significant difference according to age groups (p=0.022), 75 participants stated that they were informed by dentists. The question of "What material are dental implants made from" differed according to age groups (p=0.001). The titanium response increases in strength in those aged 65 to 74 and the number of people who answered "I don't know" increased as the age progressed. The biggest advantage of dental implants compared to other prostheses differed statistically according to age groups (p=0.001), and it was stated that they were more aesthetic in early old age. The reasons for not considering dental implants differed significantly according to the age groups (p=0.001). While those over the age of 85 mostly consider themselves old for this treatment, younger age

Table 1. Socio-demographic characteristics (n=200)

		n	%
Age	65-74 years	111	55.5%
	75-84 years	44	22.0%
	85+ years	45	22.5%
Gender	Female	122	61.0%
	Male	78	39.0%
Education level	Primary school	58	29.0%
	High school	61	30.5%
	University	61	30.5%
	Graduate	20	10.0%
Income	0.0-10.000 TL	82	41.0%
	10.000-20.000 TL	71	35.5%
	≥20.000 TL	47	23.5%
Staying with	Alone	23	11.5%
	With family	135	67.5%
	In nursing home	19	9.5%
	With caregiver	23	11.5%

Table 2. General descriptive statistics of participants' dental implant preference and knowledge levels

		n	%
Implant presence	Yes	58	29.0%
	No	142	71.0%
What is a dental implant?	Never heard of it	9	4.5%
	I have heard about it, but cannot describe it	55	27.5%
	A screw applied in the bone in the absence of teeth	107	53.5%
	A needle applied in the bone in the absence of teeth	29	14.5%
How well informed are you about dental implants?	Well	21	10.5%
	Moderate	73	36.5%
	Insufficient	84	42.0%
	Don't know	22	11.0%
Source of your information	Dentists	74	37.0%
	Medical doctors	22	11.0%
	Family	30	15.0%
	Friends	40	20.0%
	TV/internet	28	14.0%
	Don't know	6	3.0%
From what material implants made?	Titanium	115	57.5%
	Acrylic	0	0.0%
	Porcelain	11	5.5%
	Don't know	74	37.0%
What do you think is the main advantage of dental implants as compared to other prostheses?	Aesthetic	65	32.5%
	Tissue-preserving	27	13.5%
	long lasting	65	32.5%
	Don't know	43	21.5%
I don't think getting dental implants because...	I don't have missing teeth	77	38.5%
	I consider myself too old for this treatment	31	15.5%
	I'm afraid of necessary surgery	4	2.0%
	I do not desire to have a foreign body inserted into my body.	3	1.5%
	I find it expensive	85	42.5%
	Don't know	0	0.0%
What do you think is the most important factor for implant success?	Implant type and material	67	33.5%
	Surgical technique	20	10.0%
	Patient compliance	10	5.0%
	Experience and skill of the surgeon	58	29.0%
	Don't know	45	22.5%
How long is a dental implant's lifespan, in your opinion?	0-10 years	16	8.0%
	10-20 years	33	16.5%
	Forever	98	49.0%
	Don't know	53	26.5%
Do you think that dental implants require additional oral hygiene maintenance?	No, it is cleaned like a natural tooth.	52	26.0%
	Yes, it needs different care than a natural tooth.	70	35.0%
	No, it does not need as much care as a natural tooth.	26	13.0%
	Don't know	52	26.0%

Table 3. Relationship and distribution between "age groups" and "dental implant preferences and knowledge levels"

		Age range						*p
		65-74		75-84		85+		
		n	%	n	%	n	%	
Implant presence	Yes	38	65.5%	13	22.4%	7	12.1%	0.066
	No	73	51.4%	31	21.8%	38	26.8%	
What is a dental implant?	Never heard of it	1	11.1%	2	22.2%	6	66.7%	**0.001**
	I have heard about it, but cannot describe it	20	36.4%	12	21.8%	23	41.8%	
	A screw applied in the bone in the absence of teeth	74	69.2%	23	21.5%	10	9.3%	
	A needle applied in the bone in the absence of teeth	16	55.2%	7	24.1%	6	20.7%	
How well informed are you about dental implants?	Well	12	57.1%	6	28.6%	3	14.3%	**0.001**
	Moderate	55	75.3%	15	20.5%	3	4.1%	
	Insufficient	39	46.4%	21	25.0%	24	28.6%	
	Don't know	5	22.7%	2	9.1%	15	68.2%	
Source of your information	Dentists	49	66.2%	15	20.3%	10	13.5%	**0.022**
	Medical doctors	7	31.8%	5	22.7%	10	45.5%	
	Family	17	56.7%	6	20.0%	7	23.3%	
	Friends	19	47.5%	12	30.0%	9	22.5%	
	TV/internet	17	60.7%	6	21.4%	5	17.9%	
	Don't know	2	33.3%	0	0.0%	4	66.7%	
From what material implants made?	Titanium	81	70.4%	25	21.7%	9	7.8%	**0.001**
	Acrylic	0	0.0%	0	0.0%	0	0.0%	
	Porcelain	5	45.5%	3	27.3%	3	27.3%	
	Don't know	25	33.8%	16	21.6%	33	44.6%	
What do you think is the main advantage of dental implants as compared to other prostheses?	Aesthetic	39	60.0%	18	27.7%	8	12.3%	**0.001**
	Tissue-preserving	19	70.4%	7	25.9%	1	3.7%	
	Long lasting	41	63.1%	12	18.5%	12	18.5%	
	Don't know	12	27.9%	7	16.3%	24	55.8%	
I don't think getting dental implants because...	I don't have missing teeth	57	74.0%	15	19.5%	5	6.5%	**0.001**
	I consider myself too old for this treatment	0	0.0%	0	0.0%	31	100.0%	
	I'm afraid of necessary surgery	4	100.0%	0	0.0%	0	0.0%	
	I do not desire to have a foreign body inserted into my body.	0	0.0%	1	33.3%	2	66.7%	
	I find it expensive	50	58.8%	28	32.9%	7	8.2%	
	Don't know	0	0.0%	0	0.0%	0	0.0%	
What do you think is the most important factor for implant success?	Implant type and material	35	52.2%	21	31.3%	11	16.4%	0.074
	Surgical technique	15	75.0%	4	20.0%	1	5.0%	
	Patient compliance	7	70.0%	2	20.0%	1	10.0%	
	Experience and skill of the surgeon	31	53.4%	10	17.2%	17	29.3%	
	Don't know	23	51.1%	7	15.6%	15	33.3%	
How long is a dental implant's lifespan, in your opinion?	0-10 years	8	50.0%	6	37.5%	2	12.5%	**0.001**
	10-20 years	24	72.7%	7	21.2%	2	6.1%	
	Forever	63	64.3%	20	20.4%	15	15.3%	
	Don't know	16	30.2%	11	20.8%	26	49.1%	

Table 3. Continued

		Age range						*p
		65-74		75-84		85+		
		n	%	n	%	n	%	
Do you think that dental implants require additional oral hygiene maintenance?	No, it is cleaned like a natural tooth.	37	71.2%	12	23.1%	3	5.8%	**0.001**
	Yes, it needs different care than a natural tooth.	46	65.7%	11	15.7%	13	18.6%	
	No, it does not need as much care as a natural tooth.	12	46.2%	9	34.6%	5	19.2%	
	Don't know	16	30.8%	12	23.1%	24	46.2%	

* Significance level according to chi-square and Fisher's Exact test results

groups stated that they do not have missing teeth and that they find the treatment expensive. The idea of how long the life of dental implants is also showed a significant difference according to age (p=0.001), and it comes to the fore that there is no information as the age progresses. The answers given to the question of whether dental implants require additional oral hygiene care differed according to age groups (p=0.001), and the answer was predominantly yes at younger ages.

Only the responses to the question, "What do you think is the most critical aspect impacting the success of the implant?" did not reveal a statistically significant difference between the groups when the education (p=0.62) and income levels (p=0.60) were considered. It has been observed that most of those with implants are university graduates, and their monthly income is over 20 thousand Turkish Lira (TL). The same question only differed according to gender. Women stated that implant type and material were more critical.

There was a statistically significant link between monthly income and the prevalence (p=0.03) and knowledge (p=0.001) of dental implants (p=0.03). We observed that individuals with high monthly income receive information mostly from dentists (41.9%), while the low-income elderly people mainly source information from friends (52.5%), and this difference was statistically significant (p=0.001). The percentage of those who do not plan to have dental implants because they find it expensive also differed significantly according to the monthly income range (p=0.03).

It has been noted that a person's living situation has no bearing on whether or not she has an implant (p=0.596).

Discussion

According to a number of studies, people who lose teeth over time may experience varying degrees of cognitive impairment (7,8). Osseointegrated implant surgery is an option for medically sound elderly patients who want to improve their oral health, comfort, and the quality of life (9). Several factors are explored concerning the clinical effectiveness of implant therapy in elderly patients (10).

The use of age as a criterion in determining whether dental implants would be successful in senior patients is supported by conflicting data (9). Potential barriers to the effectiveness of osseointegration in elderly people include soft tissue reaction, bone resorption, bone remodeling, and patient health (11). On the other hand, some authors claim that older individuals who would benefit from treatment with dental implants should not be disqualified since the bone and soft tissue recovery are not always hindered in this age group. Age does not appear to be a clear predictor of implant failure (11,12).

Old and very old patients, terms that are often used when referring to persons 75 years or older, often present with functional dependency, multimorbidity, and frailty (13). Previous studies show that older people evaluate oral implants more negatively and are more skeptical of such treatments for themselves (14). In our study, it was observed that considering implantation differed significantly according to age groups. The majority of individuals over 85 stated that they consider themselves too elderly to receive implant treatment. The fact that this answer was never given in other age groups is one of the surprising results of our study. This shows that from the patients' perspective, financial hardships are a more significant barrier than age.

Numerous earlier studies have supported the importance of socio-economic factors in determining the use of dental care services (15-17). Similarly according to our research, there is a statistically significant link between monthly income and the prevalence of dental implants (p=0.03). Eighty five of the examined people said they were not interested in getting implants because they thought the procedure was too expensive, and it was determined that 71 of them had a monthly income less than 20.000 TL per month.

Education level and the existence of dental implants had a statistically significant beneficial link in our study (p=0.001). An earlier study linked a lesser degree of schooling to a higher risk of edentulism (18). Although this situation necessitates the increasing need for implants at low education levels, the fact that financial difficulties are more prominent in low education

levels, especially in our country, disproved this hypothesis in our study.

In the literature, there are studies reporting that women have less awareness of dental implants than men (19), as well as studies reporting that they have more awareness (20,21). Our investigation revealed that there were no gender differences in the implant knowledge and awareness levels in elderly patients ($p>0.05$).

According to the World Health Organization's World Health Report on Aging, cancer, respiratory diseases, osteoarthritis, diabetes mellitus, liver cirrhosis, cardiovascular diseases, and neurocognitive impairment are the most prevalent chronic conditions in older people (22). Treatment for these medical disorders may include additional risks, such as undesirable side effects. The patient or doctor may see any of these diseases or therapies as an absolute or relative contraindication to implant surgery or therapy (13,23). Only four participants in our study said they would not get this treatment because they were terrified of implant surgery. We would anticipate that this worry, which we commonly hear from patients of all ages while treatment planning, would be more prevalent in older people. We hypothesize that this may be because the doctors read the questionnaire questions to the patients and asked them for their responses.

According to the results of our study, relatively younger age groups think that implant treatment is more aesthetic than alternative treatment methods ($p=0.001$). In trials with a wider age range of participants, older patients' perceptions of the relevance of their teeth's look were lower than those of younger patients (24). The fact that social interactions are higher in relatively younger age groups may be the primary reason for this situation.

While the thought that implant treatment is long-lasting was the second most popular answer, this rate was also higher in the relatively younger age group (63.1%). Similarly, almost half of the elderly individuals included in the study stated that implant treatment is a lifelong treatment. Contrary to the results of our study the proportion of people who believe implant therapy is a permanent solution has declined with time, according to a previous research in the literature (25). We think that this may be due to the widespread use of implant treatment over the years and the increased trust in treatment. These were the outcomes we anticipated.

According to an earlier research, the media served as the primary source of information about dental implants, with dentists playing at best a supporting role (14). A recent study states that dentists are the leading source of information with 34.5%, followed by relatives and friends, family doctor, radio-television and multimedia, respectively (26). In our study, we observed that dentists were the primary source of information for our patients with 37%, followed by friends with 20%, family with 15% and TV-internet with 14%. Considering that patients are likely to misinterpret oral health information obtained from the internet, it is promising that dentists are the source of information, especially for geriatric patients.

In our study, we observed that the level of implant knowledge differed statistically significantly according to age groups ($p=0.001$). These results are consistent with a recent study reporting higher implant knowledge in younger individuals (27). According to another recent study, the highest awareness of implants is between the ages of 20-30 and decreases as age increases (28). At the same time we observed that 95.5% of the elderly individuals who participated in our study had already heard about dental implants, but 53.5% of them had correct information. Moreover, we reported that relatively younger age groups are largely correct about what an implant is. A recent study involving a large number of dentistry patients of a wider age range reports that the awareness of dental implants is 74.8% (26). We believe that this result is a positive reflection of the health system in Turkey.

