Fatigue in cancer patients is one of the most frequent symptoms present irrespectively of the kind of malignant tumor, its localization, stage and/or treatment modality. One of the most often used definition of fatigue emphasizes a disturbing, persistent, subjective feeling of physical, emotional and/or cognitive fatigue, or tiredness, connected with the carcinoma and/or its therapy, that is not proportional with the patients’ activities and therefore impairs their daily functioning. The study has been undertaken with the aim of determining the levels of fatigue in cancer patients during radiotherapy.

Material and Method. The study was conducted as a cross-sectional study, by interviewing 80 hospitalized patients at the Institute for Oncology of Vojvodina in Sremska Kamenica, Clinic for Radiotherapy. Perform Questionnaire with 12 item describing fatigue over the previous two weeks was used as a study instrument. For the statistical analysis of data we used method of descriptive statistics and inferential statistics. Statistical significance was determined at the level of \( p < 0.05 \).

Results. The highest average values of the general Perform questionnaire score were recorded in the patients diagnosed with the central nervous system carcinoma \([38.9 ± 14.6]\), while the lowest were recorded in the group of patients with prostate cancer \([17.0 ± 4.6]\). Simultaneous administration of radiotherapy and chemotherapy leads to major limitations of physical performance, daily life activities and patient attitudes.

Conclusion. All participants included in this study experienced fatigue, although it differed in separate domains, as well as by the type of therapy, primary diagnosis and intensity over the previous two weeks; however, it was present at the moment of estimation.

Key words: Self-Assessment; Fatigue; Neoplasms; Activities of Daily Living; Signs and Symptoms; Surveys and Questionnaires

Sažetak

Uvod. Umor kod onkoloških bolesnika jedan je od najčešćih simptoma prisutan nezavisno od vrste malignog tumora, lokalizacije i stadijuma i/ili medicinskih modaliteta lečenja. Jedna od najčešće korišćenih definicija umora naglašava uznemirujući, perishentni, subjektivni osećaj fizičkog, emocionalnog i/ili kognitivnog umora, odnosno iscrpljenosti, povezanog sa kancerom i/ili terapijom karcinoma, koji nije srazmeran s bolesnikovim aktivnostima te ometa svakodnevno funkcionisanje. Studija je sprovedena sa ciljem utvrđivanja nivoa umora kod onkoloških pacijenata tokom radioterapije.

Materijal i metode. Ispitivanje je sprovedeno kao studija preseka, anketiranjem 80 hospitalizovanih pacijenata na Klinici za radioterapiju Institut za onkologiju Vojvodine u Sremskoj Kamenici. Za utvrđivanje umora korišćen je Perform Questionnaire – Perform upitnik koji se sastoji od 12 stavki na osnovu kojih se procenjuje umor u protekle dve nedelje. Za statističku obradu podataka primenjene su metode deskriptivne i inferencijalne statistike, a statistička značajnost određivana je na nivou \( p < 0.05 \).

Rezultati. Najviše procesne vrednosti ukupnog skora upitnika Perform ima su pacijenti sa dijagnozom tumora centralnog nervnog sistema \((38.9 ± 14.6)\), dok su najniže vrednosti zabeležene u grupi pacijenata sa dijagnozom karcinoma prostate \((17.0 ± 4.6)\). Istovremena primena radioterapije i hemoterapije dovodi do većih ograničenja u domenima fizičkih performansi, aktivnostima dnevnog života i stavovima pacijenata.

Zaključak. Umor kod onkoloških pacijenata obuhvaćenih ovim istraživanjem razlikovao se u različitim domenima, prema vrsti terapije, primarnoj dijagnozi, intenzitetu i prisustvima tokom poslednje dve nedelje ali u trenutku procene bio je prisutan kod svih ispitanika.

Ključne reči: samoprocena; umor; neoplazme; aktivnosti svakodnevnog života; znaci i simptomi; istraživanja i upitnici

Summary

Introduction. Fatigue in cancer patients is one of the most frequent symptoms present irrespectively of the kind of malignant tumor, its localization, stage and/or treatment modality. One of the most often used definition of fatigue emphasizes a disturbing, persistent, subjective feeling of physical, emotional and/or cognitive fatigue, or tiredness, connected with the carcinoma and/or its therapy, that is not proportional with the patients’ activities and therefore impairs their daily functioning. The study has been undertaken with the aim of determining the levels of fatigue in cancer patients during radiotherapy.

