Original Article

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Cancer Patients' Knowledge of Exercise in Cancer: A Cross-sectional Study

Kanser Hastalarının Kanserde Egzersiz Bilgisi: Kesitsel Çalışma

Ahsen OĞUL[1], Sabriye ERCAN[2]

[1]University of Health Sciences Turkey Gazi Yaşargil Training and Research Hospital Clinic of Sports Medicine, Diyarbakır, Turkey
[2]Süleyman Demirel University Faculty of Medicine, Department of Sports Medicine, Isparta, Turkey

ABSTRACT

Objective: Exercise is effective in reducing the risk of cancer, and treatment side effects. However, our empirical observations indicate that patients diagnosed with cancer have poor knowledge of exercise in cancer. This study aimed to evaluate cancer patients' knowledge of exercise in cancer.

Methods: After a review of the literature, the researchers developed a questionnaire aimed at evaluating knowledge of exercise in cancer. The study included patients with a history of cancer aged ≥18 years. The participants were asked to respond to each item in the electronic survey by selecting "I had no idea", "I have heard of it", or "I know very well".

Results: The study included a total of 125 participants with a history of cancer (75 females, 60%; 50 males, 40%), and their mean age was 52.05±11.50 years. We determined the validity and reliability of the questionnaire before analyzing participants' knowledge of exercise in cancer. Bartlett's test of sphericity and the Kaiser-Meyer-Olkin measure indicated that the data were appropriate for factor analysis ($p<0.001$). Factor analysis confirmed the structural validity of the questionnaire. Cronbach's alpha was calculated as 0.963, implying reliable internal consistency. Subsequently, we analyzed participants' answers to the questionnaire and observed that the response rate of "I know very well" ranged between 3.2% and 14.4% for different items.

Conclusion: We prepared and validated a tool for the measurement of knowledge exercise in cancer. Accordingly, we conclude that cancer patients have inadequate knowledge of exercise in cancer.

ÖZ

Amaç: Egzersizin kanser riskini ve kanser tedavilerinin yan etkisini azaltmakta faydalı olduğu bilinmektedir. Ancak, kanser tanısı almış bireylerin kanserde egzersiz konusundaki bilgilerinin düşük olduğu ampirik gözlemlerimiz arasındadır. Bu çalışma ile kanser hastalarının kanserde egzersiz konusundaki bilgilerinin değerlendirilmesi amaçlanmıştır.

Yöntemler: Araştırmacılar tarafından literatür taraması yapılarak kanserde egzersiz bilgisini değerlendirmeyi amaçlayan bir anket formu (ölçüm aracı) oluşturulmuştur. Özgeçmişinde kanser tanısı bulunup 18 yaş üzeri olan hastalar çalışmaya dahil edilmiştir. Araştırmacılar tarafından hazırlanan ölçüm aracındaki her bir maddeye, elektronik anket aracılığı ile "hiçbir fikrim yok", "duymuştum" ya da "çok iyi biliyorum" yanıtlarından birisinin verilmesi istenmiştir.

Bulgular: Çalışmaya özgeçmişinde kanser tanısı olan 125 birey katılmıştır. Çalışmaya katılan bireylerin %60'ının (n=75) kadın, %40'ının (n=50) erkek olduğu ve katılımcıların yaş ortalamalarının 52,05±11,50 yıl olduğu saptanmıştır. Çalışmaya katılan bireylerin bilgi düzeyini değerlendirmeden önce araştırmacılar tarafından hazırlanan ölçüm aracının geçerlilik ve güvenirlilik analizleri yapılmıştır. Kaiser-Meyer-Olkin ölçüm değeri ve Bartlett küresellik test sonuçlarına göre ölçüm aracının faktör analizi yapmaya uygun olduğu belirlenmiştir ($p<0,001$). Faktör analizi sonucunda ölçüm aracının yapı geçerliliğinin sağlandığı gösterilmiştir. Cronbach alfa kat sayısı 0,963 olarak hesaplanan ölçüm aracının güvenilir olduğu saptanmıştır. Ölçüm aracının geçerlilik ve güvenirlilik sağladığı gösterildikten sonra ölçüm aracına verilen cevaplar incelendiğinde

Address for Correspondence: Ahsen OĞUL, University of Health Sciences Turkey Gazi Yaşargil Training and Research Hospital Clinic of Sports Medicine, Diyarbakır, Turkey
E-mail: ahsenogul91@gmail.com **ORCID ID:** orcid.org/0000-0001-7379-0750

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The developed questionnaire can contribute to assess and improve knowledge of exercise among cancer patients.