Despite the fact that our study yielded significant findings indicating the awareness of implants in the senior Turkish population, we believe that additional research is required in which a larger sample size is included and patient attitudes are assessed using a variety of measures.

Study Limitations

Our study's most significant restriction is that it only included patients who visited our hospital for dental care. Due to underlying medical issues and financial constraints, many older people put off getting dental work. Dental implant awareness may be much lower in the geriatric population randomly selected from the community.

Our lack of a scale to gauge participants' levels of awareness and knowledge is another drawback of our study. The survey questions were designed by us using samples from previous researches. Since this study is cross sectional in nature, it cannot conclusively establish cause and effect.

Conclusion

As the world's population ages, dentists may encounter individuals who need implant therapy and have complicated medical and socio-economic histories. Even with the deteriorated levels of oral hygiene that frequently come with aging and the lack of financial means, we concluded that old age is not a contraindication for implant therapy. Dentists need to focus on patient-based evaluation and education to help patients and families understand the advantages and disadvantages of implant therapy.

Ethics

Ethics Committee Approval: This study was approved by University of Health Sciences Turkey Gülhane Scientific Research Ethics Committee (project no: 2022-341).

Informed Consent: Written and oral informed consent was obtained, and participants were asked to complete the study-related questionnaire forms.

Peer-review: Externally peer-reviewed.

Authorship Contributions

Surgical and Medical Practices: Ö.S.A., Ü.T.K., Concept: Ö.S.A., Ü.T.K., Design: Ö.S.A., Ü.T.K., Data Collection or Processing: Ö.S.A., Ü.T.K., Analysis or Interpretation: Ö.S.A., Ü.T.K., Literature Search: Ö.S.A., Ü.T.K., Writing: Ö.S.A.

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ORIGINAL RESEARCH

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Dalbavancin as Consolidation Therapy in Elderly Patients

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Abstract

Objective: The goal of this study was to show the clinical characteristics, tolerability, safety and outcomes of geriatric patients treated with dalbavancin.

Materials and Methods: A retrospective and observational study was conducted in a tertiary-level hospital. All patients over 80 years old who received at least one dose of dalbavancin from June 2016 to December 2021 were in included. Demographic and clinical data, microbiological, indication for dalbavancin prescription, adverse effects and evolution of the infection were collected in this study. Geriatric assessment of the patient on admission was also documented, including Barthel index and the presence of polypharmacy in their treatments.

Results: A total of 25 patients were included (mean age =87), mostly were female (64%), coming from their usual residence (72%), independent for the activities of daily living "ADLs" (68%) and in a hyperpolypharmacy regimen (up to 44%). Fourteen patients presented endovascular infections like endocarditis/vascular device infections (53%), the other 13 patients (47%) debuted with locomotor system infections such as joint prosthetic infection or septic arthritis. Regarding the microbiological data, 56% of the patients were infected by *streptococcus/enterococcus* group, followed by methicillin-resistant coagulase-negative *Staphylococci* (24%) and methicillin-resistant *S. aureus* (20%). No patient experienced adverse effects.

Conclusion: Dalbavancin is presented as an attractive antibiotic in the geriatric population due to its potential uses in complex pathologies, showing safety and efficacy in short treatments or in prolonged regimens.

Keywords: Clinical geriatrics, dalbavancin, early discharge, elderly patients, hospitalization, safety and toxicity

Introduction

Dalbavancin is a long-acting lipoglycopeptide approved by European Medicines Agency since March 2015 for the treatment of acute bacterial skin and skin-structure infections (ABSSSIs) (1,2), with excellent activity against Gram-positive pathogens, including multi-drug resistant isolates. While dalbavancin is approved for ABSSSIs, it has subsequently been used in serious, Gram-positive infections requiring long-term intravenous (IV) antibiotics, such as osteoarticular and endovascular infections, showing efficacy and a favorable safety profile. Dalbavancin's pharmacokinetics characteristics, with a half-life of 14.4 days, permits an IV dosing regimen of 1.500 mg as a single infusion or 1.000 mg followed by 500 mg one week apart, without the need of daily in-hospital IV or outpatient antimicrobial regimens (3-10).

The rapid and constant population ageing represents a worldwide challenge. For that reason, it is essential to effectively manage elderly patients with a tailor-made treatment approach. However, there are not enough evidence available to guide clinicians in the appropriate antimicrobial treatment strategy for this aged population. In addition, the high prevalence of comorbidities in the elderly and the loss of functional capacity due to prolonged hospitalization, results in complex medical treatments (11). According to the statistical data of the Continuous Register published in December 2019, there are 9,057,193 people over 65 years old in Spain, which

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represents approximately 19% of the total national population. The population of octogenarians represents about 6.1%, while there are about 16,300 people over 100 years old (12). The number of residential health and social care institutions in Spain is estimated to be 5.500, which stands for approximately 384,251 beds with an average occupancy pattern of 81.4% (13,14). The numbers of these residential institutions, as well as the number of beds is increasing in the last years, reaching 116% more residential beds than 10 years ago (15).

Given the unique pharmacokinetic/pharmacodynamic properties of dalbavancin, this long-acting lipoglycopeptide could be an effective therapeutic strategy, in an outpatient setting, in residential health and social care institutions. Therefore, the goal of this study is to show the clinical characteristics, tolerability, safety, and clinical outcomes of geriatric patients treated with dalbavancin in a tertiary hospital in Spain.

Materials and Methods

A retrospective and observational study was conducted in a tertiary-level hospital. All patients over 80 years old who received at least one dose of dalbavancin from June 2016 to December 2021 were included in the study. Dalbavancin was administered intravenously with the following doses: 1.500 mg as a single infusion, 1.500 mg every two weeks (most frequent regimen), 1.500 mg every 3 weeks or 1.500 mg per month if estimated glomerular filtration rate <30 mL/min/1.73 m^2.

The following variables were included in the study: Demographics (age, gender, usual residence), clinical characteristics (location of infection), microbiological features (microorganism), indication for dalbavancin prescription (drug toxicity, interactions, allergies, poor adherence to first-line therapy, indication for suppressive therapy or early hospital discharge), adverse effects and evolution of the infection. Geriatric assessment of the patient on admission was also documented, including Barthel index (dependency if <60 points or independent for the activities of daily living if >60 points), polypharmacy (between 5 and 10 drugs) or hyperpolypharmacy (more than 10 drugs).

Statistics

A descriptive-univariate analysis was performed for all clinical variables studied. Qualitative variables were presented in absolute and relative frequencies, and quantitative variables were presented with the main measures of centralization and dispersion (average, standard deviation).

Ethics Committee

The work was evaluated by the Ethics Committee of La Paz University Hospital and was carried out in accordance with the protocol and ethical considerations outlined in the Declaration of Helsinki, and the ethical guidelines of the Council for International Organizations of Medical Science.

Results

Twenty-five elderly patients treated with dalbavancin were documented at our hospital since its approval in 2016. The average patient age was 87 years old (range: 81-96 years). Patients were predominantly female (64%), from their usual residence (72%), considered independent for the activities of daily living "ADLs" (68%), and following a hyperpolypharmacy regimen (up to 44%). Demographic data and clinical characteristic are shown in Table 1.

Fourteen patients presented endovascular infections (endocarditis/vascular device infections) (53%), and the remaining 13 patients (47%) debuted with locomotor system infections (prosthetic joint infections or septic arthritis). Out of the total patient population, 6 patients (24%) had associated bacteremia at the time of diagnosis and 2 patients (8%) presented both clinical infections (endocarditis and osteoarticular infection).

Table 1. Demographic and clinical characteristics of total population, n=25

Variable	
Total	25
Mean age	87, (81-96 years old)
Sex	
Male	9 (36)
Female	16 (64)
Place of residence	
Home	18 (72)
Nursing home	7 (28)
Barthel index	
>60 points	17 (68)
<60 points	8 (32)
Treatment	
Polypharmacy	14 (56)
Hyperpolypharmacy	11 (44)
Chronic kidney disease	
Yes	11 (44)
No	14 (56)
Infection type	
Endocarditis/endovascular	14 (56)
Chronic prothesis infection	5 (20)
Acute prothesis infection	4 (16)
Infectious arthritis	3 (12)
Skin and soft tissue infection	1 (4)
Bacteremia	6 (24)

Regarding the processed samples, 29 types of samples were collected from the 25 patients included in the study, since some patients had several positive cultures, e.g., blood and joint cultures. Samples were obtained from skin abscesses (1/29; 4%); from blood cultures (15/29; 60%); from joint fluid cultures (3/29; 10%); from intraoperative samples: Tissues and joint fluid (8/29; 28%); from IV catheters (1/29; 4%); from surgical wounds (1/29; 4%) Figure 1.

Overall, all patients had positive cultures, and 25 microorganisms were isolated in the study. The most common isolated pathogens belonged to the *Streptococcus/Enterococcus* group, followed by methicillin-resistant coagulase-negative staphylococci, methicillin-resistant *S. aureus*, methicillin sensitive coagulase-negative staphylococci and methicillin sensitive *S. aureus*. The isolated microorganisms are summarized in Figure 2.

The main indications for initiating treatment with dalbavancin were early discharge in 10 patients (40%), toxicity to previous antibiotics in 7 patients (28%), or allergy to the antibiotic of choice in 6 patients (24%). Up to 44% of the patients had more than one indication to support the prescription of dalbavancin. A total of 16 patients (64%) received concomitant treatment with another antibiotic against Gram-positive pathogens Figure 3. The number of doses administered ranged from 1 administration to 29 administrations (mean: 6 administrations; median: 2 administrations).

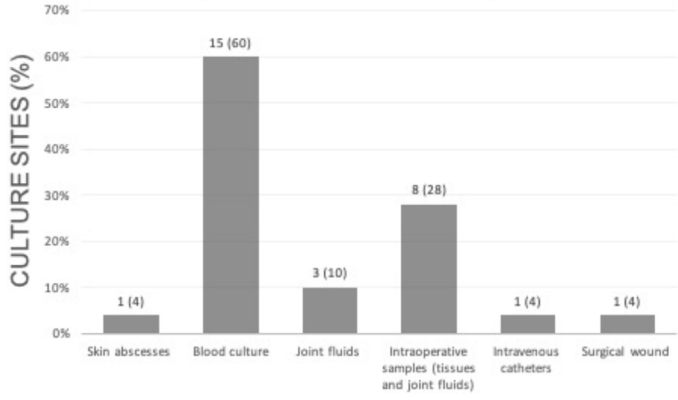

Figure 1. Culture sites n (%)

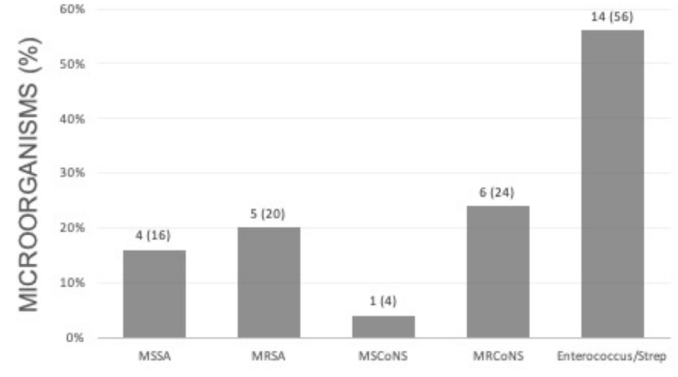

Figure 2. Microbiological isolation n (%)

Chronic kidney disease was present in 44% of the patients in whom dalbavancin dose was appropriately adjusted. There was a wide variability in the doses prescribed from 500 mg-1.500 mg in fortnightly doses to 1.500 mg monthly. Regarding the range of administrations, it ranged from patients who received a single dose (11 patients) to patients who received up to 29 doses. No patient experienced dalbavancin-related adverse effects; one patient suffered a reversible angioedema during dalbavancin infusion. However, after further investigation by our allergy department, it was concluded that there was no correlation between the study drug and the adverse event.

Overall, most patients (24/25; 96%) showed a favorable clinical outcome compared to a patient (1/25; 4%) who experienced a treatment failure due to a dalbavancin-resistant microorganism. There were no infection-related deaths.

Discussion

In the literature, dalbavancin has shown great clinical efficacy, achieving clinical cure or infection control in more than 96% of patients, as well as safety and tolerability in both, elderly patients over 80 years old and in the general adult population (3,16). Several multicenter cohort studies [Bouza et al. (3), Morata et al. (8) and Hidalgo-Tenorio et al. (5)] assessed the efficacy of dalbavancin for the treatment of different type of Gram-positive infections, resulting in a clinical success rate ranging 80-96% (4,16). Consistently with previous reported data, 96% achieved clinical success in our study. According to the systematic review and meta-analysis on the safety of dalbavancin published by Monteagudo-Martínez et al. (16), adverse events, mainly gastrointestinal alterations, may occur in 13-55% of patients as reported by different studies (8,17). However, our patients presented excellent adherence, tolerance, and safety, only one patient reported a side effect of angioedema, which was assessed as not directly related to the study drug.

