

Health literacy status and its relationship with physical therapy and rehabilitation applications in patients with knee osteoarthritis

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ABSTRACT

Objectives: The study aimed to determine the level of health literacy in patients with knee osteoarthritis and investigate the relationship between health literacy and exercise approaches and physical therapy use.

Patients and methods: The cross-sectional study included 203 patients (143 females, 60 males; mean age: 63.5±9.2 years) between November 2018 and September 2019. Sociodemographic data, exercise habits, the number of applications to the physical medicine and rehabilitation outpatient clinic, and physical therapy applications were recorded. The Turkish Health Literacy Scale-32 (THLS-32), was used to determine health literacy. The Western Ontario and McMaster Universities Arthritis Index (WOMAC) was used to evaluate pain and physical function. The relationship between THLS-32 and the number of admissions to the outpatient clinic, the number of physical therapy applications, exercise frequency, and WOMAC scores were investigated.

Results: The median THLS-32 of the patients was 33.8 (13-46.8). A statistically significant negative correlation was found between THLS-32 scores and the number of admissions to the physical medicine and rehabilitation outpatient clinic for knee pain in the last year, the number of physical therapies, the exercise frequency, and total WOMAC scores.

Conclusion: Increasing health literacy strengthens the capacities and participation of patients, reduces the costs of physical therapy, as well as medication costs, and consequently increases efficiency in the use of health services.

Keywords: Health literacy, knee osteoarthritis, physical therapy and rehabilitation.

Knee osteoarthritis (OA) is one of the important causes of physical disability. It not only causes a decrease in the quality of life of the patient but also leads to an increase in health expenditures.^[1] The aim of knee OA treatment is to decrease pain, maintain joint functions, and improve quality of life. Treatment guidelines emphasize the need to combine pharmacological and nonpharmacological treatments.^[2] Patient education is the first important step in nonpharmacological treatments. It includes education on exercise, lifestyle changes, activity control, and the importance of weight loss. Tools such as books, brochures, and videos are useful in informing the patient.

Health literacy is the ability to obtain, read, understand, and use health information to make appropriate health-related decisions and follow treatment instructions.^[3] These skills range from simple reading to being able to critically analyze health-related information. It contributes to the correct use of resources, to increase the quality of health services, and to have a say in the individual's health and public health.^[4] Studies have shown that insufficient health literacy is associated with less use of preventive health services and a decrease in the frequency of screening for conditions that can be diagnosed early, such as cancer.^[5] It also has been found that people with insufficient health literacy

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apply for therapeutic health services more, have higher hospitalization rates, stay in the hospital longer, have higher hospital costs, and show lower adherence to treatment.^[6] When all these conditions are taken into consideration, low health literacy causes loss of workforce and increased health expenditures.

Although there are studies in the literature evaluating the relationship between health literacy and admission to hospital/emergency services,^[7] we could not find any study investigating the relationship between health literacy and the frequency of applying to physical therapy. Hence, this study aimed to determine the level of health literacy in patients with knee OA, examine the factors associated with insufficient health literacy, and investigate the relationship between health literacy and exercise approaches and physical therapy use.

PATIENTS AND METHODS

Patients who applied to the physical medicine and rehabilitation (PMR) outpatient clinic of the Uludağ University Faculty of Medicine with chronic knee pain between November 2018 and September 2019 were evaluated for eligibility for the cross-sectional study. The inclusion criteria were as follows: being between 45 and 80 years old, being diagnosed with knee OA according to the diagnostic criteria of the American College of Rheumatology (ACR),^[8] and having the intellectual and cognitive capacity to understand the questionnaires. Health workers and patients for whom physical therapy was contraindicated due to cancer, cardiac disease, or other health problems were excluded. Two hundred and three patients (143 females, 60 males; mean age: 63.5±9.2 years) were included in the study. A written informed consent was obtained from each patient. The study protocol was approved by the Uludag University Faculty of Medicine Clinical Research Ethics Committee (date: 02.10.2018, no: 2011-KAEK-26). The study was conducted in accordance with the principles of the Declaration of Helsinki.