Keywords: Cancer, exercise, knowledge

ölçüm aracındaki maddelere "çok iyi biliyorum" cevabının verilme oranının %3,2 ile %14,4 arasında değiştiği gösterilmiştir.

Sonuç: Araştırmacılar tarafından hazırlanıp geçerliliği ve güvenilirliği sağlanmış olan bu ölçüm aracına verilen cevaplar göz önüne alındığında kanser hastaların kanserde egzersiz bilgisi düzeyleri düşük bulunmuştur. Hazırlanan bu ölçüm aracı, kanser hastaların kanserde egzersiz bilgi düzeylerinin değerlendirilmesine, eksikliklerin saptanmasına ve bu doğrultuda bilgi düzeylerinin artırılmasına katkıda bulunulabilir.

Anahtar Sözcükler: Kanser, egzersiz, bilgi

Introduction

Cancer is a leading cause of morbidity and mortality around the world. World Health Organization (WHO) data indicated that 18.1 million people were diagnosed as having cancer in 2018, 30-50% of which were preventable (1). Accordingly, WHO invited all member states to pursue high-level efforts to encourage measures such as healthy eating, increased physical activity, reduced alcohol and cigarette consumption, and vaccination. A 2020 report by WHO indicated that the world was likely to see a 60% increase in cancer cases over the next 20 years if current trends continued (2).

Significant progress was made in exercise and oncology research within the last two decades (3). Regular exercise has been shown to reduce the incidence of many types of cancer, especially breast and colorectal cancers (4). Again, exercise has been associated with a substantial decline in recurrence and mortality in many types of cancer (5). Physical activity reduces life-long endogenous estrogen exposure and increases sex hormone-binding globulin levels (6). Reduced estrogen and increased physical activity help to achieve long-term energy balance and to reduce central adiposity. Decreased estrogen, adiposity, and glucose and increased insulin sensitivity contribute to the improvement of metabolic profile (6). Exercise decreases insulin-like growth factor-1, which is known to increase cancer cell division in breast, prostate, lung, and colorectal cancers, and PGE2, which stimulates cell proliferation in colon cancer (7). Moreover, exercise mediates the reduction of C-reactive protein, improves circulating granulocyte ratio and monocyte function, and contributes to immune function by increasing the cytotoxic activity of natural killer cells and thymidine uptake by lymphocytes (8,9). These physiological contributions translate into reduced cancer recurrence and mortality.

Cancer treatment is associated with weight loss, decreased muscle mass, loss of physical function, and decreased quality of life. Decreased aerobic capacity, fatigue, and depressive symptoms are common during cancer treatment (5). Exercise is a safe and cost-effective tool to prevent or alleviate numerous secondary complications associated with cancer treatment, and to improve quality of life for cancer survivors (10). The most common side effect of cancer treatment is fatigue (4). Loss of muscle mass, anemia, increased cytokine levels, depression, and anxiety cause fatigue. Regular exercise improves physical function and increases aerobic capacity and muscle and bone masses, and is also associated with improved immune function and psychosocial well-being, all of which help to reduce fatigue symptoms (4). Aerobic exercises increase cardiopulmonary capacity, increase hemoglobin concentration, accelerate angiogenesis, increase capillary surface area and improve the oxidative capacity of muscles and adenosine triphosphate resynthesis, contributing to the regulation of physiological functions (11). Resistance exercises increase muscle glucose uptake by increasing muscle and bone masses and thus help to correct hyperinsulinemia and to improve insulin sensitivity (11). In addition, regular exercise improves pain, nausea, vomiting, diarrhea, and insomnia (4). Given these benefits, exercise is a prominent component of cancer rehabilitation (5).

Unfortunately, research has shown that doctors, nurses and other health professionals do not routinely inform patients about exercise programs, which results in poor patient knowledge and limited participation in exercise (12). This study aimed to evaluate cancer patients' knowledge of exercise in cancer.

Methods

This study was granted ethical approval by the local ethics committee (date: 05/03/2021 decision no: 700).