In our study, dalbavancin was mainly used for endovascular infections (53%), followed by osteoarticular infections (47%), which is not consistent with previously published series in

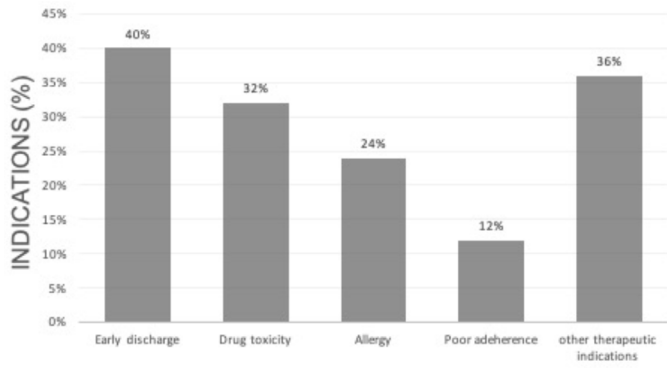

Figure 3. Main indications for the use of treatment with dalbavancin n (%)

which osteoarticular infections were the most common type of infection (3,18). Of note, 83% of bacteremia reported in the study was secondary to catheter/endovascular devices, which possibly reflects the challenge in the clinical management of elderly population due to several factors such as frailty, atypical presentation of symptoms, presence of comorbidity and polypharmacy (19,20). Regarding the type of microorganisms, staphylococcus is frequently the most prevalent microorganism in previous published series. However, 56% of the total infections were caused by *Enterococci/Streptococci* in our study, which were responsible from 40% of all endovascular infections reported (5). Given that elderly population over 80 years old presents greater intestinal flora colonization than the overall adult population, it might explain the microbiological difference reported in our study versus the literature (19). We have only found one recent publication by Wackenheim et al. (20) reviewing the use of dalbavancin in elderly population. Among the 65 patients included in the study, 51% (33) were considered old (over 75 years old, or over 65 years old, but associated with a CIRS-G score of 7 or more). Patients presented mainly with bone and joint infections (52%), while infective endocarditis was the less common type of infection (8%). The most frequently isolated microorganism was *Staphylococcus* spp. Overall, the study showed similar results to those described in the literature, achieving clinical cure of the infection in approximately 80% of patients, with only 9% of patients reporting side effects (20).

Moreover, chronic kidney disease is relatively common in the elderly. According to our data, 44% patients had impaired kidney function in whom dalbavancin dose was appropriately adjusted. One of the unmet needs in clinical practice is to stablish the appropriate dosing regimen in patients with altered kidney function. DUR001-303 clinical trial demonstrated that single-dose regimen (1.500 mg) or a two-dose regimen, as administered in DISCOVER 1 and 2 pivotal trials (1.000 mg on day 1.500 mg on day 8), achieved similar efficacy and safety results, avoiding nephrotoxicity, both in healthy patients and chronic kidney diseases patients in whom dose adjustment is required (21). However, real-world clinical experience has showed potential variability at different doses (3,4,8,16). In our study, elderly patients with a glomerular filtration rate <20 mL/min received monthly doses of 500 mg achieving therapeutic success, which ensures the efficacy and convenience of a single monthly administration without secondary nephrotoxicity.

An important aspect of dalbavancin in the elderly population is that it allows the treatment of complex infections on an outpatient basis: three different hospitalization methods could be used such as home care units, day hospitals or medicalized nursing homes. Some of the infections reviewed in our study (prosthetic joint infections and infective endocarditis) require prolonged courses of antibiotics (4-6 weeks). Given the impact of long-term hospitalization in geriatric patients, resulting in loss of functionality and muscle mass, in-hospital delirium, catheter-associated infections, pressure sores, pneumonia, and nosocomial urinary tract infections, among other health-related problems, it is essential to decrease the number of unnecessary hospitalizations, especially in this patient population (18). Dalbavancin could be a valuable therapeutic approach to facilitate hospital discharge, providing reliable systemic antimicrobial exposure for multiple weeks, avoiding nosocomial infections, optimizing therapeutic compliance, and ensuring a favorable safety profile. For that reason, analyzing the efficacy and safety of dalbavancin in the elderly population represents an unmet need, and studies in this line would be of great interest for the medical community. In addition, dalbavancin has shown to reduce the average hospital patient stay, lowering the impact on healthcare associated costs. Therefore, it would be of great interest to extend these cost-effectiveness studies to the geriatric population (22).

This study presents some limitations. First, as per the intrinsic retrospective nature of the study, we lacked relevant information such as patient frailty, which is currently an important tool for geriatric assessment (23,24). Second, the relatively small sample size highlights the need to conduct additional multicenter studies with larger sample sizes to further advance the knowledge of dalbavancin in the geriatric population.

Conclusion

In conclusion, unlike previous published data, *Streptococci* and *Enterococci* isolates were responsible from most of the infections reported in our elderly patients over 80 years old, followed by endovascular infections as the most prevalent infection type described in the study.

Dalbavancin is an attractive antibiotic for the geriatric population due to its potential use in deep and complex infections, showing efficacy and a favorable safety profile, both in short and prolonged treatment regimens. Dalbavancin may thus facilitate early hospital discharge or referral to support units, reducing hospital stay, along with the subsequent reduction in nosocomial-related infections derived from prolonged hospitalization. Therefore, the use of dalbavancin not only reduces hospitalization, but also residential social health centers could benefit from its easy and convenient administration.

Ethics

Ethics Committee Approval: The work was evaluated by the Ethics Committee of La Paz University Hospital and was carried out in accordance with the protocol and ethical considerations outlined in the Declaration of Helsinki, and the ethical guidelines of the Council for International Organizations of Medical Science.

Informed Consent: Retrospective study.

Peer-review: Internally and externally peer-reviewed.

Authorship Contributions

Concept: L.C.S., A.G., A.R.N., B.L.Y., F.M.R., Design: C.S.L., A.R.N., Data Collection or Processing: C.S.L., A.G., A.R.N., Analysis or Interpretation: C.S.L., A.G., Literature Search: C.S.L., Writing: C.S.L.

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ORIGINAL RESEARCH

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Comparison Between Geriatric and Non-geriatric Patients in the Development of Complications After Percutaneous Endoscopic Gastrostomy

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Abstract

Objective: Despite the rising geriatric age and the need for percutaneous endoscopic gastrostomy, there are few data regarding its complications and mortality rates in geriatric patients.

Materials and Methods: This is a retrospective study of patients over 18 years old who had a percutaneous endoscopic gastrostomy tube inserted between January 2016 and December 2020. Age, gender, percutaneous endoscopic gastrostomy indications, minor and major post-procedure complications, and 30-day mortality rates were compared between geriatric and non-geriatric patients.

Results: Females accounted for 276 (47.6%) of the 580 patients, while 304 (52.4%) were males. Among the study population, 65.7% of the patients were older patients (n=381), and the median age was 67.8 years. Alzheimer's dementia accompanying dysphagia (n=232; 40%) and stroke (n=148; 25%) were the most prevalent diagnoses. No differences were found regarding the complication rate between geriatric patients and non-geriatric patients. The incidence of complications after percutaneous endoscopic gastrostomy insertion was 35.8%, with 71.1% are minor. Granuloma (12.6%) was the most minor complication while buried bumper syndrome (4.8%) was the most common major complication. However, peristomal leakage-necrotizing fasciitis and aspiration pneumonia was the most lethal complications. The mortality rate was 0.5%, and there was no significant difference between geriatric patients and non-geriatric patients.

Conclusion: We established that older age alone was not a risk factor for geriatric patients undergoing percutaneous endoscopic gastrostomy because there was no statistically significant difference between the complication and mortality rates of younger and older individuals. Hence, PEG can be used safely on older patients when necessary.

Keywords: Alzheimer's disease, geriatric care management, geriatrics, percutaneous endoscopic gastrostomy

Introduction

The term older person is generally defined as someone aged 65 years or older, whereas the term geriatric patient often implies a high degree of frailty and associated pathologies rather than age. Geriatric patients cannot be described by age alone but will be associated with the typical morbidity observed in older patients. Nutritional disorders are becoming an increasingly serious problem in geriatrics as a result of impaired oral intake and comorbidities (1). Enteral nutrition has many advantages over parenteral nutrition in patients who require nutritional support, including lower costs, reduced bacterial translocation, and a lower risk of sepsis. As a result, enteral nutrition is the preferred method when the gastrointestinal tract is functional. Enteral nutrition is possible with a gastrostomy tube, which can be placed surgically or radiologically in patients whose oral intake is insufficient. Percutaneous endoscopic gastrostomy (PEG) is recommended for patients with normal gastrointestinal

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system function who will not be fed orally for more than three weeks (2,3).

PEG, which was initially designed for children, is now used in all age groups for various indications (4). Head and neck traumas, various chronic neurological diseases such as Parkinson's disease and dementia, and upper esophageal and pharyngeal cancers are the most common indications (5,6). Weight loss and malnutrition can be avoided with PEG, but complications such as PEG site infection, aspiration pneumonia, gastric perforation, and necrotizing fasciitis may occur after the procedure (7,8).

The elevated incidence of concomitant diseases in older patients requiring PEG, such as cerebrovascular accidents, malignancy, and neurodegenerative disorders, may be a risk factor for the development of complications (9). In this study, we aimed to assess the safety of PEG insertion in geriatric patients by comparing them with non-geriatric patients and to evaluate procedure-related complications. To the best of our knowledge, no study has compared the complication rate due to PEG insertion between the geriatric and non-geriatric populations.

Materials and Methods

This is a retrospective study that included PEG insertions in patients over the age of 18 years performed by a single surgeon between January 2016 and December 2020. The Ethics Committee of clinical research at University of Health Sciences Turkey, Dışkapı Yıldırım Beyazıt Training and Research Hospital granted ethical approval (date: 12.09.2022, no: 146/04). The study excluded patients younger than 18 years of age and 117 cases in which the PEG tube was being replaced. The term "geriatric" patient was used for older people above 65 years and generally having additional comorbidities. We used the "pull" method for inserting the PEG tubes introduced by Gauderer et al. (4). After being given verbal information about PEG insertion, patients or their representatives were routinely asked to provide written consent. The patients' oral intake was stopped at least eight hours before the procedure. Intravenous midazolam was administered to all patients for sedation during the procedure. Oxygen saturation, pulse rate, and blood pressure were monitored during PEG insertion. Patients who were taking antiaggregant drugs had been instructed to stop taking them five days before the intervention. Antiaggregant medications were reinstated 1-2 days after the procedure. A note was recorded for patients who received a single dose of intravenous cefazolin as antimicrobial prophylaxis (AMP) prior to PEG insertion. Considering the patient's clinical status and the existence of comorbidities, the decision to administer AMP was made. All inpatients with coexisting diseases received AMP. Lidocaine hydrochloride spray and prilocaine were used for local oropharyngeal and skin incision anesthesia. Povidone-iodine was used to provide skin antisepsis. All PEG insertions were performed by a single experienced general surgeon. The PEG tube was used to initiate progressive advancement of enteral feedings beginning 24 hours after the procedure.

Complications that occurred within the first 30 days after PEG insertion was evaluated and classified as minor or major complications. Minor complications included granuloma, PEG tube obstruction, local wound infections, and PEG tube dislodgement. Major complications included buried bumper syndrome, aspiration pneumonia, peristomal leakage, gastric bleeding, gastrocolic fistula, intestinal injury, and necrotizing fasciitis. Age, gender, indications for PEG insertion, post procedure complications, and 30-day mortality rates were analyzed.

Statistics

For quantitative variables, mean, standard deviation, and median (minimum-maximum) were used as descriptors, and for qualitative variables, the number of patients (percentage) was used. For categorical variables, numbers and percentages were used. The Kolmogorov-Smirnov test was used to examine the normal distribution of numerical variables. The Mann-Whitney U test or Student's t-test were used to compare two independent groups. The chi-square test was used to compare differences between categorical variables. The Statistical Package for the Social Sciences (SPSS) for Windows version 22.0 was used for all analyses. A p-value of 0.05 was considered statistically significant.

Results

Five hundred and eighty patients had PEG insertions between January 2016 and December 2020. There were 276 female patients (47.6%) and 304 male patients (52.4%). The cohort was divided into geriatric and non-geriatric patients. The geriatric age group included 381 patients (65.7%). The average age of patients was 67.8±19.1 years. Table 1 presents the demographic characteristics and mean age distributions according to indications, complications and mortality rates. The most common reasons for PEG were Alzheimer's dementia accompanying dysphagia (n=232, 40%), cerebrovascular accidents (n=148, 25.5%), and head trauma (n=74, 12.8%). The mean age of patients with Alzheimer's dementia who required PEG implantation, the majority of the geriatric group, was found to be 83.1 years. The mean age of the other comorbidities was found 70.1 years for Parkinson's disease and 68.3 years for cerebrovascular accidents.