Sociodemographic data, the general health status of the patients, and the presence of chronic diseases were recorded. The number of applications to the PMR outpatient clinic and physical therapy applications were recorded. Exercise habits of the patients were recorded as follows: almost every day, several times a week, several times a month, and never.

The Western Ontario and McMaster Universities Arthritis Index (WOMAC) was used to assess pain, stiffness, and function. It is widely used in the evaluation of hip and knee OA. It consists of three subscales (pain, stiffness, and physical function) and 24 questions. Higher WOMAC scores indicate increased pain and stiffness and decreased physical functions. The validity and reliability study of the Turkish version of the questionnaire was previously conducted.^[9]

The Turkish Health Literacy Scale-32 (THLS-32), developed by Okyay et al.^[10] in 2016 by adapting from the European health literacy survey, was used to determine health literacy.^[11] It consists of 32 items and is structured as a 2×4 matrix by taking into account two basic dimensions. This matrix consists of eight components, two areas (health care and disease prevention and health promotion), and four processing stages (accessing health-related information, understanding health-related information, appraising health-related information, and using/applying health-related information). The score ranges between 0 and 50. Zero indicates the lowest health literacy, while 50 indicates the highest. Patients also are categorized as follows according to the score obtained from the scale: 0-25 points, insufficient health literacy; >25-33, limited or problematic health literacy; >33-42, adequate health literacy; >42-50, excellent health literacy. The relationship between THLS-32 and the number of admissions to the outpatient clinic, the number of physical therapy applications, and exercise frequency were investigated.

Statistical analysis

Data were analyzed using IBM SPSS version 22.0 (IBM Corp., Armonk, NY, USA). The Shapiro-Wilk test was used to determine whether the data was in a normal distribution. Variables with normal distribution were expressed as mean ± standard deviation, while those that did not fit the normal distribution were expressed as median (min-max) values. In the case of more than two groups, the Kruskal-Wallis test was used for intergroup comparisons of parameters. From which groups the differences originated were analyzed using the Mann-Whitney U test by making a pairwise comparison using the Dunn-Bonferoni post hoc test. Categorical variables were expressed as frequency (%), and the Pearson chi-square test was used for comparisons. The relationships between the variables were analysed with the Spearman correlation coefficient. A p-value <0.05 was considered statistically significant.

| TABLE 1 Data on demographic characteristics, health status of the patients, exercise frequency, and application to the PMR outpatient clinic in last year | | | |
|--|-----|------|----------|
| | n | % | Mean±SD |
| Age (year) | | | 63.5±9.2 |
| Sex | | | |
| Female | 143 | 70 | |
| Male | 60 | 30 | |
| Marital status | | | |
| Single | 25 | 12 | |
| Married | 178 | 88 | |
| Education | | | |
| Elementary school | 87 | 43 | |
| Middle school | 43 | 21 | |
| High school | 40 | 20 | |
| University | 33 | 16 | |
| General health status | | | |
| Excellent | 6 | 3.0 | |
| Very good | 15 | 7.4 | |
| Good | 103 | 50.7 | |
| Not bad | 63 | 31.0 | |
| Poor | 16 | 7.9 | |
| Systemic disease | | | |
| Yes | 143 | 70.4 | |
| No | 60 | 29.6 | |
| Application of PMR outpatient clinic in last year | | | |
| 1 | 70 | 34.5 | |
| 2 | 61 | 30 | |
| 3 | 52 | 25.6 | |
| More than 4 | 20 | 9.9 | |
| Exercise frequency | | | |
| Almost every day | 37 | 18.2 | |
| Several days in a week, | 71 | 35 | |
| Several days in a month | 63 | 31.0 | |
| Never | 32 | 15.8 | |

SD: Standard deviation; PMR: Physical medicine and rehabilitation.

RESULTS

Data on demographic characteristics, general health status, exercise frequency, and application to the PMR outpatient clinic in the last year are given in Table 1. One hundred forty-five (71.4%) patients reported that they received physical therapy at least once as an outpatient or inpatient, and 30 (14.8%) of them received it as an inpatient. Thirty-seven (18.2%) patients stated that they exercised for at least 30 min almost every day, 71 (35%) patients a few days a week, 63 (31%) patients a few days a month, and 32 (15.8%) patients did not exercise at all.