Sample: We invited cancer patients who were members of relevant Turkish non-governmental organizations. The study included patients with a history of cancer who were aged ≥18 years on a voluntary basis. One hundred twenty five participants diagnosed as having cancer (regardless of cancer type) were included in the study. Participants completed the questionnaire prepared by the researchers online (Google Forms).

Measurement Tool: After reviewing the literature (13), the researchers developed a 25-item questionnaire aimed at evaluating knowledge of exercise in cancer. The participants were asked to respond to each item in the electronic survey by selecting "I have no idea", "I have heard of it", or "I know very well".

A pilot study was conducted with healthy individuals to confirm the clarity and utility of the questionnaire, followed by the main study conducted with the target population, i.e., patients diagnosed as having cancer. The sample size was calculated as five participants per item, that is 125 participants.

Statistical Analysis

Sociodemographic data were analyzed using descriptive statistics and frequencies. The validity and reliability of the questionnaire, prepared in line with the literature, were confirmed using SPSS version 23. The suitability of the measurement tool for factor analysis was analyzed with Kaiser-Meyer-Olkin and the Barlett sphericity tests. Cronbach's alpha coefficient was used to evaluate the reliability of the measurement tool. The results were presented as frequencies, percentages, and mean ± standard deviation.

Results

There was a total of 125 participants (75 females, 60%; 50 males, 40%). The mean age was 52.05±11.50 years. Among the participants, 65.6% had completed primary education, 19.2% secondary education, and 15.2% post-secondary education and above. Of the participants 54.4% were in active treatment, 38.4% completed treatment and were on follow-up, and 7.2% received a new diagnosis but were not started treatment.

Cancer diagnoses included breast cancer (41.6%), colorectal cancer (10.4%), stomach cancer (9.6%), female genital system cancer (8.8%), male genital system cancer (6.4%), lung cancer (6.4%), and other (16.8%). The mean time since cancer diagnosis was 49.50±1.89 months.

We determined the validity and reliability of the Knowledge of Exercise in Cancer Questionnaire before analyzing participants' knowledge of exercise in cancer. Kaiser-Meyer-Olkin test (0.877) and Bartlett test of sphericity (3034.55, $p<0.001$) verified the questionnaire's adequacy for factor analysis. The suitability of the items for performing a factor analysis was tested using an anti-image correlation matrix (minimum 0.812 and maximum 0.930). Factor loadings of the items were between 0.504 and 0.857. These results confirmed the structural validity of the questionnaire. The scree test for the plot of eigenvalues showed the questionnaire to be unidimensional with an eigenvalue greater than 1.0. The eigenvalue of the single factor structure was 13.363, and the variance ratio was 53.45%. Cronbach's alpha was calculated as 0.963, implying reliable internal consistency. None of the items if deleted would increase Cronbach's alpha more than 5%. These results indicated excellent reliability. According to results concerning the significance of the difference between the upper and lower 27% of the total scores, all t-values were positive and significant ($p<0.05$). Table 1 presents the results of our study, and responses to each item are indicated as percentages (%).

We analyzed participants' responses to the Knowledge of Exercise in Cancer Questionnaire and observed that the response rate of "I know very well" ranged between 3.2 and 14.4% for different items. This finding suggested that cancer patients had inadequate knowledge of exercise in cancer.

Discussion

We found that the questionnaire prepared in this study was valid and reliable in determining cancer patients' knowledge of exercise in cancer, and our results suggested that cancer patients' knowledge of exercise in cancer needed improvement.

As part of cancer treatment, exercise reduces treatment-related side effects, improves psychosocial status (14), and reduces risk of recurrence and mortality through various mechanisms (5). Due to increasing patients' life expectancy and quality of life, exercise should be a routine part of cancer treatment and rehabilitation. The first step to integrating exercise into daily life is to develop knowledge of exercise (15). Studies have shown that according to the planned behavior theory, exercise adherence is primarily associated with intention (15,16). To create an intention for physical activity, one must increase patients' knowledge of exercise. After setting a positive intention, subsequent steps include creating a positive attitude and establishing and maintaining exercise behavior (15,16). To achieve progress when following these steps, it is necessary to determine patients' knowledge of exercise and to fill any gaps.