The complication rate did not differ by age (p=0.87). The average age of patients who had complications was 65.9 years while the average age of patients who did not have complications was 68.9 years (Table 2). A total of 372 (64.2%) patients had no complications after PEG insertion, while 208 had complications,

Table 1. The demographic characteristics, complication and mortality rate and, the mean age distribution for the various indications for PEG insertion

			Number, %
Number of participants	Geriatric patients		381 (65.7%)
	Non-geriatric patients		199 (34.3%)
Sex	Female		276 (47.6%)
	Male		304 (52.4%)
Mean age (years)	67.8±19.1		
Average age based on indications for PEG insertion (years)	Alzheimer's dementia	83.1±6.8	232 (40%)
	Cerebrovascular accidents	68.3±8.1	148 (25.5%)
	Head trauma	35.5±11.1	74 (12.8%)
	Parkinson's disease	70.1±8.2	52 (9%)
	Cerebral hemorrhage	59.9±9.6	22 (3.7%)
	Cancer	50.6±5.8	16 (2.8%)
	Cerebral palsy	24.2±18.1	14 (2.4%)
	Sepsis	62.3±9.7	12 (2.1%)
	ALS	47.3±9.5	10 (1.7%)
Complications	**None**		**372 (64.2%)**
	Present		208 (35.8%)
	Minor		**148 (25.5%)**
		Granuloma	73 (12.6%)
		Obstruction of PEG tube	46 (7.9%)
		Local wound infections	28 (4.8%)
		Dislodgement of PEG tube	1 (0.2%)
	Major		**60 (10.3%)**
		Buried bumper syndrome	28 (4.8%)
		Aspiration pneumonia	13 (2.2%)
		Peristomal leakage	10 (1.8%)
		Gastric bleeding	6 (1%)
		Gastrocolic fistula	2 (0.3%)
		Intestinal injury	1 (0.2%)
Mortality rate	**Total**		**3 (0.5%)**
	Etiologies	Peristomal leakage-necrotizing fasciitis	**2** (0.3%) 1 (geriatric) 1 (non-geriatric)
		Aspiration pneumonia	1 (0.2%) geriatric

PEG: Percutaneous endoscopic gastrostomy, ALS: Amyotrophic lateral sclerosis

Table 2. Comparison of complication rates after PEG insertion based on age distributions

		Number	Mean age (years)	p
Complications	**None**	372 (64.2%)	68.9±18.3	**0.87**
	Present	208 (35.8%)	65.9±20.4	
	Total	580	67.8±19.1	

Mann-Whitney U test, PEG: Percutaneous endoscopic gastrostomy

indicating a complication rate of 35.8%. Fortunately, 71.1% (148/208) of all complications were classified as minor (n=148, 25.5%). Granulomas (12.6%), PEG obstructions (7.9%), and local wound tube infections (4.8%) were the most common minor complications. Major complications were observed in 60 patients (10.3%) including buried bumper syndrome (4.8%), aspiration pneumonia (2.2%), and peristomal leakage (1.8%). The complication rates in patients with amyotrophic lateral sclerosis (ALS), cerebral palsy, and brain tumors were significantly higher (p=0.001), whereas there were no complications in patients with laryngeal cancers. Table 3 shows the relationship between complication rates and PEG indications. AMP was administered to 264 patients (45.5%), primarily inpatients. The complication rate did not differ significantly with the AMP administration (p=0.063).

Table 4 compares geriatric versus non-geriatric PEG patients in terms of complications, and mortality. The mortality rate related to PEG was 0.5% (3/580) and was similar between groups. Necrotizing fasciitis caused by peristomal leakage (n=2; one geriatric patient and one non-geriatric patient) and aspiration pneumonia (n=1; one geriatric patient) were the causes of PEG related mortality.

Discussion

Due to the prevalence of comorbidities and inadequate dietary intake, malnutrition is a common concern among the older people (10,11). PEG can improve the quality of life by providing nutritional support (12). Our research on the complication rates of PEG in geriatric patients indicates that the procedure is safe. The incidence of procedure-related complications was found to be comparable between the geriatric and non-geriatric patient populations. Moreover, there were no statistically significant differences in mortality rates based on age. We believe that age is not a risk factor alone in geriatric patients with PEG insertion. It should be remembered that Alzheimer's disease may be the only pathologic issue in a substantial fraction of geriatric patients, despite their older age and the presence of critical comorbidities.

Although Alzheimer's dementia is the most common reason for PEG insertion among the geriatric population, accompanying dysphagia and stroke have become more prevalent indications in recent years (11,13). Cerebrovascular accidents and head trauma are also common causes of PEG insertion (3,14). The pathology that necessitates the use of a PEG tube varies with age. We found that the demand for PEG grows dramatically at younger ages in illnesses such as cerebrovascular accidents, head trauma,

Table 3. The distribution of complications based on the indications for PEG insertion and the relationship between complication development and the AMP

		No complication	Complication present	
Distribution of complications based on indications	Alzheimer's dementia	161 (69.4%)	71 (30.6%)	0.001
	Cerebrovascular accidents	86 (58.1%)	62 (41.9%)	
	Head trauma	49 (66.2%)	25 (33.8%)	
	Parkinson's disease	34 (65.4%)	18 (34.6%)	
	Cerebral hemorrhage	10 (45.5%)	12 (54.5%)	
	Laryngeal cancer	11 (100%)	0	
	Cerebral palsy	6 (42.9%)	8 (57.1%)	
	Sepsis	11 (91.7%)	1 (8.3%)	
	ALS	3 (30%)	7 (70%)	
	Total	372 (64.2%)	208 (35.8%)	
AMP	Yes	160 (60.6%)	104 (39.4%)	0.063
	No	212 (67.1%)	104 (32.9%)	

PEG: Percutaneous endoscopic gastrostomy, AMP: Antimicrobial prophylaxis, ALS: Amyotrophic lateral sclerosis

Table 4. Comparison between geriatric and non-geriatric PEG in terms of complications, and mortality

		Non-geriatrics n=199 (34.3%)	Geriatrics n=381 (65.7%)	p
Presence of complications	**None**	120 (32.3%)	252 (67.7%)	0.097
	Present	79 (38%)	129 (62.0%)	
Complications type	**Minor**	55 (37.2%)	93 (62.8%)	0.29
	Major	24 (40%)	36 (60%)	
Mortality rate		1 (0.2%)	2 (0.3%)	0.43

PEG: Percutaneous endoscopic gastrostomy

ALS, and cerebral palsy, while Alzheimer's dementia was the most common reason for PEG in geriatric patients.

PEG tube insertion has been considered a relatively safe and effective intervention. However, studies have found that the mortality and complication rates associated with PEG insertion were significantly higher than predicted (15). According to a recent report, 18-38% of PEG patients experienced moderate complications and 2-4% of PEG insertions led to life-threatening complications. Complications can be divided into two categories based on their severity: minor and major complications. The overwhelming majority of complications, such as wound infections and minor bleeding, are considered minor complications. Necrotizing fasciitis and colocutaneous fistulas are rare complications (16). According to some studies, the incidence of complications after the PEG insertion may range from 16% to 70% (17-21). Variations in the rates reported in the scientific literature due to be caused by differences in the patient populations examined. Older people with a history of infection or aspiration pneumonia are more likely to develop complications (6,20). Our frequency and distribution of minor and major complications were comparable to those of other studies. Our rate of complications was 35.8%, of which 71.1% were evaluated as minor. Granulomas, blockage of the PEG tube, and local wound infections were the most frequently occurring minor complications. There was no significant difference in the development of complications between the geriatric and non-geriatric populations. A multicenter study on PEG mortality and complications determined that older patients had a greater risk of major complications, but the geriatric population was not specifically evaluated (16). Despite the fact that comorbidity is more common in the older people, a recent retrospective study found no significant difference in general complication rates between older and young patients, which is consistent with our findings. We agree with Wirth et al. (22) that procedure-related complications are more dangerous risk factors than old age itself.

A study on AMP in PEG patients supports the use of systemic antibiotics and demonstrates that AMP is effective against peristomal infections in PEG insertion. Various antibiotics, including ceftriaxone, cefuroxime, cefazolin, and cefoxitin, have been evaluated in randomized studies evaluating AMP in PEG patients (23,24). In our study, there was no significant relationship between the complication rate and AMP administration. Recent reports also stated that no differences were found regarding major complications and mortality rates in patients who had given AMP prior to PEG insertion (25).

A recent meta-analysis revealed that despite the fact that PEG-fed patients had a significantly better quality of life than nasogastric-fed patients, there was no significant difference in mortality rates between the two groups. Mortality risk exists regardless of whether a PEG tube is inserted in older or young patients (26). Although complications associated with PEG insertion are believed to be rare, the 30-day mortality rate ranges from 3% to 23%, and the overall hospitality mortality rate was reported to be 5% (11,16,26). The fact that our 30-day mortality rate was 0.5%, which is comparable to the lower level of mortality rates reported in the medical literature, is encouraging.

Although necrotizing fasciitis is a rare complication of PEG, severe traction of the PEG tube may increase the risk in patients with comorbid conditions (8,16). Numerous microorganisms contribute to the life-threatening complication of necrotizing fasciitis; effective treatment options include extensive surgical debridement and broad-spectrum antibiotic therapy. The leading cause of death in our studies was necrotizing fasciitis caused by peristomal leakage. It is known that the condition is more prevalent in diabetic patients and those taking corticosteroids or other immunosuppressive drugs. As evidenced by our data, we believe that this life-threatening complication may result from complications encountered during or after the PEG procedure and not from advanced age.

Study Limitations

The most significant limitations of this study are that it is retrospective and unicentric. In addition, we were unable to evaluate all the requested data due to a deficiency of information in the medical records. Prospective studies from multiple institutions are necessary to confirm our findings. However, because some patients are referred daily from aged care homes in numerous institutions, it is difficult to collect prospective data due to the inability to follow up after the procedure. The data which may be directly related to the nutrition status such as albumin, and hemoglobin could be included to discuss the presence of nutritional disorders. But, it was not possible to obtain these data in all patients due to the retrospective nature of the study. Given the paucity of data in the literature on PEG complications in elderly patients and the fact that 580 PEG procedures were performed in our study by a single experienced surgeon, we deem this study to be valuable research.

Conclusion

The PEG procedure is feasible and safe for older patients. However, geriatric patients require careful patient selection. PEG insertion may be complicated by comorbidities and surgical complications related to the patient but we believe that age is not a risk factor alone in geriatric patients for PEG insertion. Prospective research is required to resolve the discrepancies in the literature regarding PEG outcomes in the geriatric population.

Ethics

Ethics Committee Approval: The Ethics Committee of clinical research at University of Health Sciences Turkey, Dışkapı Yıldırım Beyazıt Training and Research Hospital granted ethical approval (date: 12.09.2022, no: 146/04).

Informed Consent: After being given verbal information about PEG insertion, patients or their representatives were routinely asked to provide written consent.

Peer-review: Externally peer-reviewed.

Authorship Contributions

Surgical and Medical Practices: C.A., Concept: C.A., Ş.B., Design: C.A., H.K., S.T., A.O.H., Data Collection or Processing: C.A., H.K., M.A., Analysis or Interpretation: C.A., Ş.B., M.A., S.Ç., Literature Search: C.A., S.Ç., Writing: C.A., S.T., A.O.H.

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ORIGINAL RESEARCH

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Loneliness and Depression Among Turkish Community-dwelling Older Adults During the COVID-19 Pandemic

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Abstract

Objective: In critical periods such as pandemics, the mental health needs of the older adults population should be one of the focal points of public health services. This study aims to investigate the loneliness and depression of older adults living in the community in Turkey during the Coronavirus disease-2019 (COVID-19) pandemic.

Materials and Methods: It is a cross-sectional and descriptive- analytical research. The sample size of the study was calculated as 510 people. Older adults aged 60 and over, residing in the province for at least one year, no history of severe psychiatric or neurological disorders, no severe clinical or psychiatric disorders, and living at home were included in the study. Data were collected with a questionnaire, Ascertain Dementia 8 (AD8), Geriatric Depression Scale-Short Form, and the University of California, Los Angeles Loneliness Scale (ULS).

Results: 58% of the older adults were between the ages of 60-69, 47% were women, 64% were married, and their mean GDS-SF score was 4.1 (standard deviation 3.4). It has been determined that factors related to socio-demographic characteristics as well as factors related to pre-pandemic health status and factors related to the negative effects of the disease on health have a decisive effect on depression in older adults during the pandemic process ($p<0.05$).

Conclusion: Depression in older adults is under the influence of many other factors that made them vulnerable even before the COVID-19 pandemic, rather than the direct effects of the pandemic. Accordingly, the older adults who live alone are a high-risk group.

Keywords: COVID-19, depression, loneliness, older adults, aging

Introduction

Since the declaration of a public health emergency by the World Health Organization in January 2020, the Coronavirus disease-2019 (COVID-19) pandemic has become a real threat that has led to radical changes in people's lives (1). In addition to the quarantine and isolation measures applied to the entire population to limit the spread of the virus in Turkey during the COVID-19 pandemic, unprecedented "social distancing" strategies have been implemented between people exposed to or infected with COVID-19 and the general population.

The global pandemic and the following safety measures have had a major (often negative) impact on the daily lives of a large part of the population. Older adults, who are considered a vulnerable population for many reasons, such as multiple diseases, long-term drug use, poor social habits, feeding and living conditions, etc., in addition to age (2), have been considered at risk of significant illness and death due to COVID-19 infection with the onset of the pandemic (3,4).

Health policies in place have targeted older adults, asking them to self-isolate and be physically distanced to avoid infection (3,5). In this regard, it has been reported that older adults who have to make major changes in their daily lives experienced difficulties such as insufficient access to health services, shortage of medicines, limited food resources, and movement

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restrictions (2,6-8). These experiences have further increased the vulnerability of the older adult population.