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Conclusion. All participants included in this study experienced fatigue, although it differed in separate domains, as well as by the type of therapy, primary diagnosis and intensity over the previous two weeks; however, it was present at the moment of estimation.

Key words: Self-Assessment; Fatigue; Neoplasms; Activities of Daily Living; Signs and Symptoms; Surveys and Questionnaires

Fatigue in cancer patients has many definitions. In professional literature the most often used definition indicates an unsettling, persistent, subjective feeling of physical, emotional and/or cognitive fatigue or exhaustion associated with the basic illness and/or therapy but disproportionate to the patient’s activities so it hinders the patient’s everyday activities [1]. The basic characteristics of fatigue in cancer patients are the lack of energy followed by exhaustion and weakness. The difficulties in defining fatigue of those diagnosed with and being treated for a malignant disease arise from a complex, multifactorial etiology of fatigue. The causes and mechanisms can be connected with the basic underlying disease and/or medical modalities of treatment, but also with potential genetic predispositions and following physical and/or mental illnesses, behavioral and environmental factors [2-6]. Because of this a wide spectrum of causes and influences – somatic affective, cognitive and psychosocial, which are often indistinguishable, equally contribute to fatigue.

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It is not just that fatigue is dominantly present irrespective of the type of malignant tumor, but it is also present as a side effect of all forms of medical treatment modalities, including bone marrow transplantation and stem cell treatment, hormonal and biological therapy and not just radiotherapy and chemotherapy. Research has shown that fatigue is present in most patients regardless of different origin, localization, stages and consequences of malignant disease and/or consequences of treatment. Data from literature point out that fatigue is one of the symptoms in the population of those suffering from and being treated for carcinoma with the greatest negative effect on daily life [2, 4].

Results of studies have shown that fatigue is present in 50% of patients suffering from cancer at the moment of diagnosis and that 80% of the patients feel fatigue during at least half of their treatment regardless of treatment modality. In patients having metastasis at the time of diagnosis, fatigue incidence grows to 75% [7]. Different data from the available literature about fatigue prevalence in cancer patients can be explained by differences in methodological approaches to measuring fatigue. Healthcare workers are recommended to approach patients directly when identifying and assessing fatigue, which should be done regularly during treatment [1]. Fatigue incidence is often measured by self-report questionnaires. Those that contain items about different dimensions of fatigue (somatic, affective, cognitive) are considered the “golden standard” [8]. This study was performed in order to determine the level of fatigue in cancer patients during radiotherapy.

Material and Methods

We performed a cross-sectional study at the Clinic for Radiotherapy, Institute for Oncology of Vojvodina in Sremska Kamenica during July 2018. All patients hospitalized for planned radiotherapy were included in the survey. The total study sample consisted of 80 patients who signed the written consent form (N=80), thus confirming their wish to participate in this study. The Perform questionnaire was used as the study instrument. The questionnaire is a short scale consisting of 12 items created for the purpose of evaluating fatigue over the previous two weeks in cancer patients. The psychometric characteristics of items included in this questionnaire are indicative of good feasibility, good reliability of testing, internal consistency, convergent validity and sensitivity to changes [9]. The participants can answer every item by choosing an option on a five point Likert scale (never, sometimes, often, mostly and always). The items are distributed into three domains: physical limitations (PHL), daily life activities (ADL) and attitudes/beliefs toward fatigue (AB). The maximal score of this questionnaire is 60, ranging from 1–12 no fatigue; 13–24 sometimes feels fatigue; 25–36 often feels fatigue; 37–48 mostly feels fatigue; 49–60 maximal fatigue always present. Sub scores for three dimensions range from 4 to 20, where high scores indicate the presence of fatigue.

For the statistical analysis of data we used method of descriptive statistics and inferential statistics. Statistical significance was determined at the level of p<.05.

Results

Table 1 shows that 52 participants (65%) were women, 49 patients (61.2%) were over 60 years of age, 51 patients (63.8%) were retired and 49 patients (61.2%) had secondary education.