The median THLS-32 of the patients was 33.8 (13-46.8). The percentages of health literacy levels are given in Figure 1. Fifty-six (27.6%) patients had inadequate, 45 (22.2%) patients had limited, 83 (40.9%)

patients had adequate, and 19 (9.3%) patients had excellent health literacy.

A statistically significant negative correlation was found between the number of admissions to the outpatient clinic for knee pain in the last year and THLS-32 scores ($p < 0.001$). Paired comparisons using the Dunn-Bonferoni post hoc test showed a statistically significant relationship between the patients who applied to the outpatient clinic once and all other groups ($r_s = 0.677$; $p < 0.05$). As total and subgroup scores of THLS-32 decreased, the number of applications to the outpatient clinic increased (Table 2).

A statistically significant negative correlation was found in the number of physical therapy and THLS-32 scores in all components ($p < 0.001$). As THLS-32 total and subcomponent scale scores

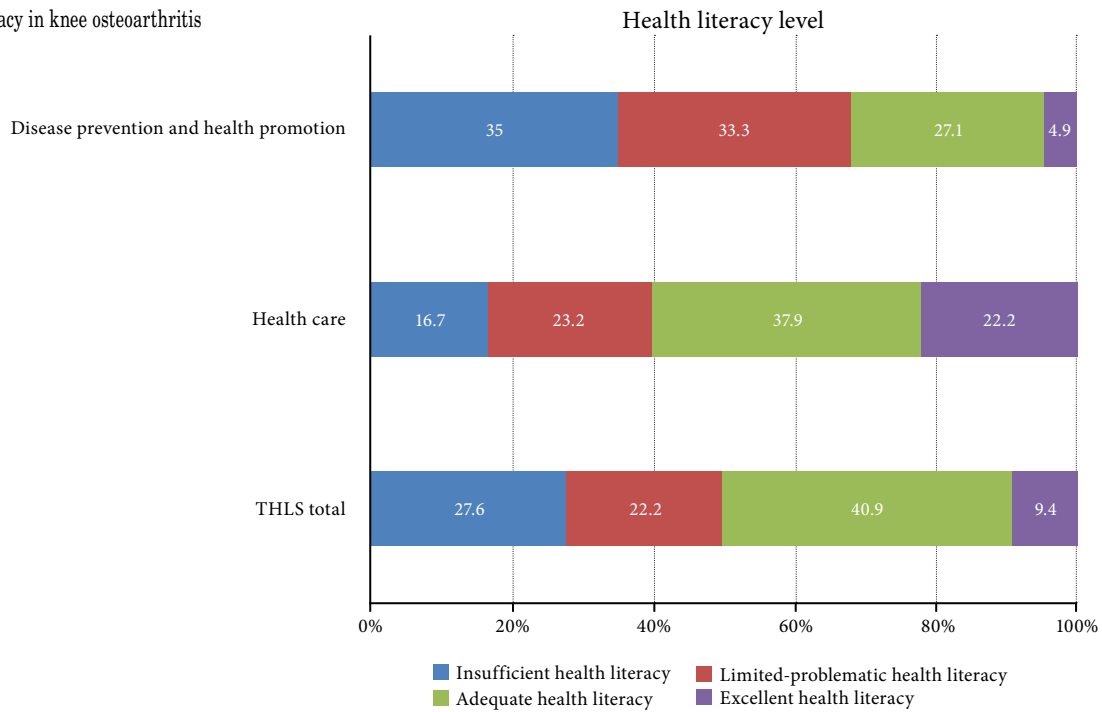


Figure 1. Health literacy levels.
THLS-32: Turkish Health Literacy Scale 32.