Older adults are more vulnerable to social isolation and loneliness since they are functionally very dependent on family members or the support provided by community services. However, it has been confirmed by many studies that lifestyle changes in the older adults during the COVID-19 pandemic are linked to negative mental health outcomes and that there was an increase in mental health symptoms and a general decrease in mental health during the pandemic. During the COVID-19 pandemic, older adults experienced withdrawal (9), increased subjective social isolation (10), decreased social interaction (11-13), increased loneliness (14-20), depression (21-24), increased psychological burden (5), high levels of COVID-19 fear (25) and COVID-19-related age discrimination (9). In addition, it has been pointed out that the personality characteristics (26), ability to regulate emotions (27), coping behaviors (28), and social resources (29) of individuals are the variables that mitigate the negative mental effects of the disease.

During the pandemic in Turkey, the older adults were investigated in two studies in terms of mental health. One study pointed out that anxiety is a predictor of depression for the older adults in quarantine (30). In another study, the incidence of depression and anxiety symptoms in older adults who had to stay at home during the pandemic was reported to be 38% and 30% (31). Apart from these studies, it was observed that the psychosocial and mental effects of the COVID-19 pandemic on older adults have been investigated only in the form of systematic reviews (32,33). This study aims to investigate the psychosocial health and well-being of older adults living in the community in Turkey during the COVID-19 pandemic within the scope of loneliness and depression and to analyze the factors associated with the conditions during the pandemic.

Materials and Methods

Study Design and Sampling

This study is a cross-sectional study of older adults living in a community in Turkey. The sample size of the study was calculated as 510 people by taking into account unknown prevalence =50%, Confidence Interval (CI) =95.0%, and sampling error =5.0%. The research inclusion criteria were being 60 years of age or older, and residing in the province for at least one year. Participants who had any severe visual or hearing impairment, had a history of severe psychiatric or neurological impairment, had severe clinical or psychiatric disorders, received institutional care, and showed cognitively abnormal results [Cognitive scores ≥5 according to Ascertain Dementia 8 (AD8) criteria] were excluded from the study.

Study Instruments

The study data were collected between March and June 2022 with the online form prepared using "Google forms".

Questionnaire

The questionnaire includes a total of 25 items, including socio-demographic characteristics such as age, sex, marital status, family type, education status, income status, number of children and place of residence of the participants (8 items), health characteristics such as distance to the health institution, presence of health problems, presence of mental illnesses, receiving support for care (4 items), and source of information about COVID-19, state of concern about COVID-19, staying in quarantine at home during the COVID-19 pandemic, the severity of the COVID-19 experience, perception of health status before the COVID-19 pandemic, perception of health status during the COVID-19 pandemic, perception of changes in the physical and mental state compared to before the COVID-19 pandemic, status of having medical check-ups during the COVID-19 pandemic, meeting needs since the COVID-19 pandemic, having a COVID test, and COVID-19 experiences (13 items).

Ascertain Dementia 8 (AD8)

The AD8 was developed to distinguish between normal cognitive aging and early-stage dementia. As a short and easy-to-understand test, the AD8 can be easily administered by patients, caregivers, or other practitioners. The AD8 contains eight items asking the participant to assess the change (yes or no) in memory, problem-solving abilities, orientation, and daily activities. The total number of "yes" responses gives the AD8 score (34). The AD8 was adapted to Turkish by Usarel et al. (35) in the non-clinical older adults population, and it was found that when a total score of ≥5 indicates dementia, its sensitivity was 100 and its specificity was 0.96.

Geriatric Depression Scale-Short Form (GDS-SF)

The validity and reliability study of the GDS-SF was conducted by Burke et al. (36). The scale consists of 15 items, responded by "yes" or "no" according to the emotions in a week. Depending on the direction of the questions, 1 point is given for the "yes" or "no" responses. It is rated by no depression (0-4 points), mild depression (5-8 points), moderate depression (9-11 points), and severe depression (12-15 points), according to the scores obtained from the scale. The Turkish version of the scale was evaluated methodologically with 329 outpatients with depression, and the correlation of the long and short forms was found to be 0.97. It has been validated as a valid and reliable tool for Turkish older adults (37).

The University of California, Los Angeles Loneliness Scale (ULS)

The ULS was developed in one dimension. Without being based on any theory, it measures the possible themes that

lead to loneliness according to Russel et al.'s (38) definition of loneliness. The 4-point Likert-type scale consists of twenty items. It has been used in different societies and cultures. An adaptation of the scale to Turkish culture was conducted by Demir (39). The highest score that can be taken on the scale is 80, and the lowest score is 20. A score between 20-40 indicates low-level loneliness, a score of 41-60 indicates moderate-level loneliness, and a score of 61-80 indicates a high level of loneliness. The criterion validity correlation coefficient of the scale was 0.82. The test-retest reliability coefficient was 0.94.

Statistics

Continuous data were expressed using averages and standard deviation, and descriptive statistics and categorical data were expressed as numbers and ratios. The normal distribution of continuous variables was tested by the Shapiro-Wilk test, and two groups were analyzed by the Independent Samples t-test for normally distributed variables and Mann-Whitney U test for variables with non-normal distribution. For more than two groups, comparisons were made with One-Way ANOVA for normally distributed variables, and with the Kruskal-Wallis test for variables without normal distribution. Post-hoc multiple comparison analysis was performed with significant values adjusted by Bonferroni correction. IBM SPSS v.21 software was used for statistical analysis, and a 95% CI was used in the analyses. Multivariate regression analysis was used for the factors predicting depression during the pandemic in the participants. The distribution of different stages of depression concerning different stages of loneliness was examined by the Cochrane-Armitage test for trend. The statistical significance level was accepted as $p<0.05$.

Results

The socio-demographic characteristics and health status of the older adults participating in the study and the relationship between these characteristics and the GDS-SF scores are presented in Table 1. Of the 510 older adults, 58% were between the ages of 60 and 69, 47% were women, 64% were married, 44% had three or four children, 64% lived in nuclear families, and 47% lived in the city center. Of them, 35% had a physical illness and 3% had a mental illness. For 49% of them, the distance to reach the health institution is 30-60 minutes. There were differences in the GDS-SF score averages of those in the 70-79 age group and 80 and above age group, women, those who did not have a spouse, those who did not have formal education, those who have a very poor income status, those who have never employed and those who depended on their family in their care ($p<0.05$). There were no significant differences in the GDS-SF score averages of in terms of number of children, family type, place of residence, physical and mental illness, and distance to health facility ($p>0.05$).

The experiences with COVID-19 and level of loneliness of the older adults participating in the study and the relationship between these characteristics and the GDS-SF scores are presented in Table 2. 61% of older adults have had a COVID test, 26% have tested positive. There were differences in the GDS-SF score averages of, those who got information about the COVID-19 from family/relatives, those who were very concerned about the COVID-19 pandemic, those who were in quarantine at home during the COVID-19 pandemic, those who did not have COVID-19 in their social environment, those who had a medium/weak health status before the COVID-19 pandemic, who described their physical and mental health as "changed" during the COVID-19 pandemic, those who postponed/were unable to postpone their medical check-ups during the COVID-19 pandemic, those who have great difficulties in meeting their needs in the COVID-19 pandemic, those hospitalized due to COVID-19, and those with a ULS score of medium and high ($p<0.05$). There were no significant differences in the GDS-SF score averages in terms of having a COVID test and being positive ($p>0.05$).

The mean GDS-SF score of the older adults was 4.1 (SD 3.4). Responses of the older adults on fifteen items of the GDS-SF are shown in Figure 1. Of the participants, 48% stated that "most people are better than themselves", 41% "preferred to stay at home rather than go out", 40% "had decreased activities and interests", 31% "did not feel happy most of the time", and 31% "were often bothered". According to the scores obtained from the GDS-SF, 59% (n=302) of the participants had no depression, 27% (n=137) had mild depression, 11% (n=57) had moderate depression, and 3% (n=14) had severe depression.

Factors (a total of 17 variables with significant difference in the GDS-SF scores in Table 1, 2) associated with depression (5 points and above) during COVID-19 among older adults are presented in Table 3. Depression was higher in the 70-79 age group than the other age groups, in those without a spouse compared to those with a spouse, in those with moderate/weak health before the pandemic compared to those with good health, in those with worsened mental health compared to those with good mental health before the COVID-19 pandemic, and in those with moderate to high ULS scores compared to those with lower scores. Depression was lower in primary school graduates than in those without formal education, and in those who met their needs easily during the COVID-19 pandemic than those who met their needs with some difficulty.

Table 4 shows the distribution of different stages of depression as measured by the GDS-SF concerning loneliness. The presence of a positive screening for depression (GDS-SF score 5+) was seen in 208 (41%) participants. Of the 194 older adults who experienced moderate and high levels of loneliness, 149 (78%) were found to have varying levels of depression. The Cochrane-

Armitage test for trend showed that the rate of loneliness increased significantly with increasing severity of depression ($p<0.05$).

Discussion

In the COVID-19 pandemic, it has become necessary to investigate depression in older adults within the scope of the combination of many effective factors (social, financial, health, and sociodemographic, etc.) as well as measures against the disease (social distancing) and the negative effects (hospitalization, physical and mental health effects, etc.) of the disease on health. Significant differences were found in terms of depression levels determined by the GDS-SF according to the univariate analysis performed in the study group divided into various subgroups. The level of depression was significantly different in the 70-79 and >80 age groups, and in women. In another study, the GDS scores were higher in women and the >85 age group, similar to this result (31). In a study conducted with a multinational database in Europe, it was found that women were twice as likely to report psychological burdens during the pandemic compared to males (5). Yildirim et al. (30) found that the effect of anxiety on depression was significantly lower in males than in women. In the same study, the highest and lowest effects of anxiety on depression were observed in the older adults aged 65-74 years and 75-84 years, respectively.

The absence of a spouse (widowed, divorced, separated, never married) made a significant difference in the GDS-SF scores of older adults and was also a factor that increased the likelihood of depression by 1.9 times. One study reported that being single, widowed, or divorced was a factor significantly associated with worsening depression after the onset of the pandemic (1.4 times) (21), while another study reported that being unmarried at all was a protective factor for depression (22).

Table 1. Older adults' socio-demographic characteristics and health status and GDS-SF using bivariate analysis

Variable	Frequency	%	Mean/median	SD/range	Statistics
Total	510	100.0	4.1	3.4	
Age (years)$^{\beta}$					
(1) 60-69	295	57.8	2.0	15.0	37.49*
(2) 70-79[1]	171	33.5	5.0	13.0	**<0.001**
(3) 80 and over[1]	44	8.6	6.0	13.0	
Sex					
Female	237	46.5	4.4	3.3	2.198**
Male	273	53.5	3.8	3.5	**0.028**
Marital status					
Married	182	64.3	3.5	3.3	-5.436**
Without partner	328	35.7	5.2	3.3	**<0.001**
Education					
(1) Illiterate[3,4]	56	11.0	5.3	3.6	
(2) Literate[3,4]	100	19.6	5.0	2.9	
(3) Primary school	209	41.0	3.7	3.4	5.686***
(4) Secondary school	63	12.4	3.0	2.8	<0.001
(5) High school	48	9.4	3.6	3.5	
(6) College and higher	34	6.7	4.9	3.9	
Income status$^{\beta}$					
(1) Very good	17	3.3	3.0	13.0	
(2) Quite good	154	30.2	3.0	10.0	
(3) Neither good nor poor	318	62.4	3.0	14.0	19.662*
(4) Quite poor	14	2.7	5.5	15.0	**0.001**
(5) Very poor[1,2,3]	7	1.4	11.0	12.0	
Presence health problems[(a)]	178	34.9	4.4	3.6	1.584
No	332	65.1	3.9	3.3	0.114**
Presence of mental illness[(b)]	16	3.1	5.7	3.0	1.924**
No	494	96.9	4.0	3.4	0.055
Needing family help to care[(c)]	83	16.3	6.3	3.7	6.028**
No	427	83.7	3.7	3.2	**<0.001**

[(a)]Rheumatism/fibromyalgia (6.1%), hypertension/heart disease/hypercholesterolemia (10.8%), chronic renal failure (1.2%), knee arthritis/prosthesis/osteoporosis (3.7%), prostate enlargement/prostate cancer (2.0%), endocrine diseases (diabetes, thyroid) (6.3%), Parkinson's disease (0.2%), waist/neck hernia (3.1%), skin diseases (psoriasis, eczema) (0.8%), sensory/orthopedic disability (1.8%), COPD/asthma (1.6%), [(b)]Depression, anxiety disorder, panic attacks, [(c)]Receiving care allowance (3.5%), *X_{kw}=Kruskal-Wallis test, **t=Independent Samples t-test, ***F=One-Way ANOVA test, [1,2,3 etc]Subgroup with difference, [β]Median (interquartile range), COPD: Chronic obstructive pulmonary disease, GDS-SF: Geriatric depression scale-short form, SD: Standard deviation

Table 2. Older adults' experiences with COVID-19 and GDS-SF using bivariate analysis