Student’s t-test was used to determine the socio-demographic differences in fatigue. The average score values in all scale domains (PHL, ADL, AB) were higher in the participants with grade school level education. Statistically significant differences in scores with regards to education were found in the PHL do-

| Table 1. Demographic characteristics of participants |
|-----------------------------------------------|
| Gender/Pol | n (%) |
| Male/Muški | 28 (35) |
| Female/Zenski | 52 (65) |
| Age group/Starosno doba | n (%)
| 41-60 years/godina | 31 (38.8) |
| Over 60 years/Preko 60 godina | 49 (61.2) |
| Education level/Nivo obrazovanja | n (%) |
| Grade school/Osnovna škola | 29 (36.3) |
| High school/Srednja škola | 49 (61.2) |
| University degree/Viša/visoka škola | 2 (2.5) |
| Employment/Zanimanje | n (%) |
| Employed/Zaposlen | 16 (20) |
| Unemployed/Nezaposlen | 13 (16.3) |
| Retired/Penzioner | 51 (63.8) |
main (t=2.68; p<0.00) and in the general score (t=2.00; p=0.04). There was no statistical difference in scores with regards to other measured socio-demographic characteristics of the sample.

Table 2 shows that most of the participants had a confirmed diagnosis of carcinoma of the head and neck, 21 patients (26.3%) had carcinoma of the oral cavity and 14 patients (17.5%) had carcinoma of the central nervous system. Almost one third of the patients had a confirmed diagnosis of breast cancer 23 (28.8%), and 11 patients (13.8%) were diagnosed with a gynecological carcinoma or prostate cancer.

As for the modality of treatment more than a half of participants (43 (53.7%)) were treated by a combined radiotherapy and chemotherapy protocol and the rest, i.e. 37 patients (46.3%) received only radiotherapy. Average values of scores in all domains (PHL, ADL, AB) were significantly higher in the participants who had undergone both radiotherapy and chemotherapy. There was a statistically significant difference in the score level between treatment modalities in all measured domains PHL (t=5.30; p<0.00), ADL (t=5.77; p<0.00), AB (t=5.57; p<0.00), as well as in the Perform general score (t=6.39; p<0.00) (Table 3).

The data analysis has shown that the average score values in all Perform domains (PHL, ADL, AB) were significantly higher in the participants diagnosed with carcinoma of the central nervous system. The lowest average values were recorded in the participants with breast and prostate cancers. A statistically significant difference was detected in the domain of physical functioning PHL (F=7.55; p<0.001), in the domain of ADL

Table 4. Total average score of the Perform questionnaire by domains: differences between diagnostic categories

| Domain questionnaires Perform | Distribution of patients by diagnosis | Therapy/Terapija |
|------------------------------|--------------------------------------|------------------|
|                              |                                      | RT (n=37) | RT+HT (n=43) |
|                              |                                      | Mean±SD   | Mean±SD     |
| Physical limitations/Fizička ograničenja | 5.6±1.5 | 9.7±4.4 | 5.3  0.00  |
| Daily life activities/Aktivnosti dnevnog života | 6.8±2.4 | 10.7±3.5 | 5.7  0.00  |
| Attitudes and beliefs/Stavovi i verovanja | 6.2±3.3 | 11.5±4.9 | 5.5  0.00  |
| Total/Ukupno                | 18.6±6.0 | 31.8±11.2 | 6.4  0.00  |

RT – Radiotherapy/Radioterapija, RT+HT – radiotherapy and chemotherapy/Radioterapija i hemioterapija

Table 4. Total average score of the Perform questionnaire by domains: differences between diagnostic categories

| Domain questionnaires Perform | Distribution of patients by diagnosis | Therapy/Terapija |
|------------------------------|--------------------------------------|------------------|
|                               |                                      | RT (n=37) | RT+HT (n=43) |
|                               |                                      | Mean±SD   | Mean±SD     |
| PHL*                         | 5.7±1.4 | 5.0±1.3 | 8.9±3.1 | 10.9±6.3 | 8.5±2.9 | 7.5  0.00  |
| ADL*                         | 6.7±2.1 | 6.0±1.5 | 10.1±2.8 | 12.2±4.5 | 9.6±2.7 | 11.7  0.00 |
| AB*                          | 5.7±1.8 | 5.8±2.8 | 10.2±3.7 | 15.8±5.4 | 8.7±2.8 | 21.9  0.00 |
| Total/ukupno                 | 18.1±4.4 | 17.0±4.6 | 29.3±8.1 | 38.9±14.6 | 26.8±5.6 | 18.0  0.00 |