| TABLE 2 The relationship between THLS-32 and the number of admissions to the outpatient clinic | | | | | | | | | |
|---|---|-----------|--------|-----------|--------|-----------|--------|-----------|----------|
| | Number of admissions to the outpatient clinic | | | | | | | | <i>p</i> |
| | 1 | | 2 | | 3 | | ≥4 | | |
| | Median | Min-Max | Median | Min-Max | Median | Min-Max | Median | Min-Max | |
| Accessing health-related information | 33.3 | 16.6-47.9 | 27.2 | 8.3-50.0 | 25.0 | 6.2-41.6 | 39.5 | 22.9-50.0 | <0.001 |
| Understanding health-related information | 41.6 | 25.0-50.0 | 33.3 | 16.6-50.0 | 34.3 | 16.6-47.9 | 32.2 | 14.5-47.9 | <0.001 |
| Appraise health-related information | 31.2 | 14.5-50.0 | 29.1 | 8.3-43.7 | 29.1 | 10.4-43.7 | 33.3 | 14.5-47.9 | 0.001 |
| Using/applying health-related information | 39.5 | 22.9-50.0 | 33.3 | 14.5-47.9 | 31.2 | 12.5-43.7 | 29.1 | 14.5-43.7 | <0.001 |
| Health care | 39.5 | 26.0-47.9 | 35.4 | 17.7-46.8 | 30.7 | 14.5-44.7 | 29.1 | 15.6-43.7 | <0.001 |
| Disease prevention/health promotion | 33.3 | 12.5-45.8 | 27.0 | 11.4-47.8 | 28.1 | 9.3-47.0 | 21.8 | 10.4-38.5 | <0.001 |
| THLS-32 total score | 36.4 | 19.2-46.8 | 31.7 | 15.1-46.5 | 29.6 | 13.5-42.7 | 25.4 | 13.0-41.5 | <0.001 |

THLS-32: Turkish Health Literacy Scale 32.

| TABLE 3 The number of physical therapy applications and THLS-32 scores | | |
|---|--------------------------------|----------|
| | The number of physical therapy | |
| | <i>rs</i> | <i>p</i> |
| Accessing health-related information | -0.601 | <0.001 |
| Understanding health-related information | -0.656 | <0.001 |
| Appraise health-related information | -0.664 | <0.001 |
| Using/applying health-related information | -0.722 | <0.001 |
| Health care | -0.682 | <0.001 |
| Disease prevention / health promotion | -0.650 | <0.001 |
| THLS-32 total score | -0.677 | <0.001 |

THLS-32: Turkish Health Literacy Scale 32.

TABLE 4
The relationship between exercise frequency and THLS-32 scores

| | Exercise frequency | | | | | | | | p |
|---|--------------------|-----------|-------------------------|-----------|--------------------------|-----------|--------|-----------|--------|
| | Almost every day | | Several times in a week | | Several times in a month | | Never | | |
| | Median | Min-Max | Median | Min-Max | Median | Min-Max | Median | Min-Max | |
| Accessing health-related information | 33.3 | 8.3-50.0 | 33.3 | 10.4-47.9 | 25.0 | 10.4-41.6 | 16.6 | 6.2-35.4 | <0.001 |
| Understanding health-related information | 41.6 | 22.9-50.0 | 39.5 | 22.9-50.0 | 33.3 | 16.6-50.0 | 27.0 | 16.6-43.7 | <0.001 |
| Appraise health-related information | 33.3 | 10.4-43.7 | 33.3 | 16.6-50.0 | 27.0 | 8.3-43.7 | 32 | 18.7-8.3 | <0.001 |
| Using/applying health-related information | 39.6 | 18.7-50.0 | 37.5 | 18.7-47.9 | 31.2 | 14.5-45.2 | 25.0 | 12.5-43.7 | <0.001 |
| Health care | 39.5 | 23.9-47.9 | 38.5 | 21.2-47.9 | 32.2 | 15.6-45.8 | 25.0 | 14.5-44.7 | <0.001 |
| Disease prevention/health promotion | 32.2 | 13.3-47.8 | 32.2 | 11.4-45.8 | 26.0 | 9.3-38.5 | 17.6 | 10.4-31.2 | <0.001 |
| THLS-32 total score | 36.4 | 20.2-46.5 | 35.9 | 17.6-46.8 | 28.1 | 13.0-41.6 | 21.0 | 13.5-37.4 | <0.001 |

THLS-32: Turkish Health Literacy Scale 32.

decreased, the number of physical therapy increased (Table 3).