Variable	Frequency	%	GDS-SF score		
			Mean/median	SD/range	Statistics
Source of information about the pandemic[β]					
(1) Family/relatives[5]	132	25.9	5.0	15.0	
(2) Newspapers	8	1.6	3.5	13.0	
(3) Internet	21	4.1	5.0	13.0	25.361*
(4) Social media	11	2.2	3.0	10.0	**<0.001**
(5) TV/radio	338	66.3	3.0	14.0	
State of concern about the pandemic					
(1) Somewhat concerned	325	63.7	3.8	3.1	9.665***
(2) Very worried[1,3]	111	21.8	5.3	3.8	**<0.001**
(3) Never	74	14.5	3.8	3.5	
Being in quarantine at home in pandemic	327	64.1	4.5	3.6	3.513**
No	183	35.9	3.5	2.9	**<0.001**
The severity of the COVID-19 experience					
(1) No one has had COVID[2,3,4]	38	7.5	5.8	3.9	
(2) There were people hospitalized	96	18.8	4.1	3.5	3.392***
(3) There have been people who have died	126	24.7	4.0	3.5	**0.018**
(4) Some people tested positive	250	49.0	3.9	3.2	
Health status before the pandemic[β]					
(1) Good	365	71.6	3.0	14.0	
(2) Perfect/very good	58	11.4	2.0	10.0	46.349*
(3) Medium/weak[1,2]	87	17.1	6.0	15.0	**<0.001**
Physical health status during the pandemic[β]					
(1) Slightly improved[3]	62	12.2	5.0	14.0	
(2) Somewhat worsened	87	17.1	4.0	15.0	
(3) Unchanged	342	67.1	2.5	15.0	34.270*
(4) Definitely worsened[3]	12	2.4	7.0	13.0	**<0.001**
(5) Definitely improved[3]	7	1.4	9.0	9.0	
Mental health status during the pandemic[β]					
(1) Slightly improved[3]	56	11.0	5.0	11.0	
(2) Somewhat worsened[3]	155	30.4	4.0	14.0	
(3) Unchanged	275	53.9	2.0	15.0	40.820*
(4) Definitely worsened[3]	19	3.7	6.0	14.0	**<0.001**
(5) Definitely improved	5	1.0	5.0	9.0	
Postponing health checks in the pandemic	215	42.2	5.0	3.7	5.040**
No	295	57.8	3.5	3.0	**<0.001**
How have you met your needs since the pandemic?					
(1) With slight difficulty[3,4]	330	64.7	4.0	14.0	
(2) With great difficulty[1]	27	5.3	6.0	15.0	
(3) Easily	52	10.2	2.0	15.0	39.520*
(4) Quite easily	101	19.8	2.0	11.0	**<0.001**
Hospitalization due to COVID	40	7.8	6.2	4.0	3.558**
No	470	92.2	3.9	3.3	**0.001**
ULS score[β]					
(1) Low level lonely (ULS 20-40)	316	62.0	2.0	11.0	170.903*
(2) Mild level lonely (ULS 41-60)[1]	186	36.5	6.0	15.0	**<0.001**
(3) High level lonely (ULS 61-80)[1,2]	8	1.6	11.5	11.0	

*X_{kw}=Kruskal-Wallis test, **t=Independent Samples t-test, ***F=One-Way ANOVA test, [1,2,3 etc]Subgroup with difference, [β]Median (interquartile range), GDS-SF: Geriatric depression scale-short form, SD: Standard deviation, COVID: Coronavirus

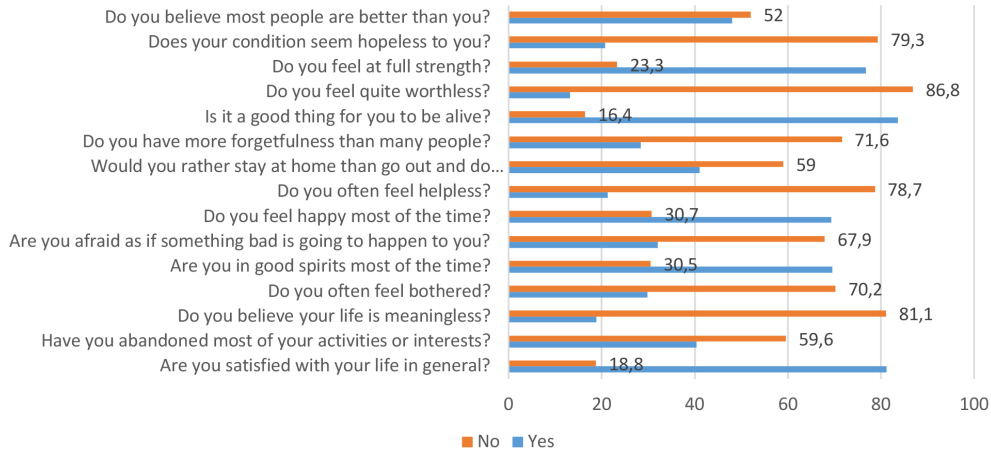

Figure 1. Older adults' agreement on the fifteen items of the GDS-SF

GDS-SF: Geriatric depression scale-short form

Table 3. Factors associated with the GDS-SF among older adults

Variables	B coefficient	Frequency std. err.	Wald	p-value	95% CI	
					Lower	Upper
60-69 years 70-79	Ref 0.569	0.268	4.503	**0.034**	1.044	2.986
Married Without partner	Ref 0.635	0.250	6.430	**0.011**	1.155	3.083
No formal education Primary education graduate	Ref -0.821	0.270	9.207	**0.002**	0.259	0.748
Good pre-pandemic health Medium/poor	Ref 1.172	0.297	15.519	**<0.001**	1.802	5.781
Mental health slightly improved/definitely improved compared to pre-pandemic Slightly worsened/definitely worsened	Ref 1.705	0.672	6.439	**0.011**	0.049	0.678
Some difficulty in meeting their needs in the pandemic Easy	Ref -0.939	0.436	4.645	**0.031**	0.167	0.918
ULS score-low level lonely (ULS 20-40) Mild level lonely (ULS 41-60) High level lonely (ULS 61-80)	Ref 2.643 3.417	 0.225 1.079	 138.044 10.036	 **<0.001** **0.002**	 9.045 3.681	 21.848 252.587

GDS-SF: Geriatric depression scale-short form, CI: Confidence interval

Table 4. The distribution of depression stages according to ULS score

GDS-SF score	Total n (%)	Low level lonely (ULS 20-40) n (%)	Mild level lonely (ULS 41-60) n (%)	High level lonely (ULS 61-80) n (%)	p-value*
No depression (score 0-4)	302 (59.2)	257 (81.3)	44 (23.7)	1 (12.5)	**<0.001**
Mild depression (score 5-8)	137 (26.9)	45 (14.2)	92 (49.5)	-	
Moderate depression (score 9-11)	57 (11.2)	14 (4.4)	40 (21.5)	3 (37.5)	
Severe depression (score 12-15)	14 (2.7)	-	10 (5.4)	4 (50.0)	
Total	510	316	186	8	

*p-value of Cochrane-Armitage test is significant at <0.05, GDS-SF: Geriatric depression scale-short form

In the study, the GDS-SF scores (5.3) of those without formal education were found to be higher than those with basic education, while the presence of basic education was seen as a factor that reduced the risk of depression at a moderate level (0.4) compared to those without formal education. Those who had poor income status were found to have higher the GDS-SF scores than those who had very good to middle-level income. However, income was not a determining factor in the increased risk of depression. Cigiloglu et al. (31) reported that the GDS scores were significantly higher in older adults in Turkish society especially in those without formal education (7.2) and in those with low income (8.5).

In the study, the place of residence (rural-urban) of the older adults and walking distance to the nearest healthcare provider did not make a difference in the GDS-SF scores. On the other hand, being away from healthcare facilities was associated with greater COVID-19 fears (25).

In the study, it was found that 35% of older adults already had at least one health problem. However, this rate does not include older adults with severe clinical or psychiatric disorders who were excluded from the study to ensure the reliability of the reported data. Das et al. (40) showed in their studies conducted with the older adults population that those with concomitant physical diseases have a 4.5 times higher risk of experiencing psychological problems. Carlos et al. (23) reported a 2.5 times greater risk of depression in those with general health disorders. Cigiloglu et al. (31) showed that older adults with chronic disease in Turkish society have higher the GDS scores. In this study, cognitive evaluation of older adults was performed using the AD8, and the reliability of the data was ensured by excluding those with cognitive scores of ≥5 and including only the individuals without dementia in the study. The study included older adults who did not have dementia and whose psychiatric disorder was clinically stable, and the older adults with a mental illness other than this were not found to have significantly higher the GDS-SF scores. Differently from this finding, the prevalence of depressive and anxiety symptoms in clinically stable older adults patients with psychiatric disorders was reported as 62% and 52%, respectively (41).

The GDS-SF scores of the older adults who stated that there were no individuals with COVID in their social environment were found to be higher than those with more severe COVID-19 experience. Unlike this result, another study reported an increase in depression and other psychological negative impacts depending on the severity of the experience, especially if someone in the social environment died due to the virus (5). In another study, having friends or family members with COVID-19 was a factor significantly associated (1.6 times) with depression (22). On the other hand, in this study, it was believed that the lack of COVID-19 experience in the social environment may have caused older adults to feel more threatened. Approximately a quarter of the older adults in the study reported that they lost people in their social circle due to COVID-19, and about half reported that they knew close people who tested positive for COVID-19. Among older adults in Poland, 19% were found to know someone with a positive diagnosis, and 39% know someone who had been in quarantine at home (24). It can be stated that the severity of the COVID-19 experience in the social environment of the older adults in this study is quite high compared to the other study results.

In terms of depression levels assessed by the GDS-SF, approximately 27% of the participants had mild, 11% had moderate, and 3% had severe depression. In an online survey study by Parlapani et al. (42) conducted with the older adults during the COVID-19 pandemic in Greece, the rate of moderate to severe depressive symptoms was reported as 82%. Another study conducted in 64 cities in India reported mild to moderate psychological effects in 15% of older adults (43). In another study, 19% of the participants stated that they were feeling more depressed (5). In the Indian older adults during the COVID-19 pandemic, the proportion of people with a GDS score of 5 and above was approximately 15% (44). In this study, the data were collected from March to June, which is the period to return to full normalcy in Turkey, and it is quite striking that the depression rate (5 points and above) determined by the GDS-SF at all levels was 41%. This rate can also be associated with depression, which occurs in the context of the post-traumatic effects of the pandemic.

The rates of staying in quarantine at home, getting tested for COVID-19, and testing positive for older adults were approximately 64%, 61%, and 25%, respectively. In a study conducted in Poland, the same data were 3.6%, 9.9%, and 2.7%, respectively (45). According to the comparison of the data of these two countries, it is obvious that a more comprehensive health service is provided in terms of secondary protection for older adults during the pandemic in Turkey. In this study, COVID-19 testing and positive COVID-19 test result did not make a difference in GDS-SF scores, while the GDS-SF scores were found to be significantly higher in those hospitalized due to COVID-19. A study comparing COVID-19 survivors and controls found significant differences in anxiety and depressive symptoms (24).

In this study, TV/radio (66%) was the first source of information, and family/relatives (26%) was the second. The GDS-SF scores of the participants who got information from their family/relatives were higher than those who got information through TV/radio. It is believed that family/relatives are often not competent as a source of information and that they may have caused excessive anxiety and unnecessary fears about the disease, especially in older adults, considering the quality of the information obtained from the Internet or social media.

In this study, although the past loneliness of the older adults is unknown, it is revealed that they are experiencing acute, severe loneliness in line with the COVID-19 pandemic, and this is the most striking factor affecting their depression. Those with moderate and high the ULS scores were found to have 2.6 and 3.4 times higher risk of depression, respectively. A study in Jordan showed that 42% of older adults were lonely and 37% tested positive for depression during quarantine. In particular, the participants who live alone were found to be 1.7 times more likely to develop depressive symptoms (20). This study showed that the price paid by the older adult population in terms of depression associated with loneliness during the pandemic is quite high. For the older adults, who were known to have suffered from loneliness and social isolation before the pandemic or who had mental problems previously, it can be assumed that this cost may have increased disproportionately according to the results of this study.

Study Limitations

One of the strengths of this study is that it is one of the first studies in Turkey to investigate the effects of the pandemic on the psychosocial health and well-being of older adults. Considering that the cognitive characteristics of older adults affect the reliability of the collected data, screening the individuals for dementia before including them in the study is another strong aspect. On the other hand, the results may not be generalized to older adults receiving institutional care since only the older adults living in the community were included in the study. Moreover, the cross-sectional design is not suitable for determining causal relationships.

Conclusion

In critical times such as pandemics, the special needs of older populations should be the focus of public health services. It should be noted that the effects of pandemics cannot be considered globally uniform, and may vary according to ethnicity and geography. Therefore, interventions to protect the older adults should be specific to countries or ethnicities, and they should be adjusted and modified according to the perceptions of the older adults such as health beliefs, attitudes, behaviors, etc.

In this study, predictive effects of the factors (70-79 age group, women, no spouse, lack of formal education) related to socio-demographic characteristics on depression in older adults during the pandemic in Turkey, in addition to factors related to pre-pandemic health status and the negative effects of COVID-19 infection on health (moderate/poor health status before the pandemic, deterioration of mental health, difficulty in meeting their needs during the pandemic, loneliness) were identified.