Exercise should be integrated into cancer care early on (17). Knowledge of exercise is the first of many factors that influence exercise adherence during cancer treatment. Ormel et al. (18) reported that predictors of adherence to exercise interventions during cancer treatment included the location of exercise facilities, history of exercising, motivation for exercise, and exercise limitations, and that predictors of adherence after treatment included less extensive surgery, low alcohol consumption, history of exercising, family support, feedback by medical staff, and knowledge and skills of exercise. Rogers et al. (19) demonstrated that most women with breast cancer did not have knowledge of exercise in cancer treatment. The majority of the participants had not been previously informed by their physicians, and most noted that the exercise intervention was more beneficial than harmful (especially in terms of reducing fatigue and improving quality of life). Moreover, half of the participants requested that training and guidance be provided about exercise programs by educated medical staff. Similarly, one study divided 26 patients with breast cancer into two groups: standard treatment, and standard treatment + exercise intervention (8 sessions of aerobic exercise, and at-home strength training) (20). The intervention group had significantly higher exercise levels after the intervention compared to the control group ($p=0.003$). In our study, the response rate of "I know very well" ranged between 3.2% and 14.4% for items concerning exercise knowledge. This finding is consistent with the literature. Assessing the relevant predisposing factors and increasing patients' knowledge of exercise as a first step to introducing exercise to cancer care are important to improve the overall well-being of patients.

A review of the literature revealed a few studies on the reasons behind the lack of exercise knowledge among cancer patients. For instance, Nadler et al. (12) surveyed 120 oncology care providers and found that 80% were not aware of any exercise guidelines. Moreover, oncology care providers had insufficient knowledge on when, how, and which patients to refer to exercise programs. Oncology care providers' barriers to providing information on exercise included poor knowledge, lack of time, and safety concerns. Most participating oncology care providers stated that

Table 1. Answers to the knowledge of exercise in cancer questionnaire

	I have no idea (%)	I have heard of it (%)	I know very well (%)
1. Individuals diagnosed as having cancer should practice moderate aerobic physical activity for at least 150 minutes per week, or alternatively 75 minutes of high-intensity exercise.	62.4	28.8	8.8
2. Individuals diagnosed as having cancer should perform strength training exercises 2-3 days per week.	61.6	32	6.4
3. Individuals diagnosed as having cancer should perform stretching exercises to improve muscle flexibility.	63.2	28.8	8
4. Not all patients diagnosed with cancer need to undergo testing before starting exercise.	72	24.8	3.2
5. Testing is not required before light exercises, including walking, stretching, and low-weight strength training.	70.4	20.8	8.8
6. Some testing may be required before starting moderate-to-high or high-intensity exercise programs.	69.6	20	10.4
7. Morbidly obese patients diagnosed as having cancer may require additional medical assessment before starting an exercise program for safety.	64	24	12
8. Patients who have received hormone therapy or whose cancer has spread to bones (bone metastasis) or who have developed cardiac insufficiency due to treatment side effects need to undergo medical assessment before starting exercise programs.	66.4	24.8	8.8
9. In some types of cancer, the arm-forearm area, calf-thigh area, or muscle strength must be evaluated before starting an exercise program.	71.2	18.4	10.4
10. Patients undergoing surgery to treat cancer should return to exercise as soon as the wound heals, and patients receiving other non-surgical treatments should return to exercise as early as possible.	72.8	20	7.2
11. Patients with excessive fatigue, anemia, or unstable gait/dizziness (ataxia) should take a break from/stop exercising.	68	24	8
12. Patients with ostomies (where the intestine is rerouted to a stoma) must avoid sports where they may receive blows (football, basketball, taekwondo, etc.).	68.8	18.4	12.8
13. Patients who have received hormone therapy or whose cancer has spread to bones (bone metastasis) are at risk of bone fracture during exercise.	68	19.2	12.8
14. There is a risk of infection during exercise while receiving chemo-/radiotherapy or when the immune system is compromised.	68.8	18.4	12.8
15. Patients diagnosed as having cancer with swollen arms or legs (lymphedema) should refrain from exercising arms/forearms or calves/thighs.	69.6	20.8	9.6
16. Patients with ostomies (where the intestine is rerouted to a stoma) should stop exercising if they develop a hernia during exercise, or ostomy-related infections.	72.8	16	11.2
17. Not all patients diagnosed as having cancer need to exercise under supervision.	80	11.2	8.8
18. Patients whose cancer has spread to bones (bone metastasis) or who have developed cardiac insufficiency due to treatment side effects must exercise under supervision.	72.8	13.6	13.6
19. Patients with swollen arms or legs (lymphedema) can prevent this complication by wearing tight-fitting clothing.	73.6	20	6.4
20. Weights should be increased gradually during strength exercises.	72.8	15.2	12
21. If a patient who does strength exercises takes a 2-week break from exercise and wants to go back to exercising, they should do so starting with lighter weights.	72	13.6	14.4
22. Patients with ostomies (where the intestine is rerouted to a stoma) should refrain from increasing abdominal pressure by performing the Valsalva maneuver (forceful attempted exhalation against a closed airway) during strength exercises.	73.6	18.4	8
23. Patients who underwent major surgery for prostate cancer (radical prostatectomy) should exercise their pelvic floor muscles.	80	11.2	8.8
24. In cancer patients who have received a bone marrow transplant, high-intensity exercise can negatively affect the immune system.	73.6	14.4	12
25. Patients with inflammation of nerve endings (peripheral neuropathy) should ride bicycles instead of walking.	77.6	11.2	11.2