A significant relationship was found between the exercise frequency and the total and subcomponent scores of THLS-32 ($p < 0.001$). In paired comparisons using the Dunn-Bonferoni post hoc test, there was no difference between those who exercised every day and those who exercised a few days a week in the THLS-32 total score component, while a statistically significant difference was found between the other groups. The frequency of exercise increased as the THLS-32 scale scores increased (Table 4). There was a significant negative correlation between the THLS-32 scores and total WOMAC scores (-0.646 ; $p < 0.001$). The WOMAC score increased as THLS-32 scores decreased.

DISCUSSION

Treatment costs of knee OA constitute a significant burden on the economy worldwide.^[12] Le Pen et al.^[13] reported that more than 13 million doctor visits are made annually in France due to OA. This amount constitutes 1.7% of the annual national health expenditures and is equal to the cost of coronary heart disease.

It is thought that health literacy has an important role in the use of health services and, therefore, is a component that affects the cost. Inadequate health literacy leads to problems in the effective use of health services and an unhealthier life at the individual

level, while it results in low productivity, increased morbidity, and higher costs at the social level.^[14] Patients' understanding of education about lifestyle changes, diet, and exercise practices recommended in OA treatment guidelines and their compliance with treatment processes are affected by many factors, as well as health literacy level.^[15]

In our study, we found the mean health literacy index score of the participants to be 33.8. This score was reported as 30.4 in the Türkiye Health Literacy Survey report conducted by Tanrıöver et al.^[16] across the country. In the validity and reliability study of the THLS-32 by Okyay et al.,^[10] this score was found to be 29.5. In our study, we found the rate of those with insufficient health literacy to be nearly 50%, while this rate was reported as 64.6% in Tanrıöver et al.'s^[16] report. Although the mean score found in our study is similar to the previous studies in general, the percentage of patients with insufficient health literacy seems to be comparatively lower. In studies conducted throughout Türkiye, people living in rural areas and illiterate individuals were also included in the study. This difference can be explained by the fact that our study included patients who could reach a tertiary hospital in an important metropolitan area of Türkiye. In the European health literacy study conducted by Sørensen et al.,^[11] 47.6% of individuals were found to have inadequate health literacy levels, while 52.5% of them had adequate or excellent health literacy levels.

In our study, we found that individuals with poor health literacy exercised less frequently. Regular

physical activity is a cost-effective way to reduce both the symptoms of OA and physical disability.^[17] In a study by Wolf et al.,^[18] it was shown that a low health literacy level is associated with unhealthy living habits, such as a sedentary life. In the European health literacy survey, it was similarly found that the frequency of physical exercise increased as the general health literacy index score increased.^[11] The average health literacy score of the patients who exercised regularly was found to be higher than those who did not exercise in two other studies.^[15,19]

In our study, it was found that patients with a low health literacy level applied to the PMR outpatient clinic more frequently. In the literature, there are studies comparing the number of patients who applied to any health institution and their health literacy levels. In the study of Rasu et al.,^[20] people with a low health literacy level were found to have a significantly higher number of annual doctor visits than those with a high level of health literacy. In the same study, it was found that those with insufficient health literacy led to increases in the use of health services and the cost of prescriptions. The researchers reported that the reason for the high prescription costs is that those with insufficient health literacy level do not focus on preventive health services and demand treatment after they become ill.^[20]

In the report prepared by the European health literacy survey, it was stated that there is a negative relationship between the increase in general health literacy of the participants and the frequency of visiting a doctor.^[11] In another study by Gordon et al.,^[21] it was found that rheumatoid arthritis patients with low health literacy applied to the outpatient clinic more frequently. Patients with high health literacy can better understand the training provided by doctors. They can better understand the exercise recommendations, the importance of weight control, and the advice on drug use, which are crucial in the treatment and prevention of OA. A full understanding of the exercise sheets given to the patients as educational material can positively affect their exercise habits. A better perception of preventive measures and treatment plans may increase self-management skills in OA, and as this increases, it can be expected that the frequency of admission to the outpatient clinic will decrease.