Depression in older adults in Turkey is more affected by many other factors that made them vulnerable before the pandemic than the direct effects of the pandemic. Accordingly, older adults who live alone are a high-risk group. Therefore, the development of policies for the empowerment of the older adults in terms of health and social issues in society will help them to cope with not only the pandemic, but all other social crises, and will help to improve their mental health. The public's emphasis on the risks of older adults should be more nuanced and free of age discrimination to reduce their loneliness and depression and maximize their resilience in response to the pandemic.

Ethics

Ethics Committee Approval: Before starting the research, approval was obtained from the Non-Interventional Health Research Ethics Committee of a Düzce University (date: 25/04/2022, decision no: 2022/54).

Informed Consent: In the interviews, the purpose of the study was explained to the older adults, their permission was obtained according to the principle of voluntary participation.

Peer-review: Externally peer-reviewed.

Authorship Contributions

Concept: S.B., E.Ö., H.K., K.Y., Y.H., A.E., S.Ö., E.Ç., E.B.İ., Ş.A., N.B., Design: S.B., E.Ö., H.K., K.Y., Y.H., A.E., S.Ö., E.Ç., E.B.İ., Ş.A., N.B., Data Collection or Processing: S.B., E.Ö., H.K., K.Y., Y.H., A.E., S.Ö., E.Ç., E.B.İ., Ş.A., N.B., Analysis or Interpretation: S.B., Literature Search: S.B., E.Ö., H.K., K.Y., Y.H., A.E., S.Ö., E.Ç., E.B.İ., Ş.A., N.B., Writing: S.B., E.Ö., H.K., K.Y., Y.H., A.E., S.Ö., E.Ç., E.B.İ., Ş.A., N.B.

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CASE REPORT

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Added Value of Geriatric Consultation on the Emergency Department to Detect Primary Hyperparathyroidism in the Elderly Presenting as Frail Phenotype: Review of the Literature and A Case Report

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Abstract

A geriatric syndrome manifests itself as a group of signs and symptoms such as functional decline or cognitive problems leading to a vulnerable or frail phenotype. Here we present the case of an older woman with primary hyperparathyroidism masked by a frail phenotype detected during the geriatric consultation at the emergency department.

A 75-year-old woman with a history of hypertension, hypercholesterolemia, diabetes mellitus type 2, morbid obesity, non-alcoholic fatty liver disease, and secondary hyperparathyroidism due to vitamin D deficiency, presented at the emergency department with progressive fatigue, weakness, confusion, and cognitive decline over the last weeks. Previous consultation at the emergency department of another hospital a week earlier had not yielded a clear diagnosis.

Geriatric assessment revealed severe frailty, functional dependence and neurocognitive decline. Blood tests revealed severe hypercalcemia (3.71 mmol/L), hypophosphatemia (0.35 mmol/L), and elevated PTH (492 ng/L). Parathyroid 4D scintigraphy and CT scan showed a possible parathyroid adenoma and multiple thyroid nodules.

The patient underwent parathyroidectomy and subtotal thyroidectomy. Pathology revealed a parathyroid adenoma confirming the diagnosis of primary hyperparathyroidism, and papillary thyroid carcinoma. She was discharged after 22 days, and full functional and neurocognitive recovery was confirmed after 12 months.

Geriatric consultation on the emergency ward is of key importance. Clinical decisions in older people are indeed complex and require multidisciplinary input where experience of geriatricians provides important added value.

Keywords: Hyperparathyroidism, elderly, parathyroidectomy, geriatric syndrome, thyroid carcinoma

Introduction

Geriatric syndrome is a term used to indicate common health conditions in older adults that do not fit into specific organ-based disease categories. Atypical symptoms can be caused by different underlying conditions. The etiology is often multifactorial, and symptoms can manifest acutely, as in delirium or syncope, or be of more chronic nature, such as functional decline, frailty, frequent falls, malnutrition or cognitive decline (1). The atypical character of geriatric syndromes

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harbors the danger of potentially masking other diagnoses, for example the hyperparathyroidism in the case we present here. Evaluation by a geriatrician of patients presenting to the emergency ward with what seems a geriatric syndrome is of key importance to avoid missing these underlying disorders presenting with atypical symptoms in the elderly (2-4).

Hyperparathyroidism is characterized by elevated parathyroid hormone (PTH) levels and activity. Primary hyperparathyroidism typically manifests itself with the symptom triad of bone loss, kidney stones and neuromuscular pain. Biochemically, it is characterized by hypercalcemia due to elevated PTH levels, as PTH, the central calcium regulating hormone, stimulates intestinal calcium absorption, calcium release from the bones, and renal calcium reabsorption (5).

The incidence of primary hyperparathyroidism increases with age and is three to four times higher in women (6,7). Its prevalence in those over 80 years of age can reach up to 7%. Many patients with hyperparathyroidism do not exhibit the classical symptoms, and although elderly patients often have clear biochemical hyperparathyroidism (6), symptoms such as cognitive impairment, muscular weakness, diffuse neuropsychiatric symptoms, and pain are often mistaken as age-related symptoms (8,9).

Here we describe the case of a 75-year-old female presenting with a geriatric syndrome, consisting of rapidly increased frailty and cognitive decline masking primary hyperparathyroidism. During further diagnostic workup, a papillary thyroid carcinoma was discovered as an incidental finding. The patient made a full recovery after surgical intervention.

Case Report

Patient Information

A 75-year-old Caucasian woman with a history of hypertension, hypercholesterolemia, diabetes mellitus type 2, morbid obesity, non-alcoholic fatty liver disease, total hysterectomy and secondary hyperparathyroidism due to vitamin D deficiency, was referred to the emergency department (ED) of the Antwerp University Hospital (UZA) by her general practitioner because of general deterioration with confusion, cognitive decline, fatigue, muscle weakness with recurrent falls, anorexia, dysphagia, polyuria.

She had visited the ED of another hospital the week before, where a routine diagnostic work-up [consisting of routine blood tests, urinalysis, electrocardiogram (ECG), thorax X-ray and computed tomography (CT) of the brain] did not lead to a definite diagnosis. She was sent home after reassurance without specific treatment. Calcium, phosphorus and vitamin D were not analyzed at that time, although mild hypercalcemia, low vitamin D levels and secondary hyperparathyroidism had been diagnosed half a year before.

The patient presented to our ED in a somewhat confused state, with slow speech, but still adequately responsive during anamnesis. She reported a gradual decline in general health over the last 10 months, with serious deterioration over the last week.

She felt somnolent, unsteady and prone to falling due to muscle weakness in the legs. She had been unable to sleep in her upstairs bedroom for a while and required extensive help with daily activities such as hygiene, cooking, groceries, cleaning, becoming totally dependent upon her husband. She lost her taste and appetite and as a result lost 6.5 kg in weight over the last 3 to 4 weeks. There was no nausea or vomiting, she reported dysphagia with difficulty swallowing even small pills. She was known with urine-incontinence, but lately also complained of polyuria and nocturia. Her partner entirely confirmed her rapid and functional decline in cognitive functioning described by the patient.

At admission, the patient's medication consisted of a bisoprolol + hydrochlorothiazide 10 mg/6.25 mg combination, losartan 100 mg and simvastatin 40 mg for hypertension and hypercholesterolemia. Her diabetes was treated with metformin 850 mg/d, but semaglutide once a week was recently stopped by her general practitioner because of general deterioration including rapid weight loss. She had received vitamin D supplementation for six months, up to 3 months previously. There was no (history) of tobacco, alcohol or drug abuse.

Clinical Findings

Physical examination revealed no abnormalities besides dry mucosa, obesity and slightly reduced limb strength. Her blood pressure was in the hypertensive range (163/77 mm Hg). Body temperature was 37.2 °C, pulse 85/min, oxygen saturation was 95%, respiratory rate was 21/min.

A comprehensive geriatric assessment was performed, yielding a 7-8 score on the clinical frailty scale [(CFS), severe to very severe frailty], STRATIFY fall risk score of 2, 3/8 on the shortened mini mental state examination (Mini-MMSE), IADL 27/27, ADL 19/24, score C_D on the Belgian Katz index of independence (10), a score of 0 on the functional ambulation categories scale (FAC), and a pain score of 0 on the numeric rating scale (NRS), delirium observation scale (DOS) score of 9 indicative of delirium, neuropsychiatric inventory questionnaire (NPI-Q) score of 71/96. Clock drawing test could not be performed at this time (Table 1).

Diagnostic Assessment

Lab results showed calcium level of 3.71 mmol/L (normal range 2.18-2.60 mmol/L) and a phosphate level of 0.35 mmol/L (normal range 0.78-1.65 mmol/L). C-reactive protein was 17.3

mg/L. PTH was highly elevated (492 ng/L, normal range 18.5-88.0 ng/L). Vitamin D was 20 ng/mL (normal range 30-100 ng/mL). The pronounced hypercalcemia and hypophosphatemia explained the patient's malaise, weight loss, dysphagia, polyuria, obstipation, confusional mental state and muscle weakness.

Albumin (37 g/L), thyroid-stimulating hormone (1.03 mU/L) and T4 (19.1 pmol/L) values as well as ionogram and liver tests were normal. HbA1c was 5.3% (normal range 4.8-6.0%), eGFR= estimated glomerular filtration rate was 67 mL/min/1.73 mm^2. Bone mineral density on DEXA scan was completely normal.

ECG showed sinus rhythm with T wave inversion and normal QT and QTC intervals. On transthoracic echocardiography ejection fraction was 72% and a grade I left ventricular diastolic dysfunction without indications of volume overload or valve dysfunction was observed. Echography of the neck showed a thyroid imaging reporting and data system (TIRADS) III nodule (17x12x7 mm) in the right lobe and a TIRADS IV nodule (10x9x7 mm) in the left lobe of the thyroid gland. A parathyroid 4D scintigraphy and CT scan showed a possible parathyroid adenoma behind the left lower part of the thyroid gland (14x9x44 mm).

Therapeutic Intervention

The patient was treated with NaCl 0.9% IV 1 L/8h +30 meq KPO_4, alternating with NaCl 0.9% IV 1 L/8h +20 meq KCl and 2 g of magnesium, pamidronate 60 mg IV, and cinacalcet 4 IE/kg twice daily subcutaneously. The bisoprolol + hydrochlorothiazide combination was stopped because thiazide diuretics reduce urinary calcium excretion, it was replaced by furosemide 20 mg twice daily to induce diuresis and calciuresis and amlodipine 5 mg to control hypertension. Physiotherapy for mobilization and fall prevention was started.

A surgical intervention comprising subtotal bilateral thyroidectomy and upper left parathyroidectomy was performed after normalization of calcium and phosphate levels. The pathology evaluation diagnosed left parathyroid adenoma and multifocal right invasive papillary thyroid carcinoma with RET fusion. The resection margins were diagnosed as not entirely free of tumor, but it was decided not to re-operate in view of the patient's age and comorbidities.

Follow-up and Outcome

The patient's symptoms quickly improved postoperatively, with CFS score decreasing from 7 to 5 (mild frailty). She was discharged after 22 days, with levothyroxine 75 µg/d and calcium and vitamin D supplementation added to her original medication scheme.

After 12 months, the patient had made a nearly full functional recovery [CFS 3 (self-reliant), STRATIFY score 0, Katz category O, FAC 5, NRS 0, ADL 6/24, IADL 12/27, NPI-Q 0/96, DOS 0], with a full restoration of cognitive function (MMSE score 30/30) (Table 1). PTH was in the normal range: 28 ng/L, echography of the thyroid region revealed no suspicious thyroid masses or lymph nodes.

Discussion

Geriatric consultation on the emergency ward is of key importance, as older people often present with a geriatric syndrome that may mask other diagnoses. Evaluation by a geriatric emergency medicine team reduces the length of the

Table 1. Results of the comprehensive geriatric assessment of the patient discussed in this case report at presentation and at follow-up 12 months later

Outcome	Assessment tool	Result	
		At presentation	At follow-up
Frailty	CFS	7-8 (severe to very severe frailty)	3 (self-reliant)
Neurocognitive functioning	Mini-MMSE	3/8	-
	MMSE	-	30/30
	DOS	9	0
	NPI-Q	71/96	0/96
	Clock drawing test	-	A
Pain	NRS	0	0
Fall risk	STRATIFY	2	0
Functional status	ADL	19/24	6/24
	IADL	27/27	12/27
	Katz index	C_D	O
	FAC	0	5

CFS: Clinical frailty scale, MMSE: Mini-mental state examination, DOS: Delirium observation screening, NPI-Q: Neuropsychiatric inventory-questionnaire, GDS-4: Four-item geriatric depression scale, NRS: Numerical rating scale, ADL: Activities of daily living, IADL: Instrumental activities of daily living, FAC: Functional ambulation categories

hospital stay (11) and geriatric assessment tools can predict revisit and readmission to the hospital (2). If geriatric assessment reveals fast functional (based on e.g., ADL, IADL scores), or neurocognitive deterioration (based on e.g., DOS, MMSE, NPI-Q scores), this is suggestive of underlying somatic disorders and needs to be investigated further.