it would be beneficial to organize training sessions to increase their knowledge on the subject, and to have an exercise specialist in the clinical team (12). A different survey of 66 patients with cancer and 18 oncologists investigated awareness on the need for structured exercise programs during and after cancer treatment (21). This study found that patients would prefer to meet with an exercise specialist to arrange an exercise program while taking into account their medical and exercise history. On the other hand, oncologists noted that they did not have enough time to provide information about exercise in their outpatient clinics (21). These studies suggest that an important factor limiting patients' knowledge of exercise is the insufficient knowledge and time of doctors and other medical personnel that are involved in their treatment.

A report titled "Moving guidelines into action" by Tomasone et al. (10) discussed basic barriers to exercising among cancer patients, and potential solutions. The report indicated that knowledge gaps on both the patient's and the physician's side, and lack of awareness and provider knowledge presented barriers to exercise. Accordingly, they argued that it was imperative to raise awareness on exercise in cancer and the relevant guidelines among physicians and other medical staff by scheduling discussions, and also among patients via training classes, developing various patient education resources (e.g. brochures, promotional videos, etc.), and creating a patient manual (10). This report emphasized the importance of including exercise recommendations or prescriptions as part of cancer treatment and that it was crucial to increase patient awareness and facilitate access to local exercise programs (including creating a database of existing programs) and establish a process for referral to these programs (10).

The current consensus is that physical activity and exercise should be an integral and continuous part of cancer care, both during and after treatment. Strong evidence suggests that physical activity and exercise should be encouraged among patients of all types of cancer (including advanced-stage cancers) before, during, and after receiving cancer treatment (22). The American College of Sports Medicine recommends avoiding sedentariness as much as possible during cancer treatment, and to practice aerobic exercise (including walking, biking, swimming, and dancing) 150 minutes per week, progressive resistance exercises for 20-30 minutes 2-3 days a week, and flexibility exercises most days of the week (23). Therefore, it is urgent to improve knowledge in order to increase patient well-being. On the other hand, there is a need for a measurement tool that measures knowledge of exercises in cancer and what to do in any potential adverse event during exercise (17). Statistical assessment indicated that the Knowledge of Exercise in Cancer Questionnaire was appropriate for factor analysis (Kaiser-Meyer-Olkin test 0.877, Bartlett's sphericity test 3034.55), and subsequent analyses demonstrated the questionnaire to be structurally valid. The questionnaire had excellent reliability (Cronbach's alpha 0.963). In reference to our results and the literature, we believe that this tool can also be used in different sample groups to measure knowledge of exercise in cancer among cancer patients.

Conclusion

We conclude that cancer patients have inadequate knowledge of exercise in cancer. We confirmed the reliability and validity of the Knowledge of Exercise in Cancer Questionnaire. The developed questionnaire can contribute to assess and improve knowledge of exercise and to create awareness among cancer patients in the clinical setting.

Ethics

Ethics Committee Approval: University of Health Sciences Turkey Gazi Yaşargil Training and Research Hospital Clinical Research Ethics Committee (number: 700/date: 05.03.2021).

Informed Consent: The patients were informed about the questionnaire and their consent was obtained.

Peer-review: Externally peer reviewed.

Authorship Contributions

Concept: A.O., S.E., Design: A.O., S.E., Data Collection or Processing: A.O., Analysis or Interpretation: S.E., Literature Search: A.O., S.E.,S.E., Writing: A.O.

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

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