In our study, we found that patients with low health literacy used physical therapy practices at a higher rate. As far as we know, there is no study in the literature focusing on the relationship between

the health literacy level and physical therapy. In a study conducted by Glasmann et al.^[22] to determine the impact of health literacy on the management of chronic low back pain, no significant relationship was found between health literacy and physical therapy applications, which is among the various treatments. However, the rate of the patients who received physical therapy was quite low. In one of the studies assessing the relationship between health literacy levels and hospitalization rates, MacLeod et al.^[23] reported that the percentage of hospitalization of patients with high health literacy was lower than the percentage of hospitalization of patients with insufficient health literacy. The hospitalization risk of 3,260 elderly people examined was evaluated by a private health insurance company in the USA, and it was determined that insufficient health literacy was an independent risk factor for hospitalization.^[24] In the same study, it was found that patients with insufficient health literacy had twice the rate of hospitalization. In the study conducted by Davis et al.,^[25] it was concluded that the rate of hospitalization increased because the patients did not benefit from preventive health services due to low health literacy. Taken together with all these studies, our study also confirms the hypothesis that health expenditures due to hospitalization and physical therapy can be reduced by increasing the level of health literacy.

In our study, it was found that WOMAC scores, used to assess the health status of OA patients, increased as their health literacy levels decreased. There is no study in the literature examining the relationship between WOMAC scores and health literacy. However, there are studies with other similar scales measuring disease severity and activation. In a study by Kuipers et al.,^[26] disease activity in patients with rheumatoid arthritis was evaluated with Disease Activity Score 28, and it was found that those with higher health literacy levels had lower disease activity. In a study examining the effect of health literacy on the use of health services in patients with low back pain, Oswestry Disability Index scores were found to be higher in patients with low health literacy levels.^[22] It can be said that the severity of disability measured by WOMAC increases as the patients' level of health literacy decreases, as they have difficulty understanding and applying preventive and therapeutic recommendations.

In addition to the WOMAC total score, it was found that as the health literacy level decreased, the pain scores evaluated by the WOMAC pain score increased. Adams et al.^[27] reported that those with low health

literacy had inadequate pain control. In another study, patients treated for musculoskeletal pain were evaluated at the end of six months, and it was found that patients with insufficient health literacy had lower physical functions and higher pain intensity.^[28] This relationship remained after adjustments for age, ethnicity, and education level variables. In the study of Köppen et al.^[29] on patients with chronic pain, Visual Analog Scale scores were found to be higher in patients with insufficient health literacy, yet no correlation with perception and duration of pain was detected. Contrarily, there are also studies in the literature in which the level of health literacy has been reported to be unrelated to pain and physical function.^[30] It is known that pain is a complex sensory and emotional experience. In addition to many psychological, social, and economic factors, depression and additional morbidities also play a role in the complaint of pain in OA.^[31] It has been shown that the training given to patients in OA about coping with pain positively affects the treatment results in the short and long term.^[32] Therefore, it can be argued that increasing the health literacy of the patients may contribute to the easier implementation of self-management strategies for pain and thus reduce pain complaints.

In conclusion, knee OA is a chronic disease, and rehabilitation is the most important part of treatment. A good practice of rehabilitation depends on the patient's ability to understand both the training materials and the verbal training. Increasing health literacy strengthens the capacities and participation of patients, reduces the cost of physical therapy, as well as medication costs, and consequently increases efficiency in the use of health services.