The case we presented here demonstrates that fatigue, muscle weakness and neurocognitive symptoms which are often present in primary hyperparathyroidism, can be mistaken for manifestations of frailty and old age, especially in the absence of more typical manifestations such as renal stones, osteoporosis or fractures. The prevalence of primary hyperparathyroidism is estimated to be 0.5 to 34 per 1000, with highest prevalence between 40 and 70 years of age, and women affected 2-3 times more often. A Scottish population study reported 29.3% and 18.8% of identified primary hyperparathyroidism patients in the 70-79 years of age and >80 years of age groups, respectively (12).

A thorough evaluation needs to take into account the history of the patient (known hypercalcemia and hypovitaminosis D), must comprise a complete ionogram that includes measurement of calcium level, and a medication review. Our patient presented with hypercalcemia, that was diagnosed previously, and was on a thiazide diuretic, which can exacerbate hypercalcemia by reducing urinary calcium excretion. Her general practitioner discontinued semaglutide shortly before her visit to our hospital. Semaglutide causes weight loss and can cause fatigue, but none of our patient's other symptoms can be attributed to the effects of semaglutide.

Although the 2022 guidelines on the evaluation and management of primary hyperparathyroidism do not recommend surgery to improve neurocognitive function because of insufficient and inconclusive evidence (13), several prospective studies have reported improvement in neurocognitive parameters after parathyroidectomy (14-17). Repplinger et al. (18) observed neurocognitive symptoms in 51.4% of patients presenting with primary hyperparathyroidism and found neurocognitive symptoms in patients with hyperparathyroidism to be predictive for parathyroid hyperplasia. The full functional and neurocognitive recovery of our patient is in line with these findings. Parathyroidectomy in the elderly has been shown to be effective and safe, with no increased incidence of complications (19).

Papavramidis et al. (20) reported decreased frailty index and improved quality of life after parathyroidectomy in older patients with primary hyperparathyroidism. Although surgical treatment is recommended for patients with calcium levels >1 mg/dL (0.25 mmol/L) above the upper limit of normal, nonoperative treatment with calcimimetics can be used as an alternative in older patients with contraindications for surgery (13). Normalization of calcium levels with calcimimetics moreover predicts the cognitive response to parathyroid surgery in the elderly (9).

Thyroid cancer is relatively rare, although the incidence of papillary carcinoma, the most common type of thyroid cancer has been on the rise since the 1970s, mainly due to increased diagnosis (21). While the incident finding of a papillary thyroid carcinoma in our patient with primary hyperparathyroidism would seem a rare coincidence, the concomitant diagnosis of papillary thyroid carcinoma in patients with hyperparathyroidism has been reported previously: In a retrospective study, of 140 patients who underwent parathyroidectomy for primary hyperparathyroidism, 75 had concomitant thyroid surgery, and in those 19 papillary carcinomas were diagnosed (22).

The case presented here prompted the UZA, a tertiary training hospital, to routinely organize three daily multidisciplinary briefings in which all patients with a geriatric profile or geriatric syndrome are discussed by a multidisciplinary team consisting of a geriatrician, geriatric nurse, emergency physician and an ED nurse. Geriatric evaluation in the ED has been shown to facilitate decision making and improve service and patient outcomes (23,24).

Patient Perspective

At the time of presentation, the patient was convinced that she had lost her mind and had nearly reached the end of her lifetime. She was confused and entirely dependent on her husband for basic and instrumental daily activities.

When she was seen in a follow-up visit about a year after the surgery, the patient indicated that she was very happy to have undergone this surgery, which gave her "a new lease on life". She regained her independence in performing daily activities, is back to run her household normally, and recently went on a holiday by plane. She does not report any remaining systemic symptoms at this point.

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Ethics

Informed Consent: The patient provided consent for the publication of this case report to enable more swift diagnosis and treatment for others in a similar situation in the future.

Peer-review: Externally peer-reviewed.

Authorship Contributions

Surgical and Medical Practices: V.M., L.V.B., C.D.B., K.D.G., Concept: V.M., L.V.B., Data Collection or Processing: V.M., L.V.B., K.D.G., Analysis or Interpretation: V.M., L.V.B., C.D.B., M.V., G.H., S.P., G.M., Literature Search: V.M., L.V.B., C.D.B., M.V., Writing: V.M., L.V.B.

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CASE REPORT

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Use of Milk and Molasses Enema in Colonic Obstruction in An Octogenarian

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Abstract

Safety and efficacy of milk and molasses enemas are described in the pediatric population, but evidence is lacking in older adults. We present the case of an octogenarian patient with acute abdominal pain as a result of colonic obstruction. After initial medical treatment failed and surgical treatment declined, milk and molasses enema were recommended to relieve symptoms. We present a case in which milk and molasses enema could play an important role in older adults who are unable to undergo surgery due to patient preferences or high comorbidity.

Keywords: Abdominal pain, case report, colonic obstruction, frail elderly, milk and molasses enema, octogenarian

Introduction

Intestinal obstruction is a common condition in older adults, regardless of gender. It represents approximately 1-3% of all hospitalizations, of which 10-15% are located in the large intestine, with the sigmoid colon being the most frequent site. The main etiologies are cancer, adhesions, diverticular disease and volvulus (1,2). Initial medical treatment includes intravenous fluids, electrolyte replacement and gastric decompression, with a success rate of 77-96%; in case of failure, decompression by endoscopy or surgery is recommended (3). Regarding the latter, studies show mortality and postoperative complications of 29.8% and 47.9%, respectively (4).

This case report aims to draw attention to the use of milk and molasses enemas as an alternative therapy to surgical management in older adults whose diagnosis is intestinal obstruction and refuses surgical procedure.

Case Report

An 86-year-old male was admitted to the emergency department with a seven-day history of constipation treated with sennosides and polyethylene glycol without clinical response, his symptomatology worsened by adding abdominal pain, fever, nausea and vomiting.

His personal history included left and right hip replacements 1 and 3 years ago, respectively; chronic constipation, sleep maintenance insomnia and severe mixed dementia (Alzheimer's and vascular) diagnosed 3 years ago; a radical prostatectomy 8 years ago; and being a heavy smoker since a young age (a 40 pack-year history). He was under treatment with citalopram, quetiapine and melatonin due to neuropsychiatric symptoms.

At comprehensive geriatric assessment, severe dependency (Barthel index 0/100), immobility, living with very severe frailty according to the clinical frailty scale, SARC-F of 10 points compatible with probable sarcopenia, malnutrition by mini nutritional assessment of 5 points, and a mini-mental state examination of 19 points indicated impairment in space-time orientation, attention, memory and concentration.

His physical examination revealed a distended abdomen, increased metallic bowel sounds flank and left iliac fossa pain on palpation. A digital rectal examination showed neither stool nor bleeding. Lab tests revealed leukocytosis and neutrophilia. After that, an abdominal X-ray was performed, finding data compatible with intestinal occlusion in the descending colon and sigmoid colon with dilation of 10 cm (Figure 1A). An abdominal computed tomography scan was then performed to rule out the possibility of abdominal pain being caused by

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diverticular diseases, volvulus, abscess, or neoplasm, which revealed an intestinal occlusion in the sigmoid colon (Figure 1B).

Conservative management was initiated by placing a nasogastric tube without material drainage; after that, surgical treatment was offered, which the patient and relatives refused for fear of possible surgical complications. Levofloxacin 750 mg was started, as well as "Mayo enemas" every 24 hours for three days, which consisted of "300 milliliters of milk and 50 milliliters of molasses", heated to 35 °C/ 95°F. His labs were as follows prior to the application of enemas: White blood cells $14x10^9/\mu L$, neutrophils $12x10^9/\mu L$, hemoglobin 10 g/dL, platelets $322x10^9/\mu L$, prothrombin time 20.5, INR 1, sodium 131.2 mEq/L, potassium 3.47 mEq/L, chloride 98 mEq/L, phosphorus 2.7 mg/dL, bicarbonate 24 mEq/L, magnesium 2 mg/dL, calcium 8.1 mg/dL, basic urea nitrogen 17.71 mg/dL and creatinine 0.39 mg/dL, where, following application, there was abundant evacuation and symptom relief but no bleeding; intravenous fluids and potassium phosphate replacement were indicated. After 24 hours, his labs did not reveal any electrolyte abnormality, and after three days of enemas and evacuation, an abdominal X-ray was performed, which showed improvement of the occlusion (Figure 1C). His labs were white blood cells $8.8x10^9/\mu L$, neutrophils $4.9x10^9/\mu L$, hemoglobin 10.7 g/dL, platelets $319x10^9/\mu L$, prothrombin time 20.2, INR 1.1, sodium 133 mEq/L, potassium 4 mEq/L, chloride 96.4 mEq/L, phosphorus 3 mg/dL, bicarbonate 22 mEq/L, magnesium 2.2 mg/dL, calcium 8.4 mg/dL, basic urea nitrogen 8.13 mg/dL and creatinine 0.3 mg/dL. After that, polyethylene glycol was added to his prescription, and he was discharged to go home.

Discussion

The management of geriatric patients is complex. In this case, due to the state of functionality, comorbidities, and family consensus, non-surgical management was decided, so the use of enemas was offered as a conservative therapeutic alternative (5).

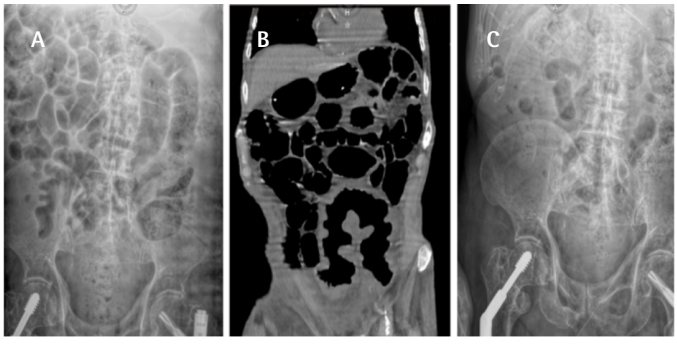

Figure 1. A) Abdominal X-ray revealed intestinal occlusion in the descending colon and sigmoid colon with 10 cm dilation. **B)** Abdominal computed tomography scan, which exhibited an intestinal occlusion in the sigmoid colon. **C)** Abdominal X-ray after "Mayo enemas" with remarkable improvement

The use of enemas based on milk and molasses for constipation has been used in medical practice, although most of the evidence is in the pediatric population. It is postulated that at the gastrointestinal level it produces a hyperosmotic effect and increased gas, promoting softening and expulsion of feces (6,7). However, there are disadvantages and complications as it is an invasive procedure, such as pain, bleeding and intestinal perforation, with an estimated mortality of 38.3% when it happens (8).

Regarding the frequency of complications, studies have produced conflicting results; hemodynamic deterioration and one death have been reported in children after milk enema (9), furthermore, a study reported that in eleven older patients after flee sodium phosphate enema, there was a decline in renal function and five patients died (10). Nevertheless, based on a study in which enemas based on milk and molasses were performed on 159 hospitalized patients, none of these adverse events were reported (11) and in one study of 261 patients in the emergency department, only 3.1% reported complications (8). Additionally, by comparison with sodium phosphate enema, both are described as equally safe and effective (12).

Frailty plays a major role in our medical practice. In the ELF study, frailty increased mortality complications and hospital stay regardless of age in emergency laparotomy, where 50% of patients presented with intestinal obstruction and mortality was 19.5% at ninety days (13); additionally, one study found that after an emergency bowel obstruction operation, 29.8% of patients died within thirty days, and 47.1% had a postoperative complication; this population was older than the ELF population (4).

Overall, intestinal obstruction is an important cause of mortality in older adults, so early identification improves survival. Geriatricians should recognize this disease in older adults, most of the patients respond to medical treatment, but there is a portion who will require a surgical procedure or decompressive endoscopy, which are safe in this population (14). Despite being candidates, some patients and families may object to invasive procedures like those in our case. In this scenario, comorbidities, quality of life, the clinical picture, geriatric syndromes and family expectations are important to making the best decision.

We acknowledge the limitations of using milk and molasses enema for colonic obstruction in older adults, as the majority of the evidence comes from the pediatric population, as well as the possibility of complications following its use. Therefore, we advocate using it as an alternative treatment in specific situations, such as ours, and obtaining written informed consent from family and patients after explaining all of the possible alternatives, all of the above, considering clinical, judgment and individualizing each case. In cases of lactose intolerance, we recommend avoiding it.

This case demonstrates that Mayo enema may be an option in geriatric patients who are unable to undergo surgery or decompressive endoscopy for intestinal obstruction due to medical, environmental, or personal reasons.

The patient's comorbidities prevented the surgeon from performing the surgery, so the enemas were a rapid and efficient option in a grim situation where the patient's life was in danger. The caretakers appreciated the conservative management.

Ethics

Informed Consent: Informed consent was obtained from the patient.

Peer-review: Externally peer-reviewed.

Authorship Contributions

Concept: L.E.M.B., J.C.D.V., Design: L.E.M.B., J.D.G.R., Data Collection or Processing: L.E.M.B., J.D.G.R., Analysis or Interpretation: L.E.M.B., Literature Search: L.E.M.B., J.D.G.R., J.R.B.M., Writing: L.E.M.B., J.D.G.R., J.R.B.M., J.C.D.V.

Conflict of Interest: No conflict of interest was declared by the authors.

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