PHL/FD – Domain of physical limitations/Domen fizičkog ograničenja; ADL/ADŽ – Domain of activities of daily life/Domen aktivnosti dnevnog života; AB/VS – Domain of attitudes and beliefs toward fatigue/Domen stavovi i verovanja
activity can range from temporary disability in the
the negative effects of fatigue in the domain of physical
Depending on the severity of the underlying diseases
metabolism and in the process of muscle activation [3].
creased physical performance result from changes in
diminishes the ability of cancer patients to perform
cancer patients; however, fatigue-related symptoms are
symptoms such as pain, sleeping disorders, lack of ap
do not feel refreshed after rest or sleep [14]. Numerous
the study also state the fact that unlike fatigue and
patients include the feeling of exhaustion and lack of
domain of physical functioning mostly cited by the
significance between fatigue and age, as
average values of all domain scores and the gen
inadequate dealing with everyday life and social with-
drawal up to inability to do ones job and earn for a
living that leads to economic difficulties for the patient
and additional economic burden for the whole society
[8, 12]. In our study, differences in the patient’s feeling
of fatigue with regard to the type of therapy show that
the average values of all domain scores and the gen-
eral score are higher in the patients who underwent the
combined therapy (radiotherapy and chemotherapy).
These results are in concordance with many findings
of earlier studies. [11, 12, 15–18]. It is known and well
described that a string of side effects resulting from
chemotherapy, i.e. of antineoplastic therapy, often be-
come more pronounced in intensity and frequency
when it is combined with radiotherapy. Nausea and
tiredness with a loss of appetite are the most frequent
symptoms after chemotherapy and have a negative ef-
fect on fatigue in the patients who are also on radio-
therapy [15–18].
The lowest average value of the summary general
score of the Perform questionnaire was recorded in the
patients diagnosed with prostate cancer (17.0±4.6) and
breast carcinoma (18.0±4.4), and almost identical aver-
age score values were found in the domain of physical
activities (5.0±1.6 vs 6.6±2.2) and the domain of attitudes
and beliefs (5.8±2.8 vs 5.6±1.8). By the questionnaire
categories and in relation with the average score, the
results of our study show that the patients with breast
and prostate carcinoma diagnosis have sometimes felt
fatigue. Such results are in accordance with those from
similar studies that also document lower fatigue-relat-
ed difficulties in the patients with breast and/or prostate
carcinoma [19].
The analysis of the results from the group of pa-
tients with carcinoma of the head and neck has shown
that the average values are higher in all domains and
in the general score. The patients with oral cavity car-
cinoma have a higher average value of general score
in two domains, the domain of daily life activities and
the domain of attitudes and beliefs (10.2±2.8 vs 10.2±3.8),
and that the average value is 8.9±3.1, which suggests that fa-
tigue due to physical limitations is almost absent. Prin-
tary localization of the carcinoma and the incidence
of side effects during radiotherapy and/or chemotherapy
(changes in the oral cavity such as mucositis, stom-
attis, impaired chewing and/or swallowing) have
contributed to greater limitations in the domain of
daily life activities, so this particular domain and that
of attitudes and beliefs are the most frequent reasons
for the presence of fatigue in this population of par-
ticipants. Although our research did not include the
assessment of the oral cavity, the participants them-
selves reported hardships they were facing, so in item
5 of the Perform questionnaire (When I am fatigued, I
must stop what I am doing in order to rest and then
carry on) they often said that during the intake of food
they had to make pauses because of fatigue, since it
was hard for them to chew and/or swallow food. The average value of the general Perform questionnaire score indicated that the participants with oral cavity carcinoma (29.3±8.1) were often tired.

The highest values obtained in our study were those in the domain of beliefs and attitudes in the patients with tumors of the central nervous system (15.8±5.6). The items of this domain reflect the personal perception of fatigue and its influence on life. High average values in this domain show that the patients with tumors of the central nervous system feel that they cannot lead regular lives because of their illness. Average values in other domains of PHL and AB (10.9±6.3 vs 12.2±4.5) as well as of the general score (38.9±14.6) indicate that the patients felt tired in the previous two weeks.

Frequent presence of fatigue during the previous two weeks is characteristic for patients with carcinoma of the gynecological region, and this is indicated by the average general score of (26.8±6.0). It is interesting to note that there is virtually no difference when these patients are analyzed regarding the scores on PHL, ADL and AB domains (8.5±2.9 vs 9.6±2.7 vs 8.7±2.8) of the Perform questionnaire. Such results suggest equal participation of physical performance, existence of limitation in daily activities and negative subjective perception of patients when fatigue in the previous two weeks is concerned.

**Conclusion**

All participants included in this study experienced fatigue, although it differed in separate domains, as well as by the type of therapy, primary diagnosis, and intensity over the previous two weeks and at the moment of estimation; however, it was the constant follower of these patients.

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