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REFERENCES

- Katz JN, Arant KR, Loeser RF. Diagnosis and treatment of hip and knee osteoarthritis: A review. *JAMA* 2021;325:568-78. doi: 10.1001/jama.2020.22171.
- Bannuru RR, Osani MC, Vaysbrot EE, Arden NK, Bennell K, Bierma-Zeinstra SMA, et al. OARSI guidelines for the non-surgical management of knee, hip, and polyarticular osteoarthritis. *Osteoarthritis Cartilage* 2019;27:1578-89. doi: 10.1016/j.joca.2019.06.011.
- Sørensen K, Van den Broucke S, Fullam J, Doyle G, Pelikan J, Slonska Z, et al. Health literacy and public health: A systematic review and integration of definitions and models. *BMC Public Health* 2012;12:80. doi: 10.1186/1471-2458-12-80.
- Sadeghi S, Brooks D, Stagg-Peterson S, Goldstein R. Growing awareness of the importance of health literacy in individuals with COPD. *COPD* 2013;10:72-8. doi: 10.3109/15412555.2012.727919.
- Berkman ND, Sheridan SL, Donahue KE, Halpern DJ, Crotty K. Low health literacy and health outcomes: An updated systematic review. *Ann Intern Med* 2011;155:97-107. doi: 10.7326/0003-4819-155-2-201107190-00005.
- Howard DH, Gazmararian J, Parker RM. The impact of low health literacy on the medical costs of Medicare managed care enrollees. *Am J Med* 2005;118:371-7. doi: 10.1016/j.amjmed.2005.01.010.
- Baker DW, Parker RM, Williams MV, Clark WS. Health literacy and the risk of hospital admission. *J Gen Intern Med* 1998;13:791-8. doi: 10.1046/j.1525-1497.1998.00242.x.
- Altman RD. Criteria for classification of clinical osteoarthritis. *J Rheumatol Suppl* 1991;27:10-2.
- Tüzün EH, Eker L, Aytar A, Daşkapan A, Bayramoğlu M. Acceptability, reliability, validity and responsiveness of the Turkish version of WOMAC osteoarthritis index. *Osteoarthritis Cartilage* 2005;13:28-33. doi: 10.1016/j.joca.2004.10.010.
- Okyay P, Abacıgil F, Harlak H. Türkiye Sağlık Okuryazarlığı Ölçeği-32 (TSOY-32). Türkiye Sağlık Okuryazarlığı Ölçekleri Güvenilirlik ve Geçerlilik Çalışması. TC Sağlık Bakanlığı 2016. s. 43-61.
- Sørensen K, Pelikan JM, Röthlin F, Ganahl K, Slonska Z, Doyle G, et al. Health literacy in Europe: Comparative results of the European health literacy survey (HLS-EU). *Eur J Public Health* 2015;25:1053-8. doi: 10.1093/eurpub/ckv043.
- Cross M, Smith E, Hoy D, Nolte S, Ackerman I, Fransen M, et al. The global burden of hip and knee osteoarthritis: Estimates from the global burden of disease 2010 study. *Ann Rheum Dis* 2014;73:1323-30. doi: 10.1136/annrheumdis-2013-204763.
- Le Pen C, Reygrobelle C, Gérentes I. Financial cost of osteoarthritis in France. The "COART" France study. *Joint Bone Spine* 2005;72:567-70. doi: 10.1016/j.jbspin.2005.01.011.
- Palumbo R. Examining the impacts of health literacy on healthcare costs. An evidence synthesis. *Health Serv Manage Res* 2017;30:197-212. doi: 10.1177/0951484817733366.
- Gibney S, Doyle G. Self-rated health literacy is associated with exercise frequency among adults aged 50+ in Ireland. *Eur J Public Health* 2017;27:755-61. doi: 10.1093/eurpub/ckx028.
- Tanrıöver MD, Yıldırım HH, Ready FND, Çakır B, Akalın HE, editörler. Türkiye Sağlık Okuryazarlığı Araştırması. Ankara: Sağlık-Sen Yayınları; 2014. s. 17-21.

17. Losina E, Smith KC, Paltiel AD, Collins JE, Suter LG, Hunter DJ, et al. Cost-effectiveness of diet and exercise for overweight and obese patients with knee osteoarthritis. *Arthritis Care Res (Hoboken)* 2019;71:855-64. doi: 10.1002/acr.23716.
18. Wolf MS, Gazmararian JA, Baker DW. Health literacy and health risk behaviors among older adults. *Am J Prev Med* 2007;32:19-24. doi: 10.1016/j.amepre.2006.08.024.
19. Suka M, Odajima T, Okamoto M, Sumitani M, Igarashi A, Ishikawa H, et al. Relationship between health literacy, health information access, health behavior, and health status in Japanese people. *Patient Educ Couns* 2015;98:660-8. doi: 10.1016/j.pec.2015.02.013.
20. Rasu RS, Bawa WA, Suminski R, Snella K, Warady B. Health literacy impact on national healthcare utilization and expenditure. *Int J Health Policy Manag* 2015;4:747-55. doi: 10.15171/ijhpm.2015.151.
21. Gordon MM, Hampson R, Capell HA, Madhok R. Illiteracy in rheumatoid arthritis patients as determined by the Rapid Estimate of Adult Literacy in Medicine (REALM) score. *Rheumatology (Oxford)* 2002;41:750-4. doi: 10.1093/rheumatology/41.7.750.
22. Glassman SD, Carreon LY, Brown ME, Jones JS, Edward J, Li J, et al. The impact of health literacy on health status and resource utilization in lumbar degenerative disease. *Spine J* 2019;19:711-6. doi: 10.1016/j.spinee.2018.10.012.
23. MacLeod S, Musich S, Gulyas S, Cheng Y, Tkatch R, Cempellin D, et al. The impact of inadequate health literacy on patient satisfaction, healthcare utilization, and expenditures among older adults. *Geriatr Nurs* 2017;38:334-41. doi: 10.1016/j.gerinurse.2016.12.003.
24. Baker DW, Gazmararian JA, Williams MV, Scott T, Parker RM, Green D, et al. Functional health literacy and the risk of hospital admission among Medicare managed care enrollees. *Am J Public Health* 2002;92:1278-83. doi: 10.2105/ajph.92.8.1278.
25. Davis TC, Michielutte R, Askov EN, Williams MV, Weiss BD. Practical assessment of adult literacy in health care. *Health Educ Behav* 1998;25:613-24. doi: 10.1177/109019819802500508.
26. Kuipers JG, Koller M, Zeman F, Müller K, Rüffer JU. Adherence and health literacy as related to outcome of patients treated for rheumatoid arthritis: Analyses of a large-scale observational study. *Z Rheumatol* 2019;78:74-81. doi: 10.1007/s00393-018-0449-y.
27. Adams J, Ballinger C, Lowe W, Rowley C, Lueddeke J, Armstrong R, et al. The personal impact of lower levels of health literacy on living with a musculoskeletal disease: A qualitative interview study. *Rheumatology* 2016;55 Supplement 1:i8-9. doi: 10.1093/rheumatology/kew096.004.
28. Lacey RJ, Campbell P, Lewis M, Protheroe J. The impact of inadequate health literacy in a population with musculoskeletal pain. *Health Lit Res Pract* 2018;2:e215-20. doi: 10.3928/24748307-20181101-01.
29. Köppen PJ, Dorner TE, Stein KV, Simon J, Crevenna R. Health literacy, pain intensity and pain perception in patients with chronic pain. *Wien Klin Wochenschr* 2018;130:23-30. doi: 10.1007/s00508-017-1309-5.
30. Loke YK, Hinz I, Wang X, Rowlands G, Scott D, Salter C. Impact of health literacy in patients with chronic musculoskeletal disease--systematic review. *PLoS One* 2012;7:e40210. doi: 10.1371/journal.pone.0040210.
31. Yu H, Huang T, Lu WW, Tong L, Chen D. Osteoarthritis pain. *Int J Mol Sci* 2022;23:4642. doi: 10.3390/ijms23094642.
32. Keefe FJ, Caldwell DS, Baucom D, Salley A, Robinson E, Timmons K, et al. Spouse-assisted coping skills training in the management of knee pain in osteoarthritis: Long-term followup results. *Arthritis Care Res* 1999;12:101-11. doi: 10.1002/1529-0131(199904)12:2<101::aid-art5>3.0.co;2-9.