CLINICAL RESEARCH

e-ISSN 1643-3750
© Med Sci Monit, 2026; 32: e952307
DOI: 10.12659/MSM.952307

Received: 2025.12.02
Accepted: 2026.03.21
Available online: 2026.04.09
Published: 2026.XX.XX

Levels of Physical Activity and Sedentary Lifestyle in Patients With Hematological Cancer Treated With Monoclonal Antibodies as a Monotherapy or Combination Therapy (Immunochemotherapy): A Comparative Study With Healthy Individuals

Authors' Contribution:
Study Design A
Data Collection B
Statistical Analysis C
Data Interpretation D
Manuscript Preparation E
Literature Search F
Funds Collection G

BCDEF 1 Małgorzata Pudełek
E 1 Jarosław Dybko
ACDE 2 Iwona Malicka

1 Lower Silesian Oncology, Pulmonology and Hematology Center, Wrocław, Poland
2 Department of Physiotherapy, Wrocław University of Health and Sport Sciences, Wrocław, Poland

Corresponding Author: Małgorzata Pudełek, e-mail: malgorzata.pudelek@dcopih.pl
Financial support: None declared
Conflict of interest: None declared

Background: Blood cancers account for 7% of all malignant neoplastic diseases worldwide. However, there has been an increase in the survival rate of patients with hematological cancer. These data indicate the need to make patients aware of the importance of physical activity. We aimed to assess the level of physical activity and sedentary lifestyle of patients with hematological cancer treated with monoclonal antibodies as a monotherapy or combination therapy (immunochemotherapy), compared with that of healthy individuals.

Material/Methods: Patients (n=155) treated for hematological malignancies (study group) and healthy individuals (n=137) were divided using World Health Organization (WHO) recommendations on physical activity into groups of adults aged 18-64 years and 65 years and older. All participants completed the International Physical Activity Questionnaire (IPAQ).

Results: In the younger adult group, the median IPAQ total score in the study group was 1235.00 compared with 3186.00 in healthy individuals ($P<0.0001$). Importantly, the study group also differed from healthy individuals in terms of sitting time: 1200.00 vs 360.00 ($P<0.0001$). In the older adult group, no significant difference was found in the median IPAQ total score: 1188.00 vs 1777.00 ($P=0.25$); however, significant differences were observed for sitting time: 900.00 vs 300.00 ($P<0.0001$).

Conclusions: Patients with hematological cancer treated with monoclonal antibodies as a monotherapy or combination therapy (immunochemotherapy) show, regardless of age, lower levels of physical activity and longer sitting time than healthy individuals, indicating the need for education and promotion of physical activity in this group of patients.

Keywords: Hematologic Neoplasms • Physical and Rehabilitation Medicine

Full-text PDF: https://www.medscimonit.com/abstract/index/idArt/952307

Indexed in: [Current Contents/Clinical Medicine] [SCI Expanded] [ISI Alerting System] [ISI Journals Master List] [Index Medicus/MEDLINE] [EMBASE/Excerpta Medica] [Chemical Abstracts/CAS]

Introduction

There is a growing trend in cancer incidence worldwide, including hematological cancers, which account for 7% of all malignant cancers. Such cancers accounted for 1.32 million cases in 2022, of which 636 000 were lymphomas, 497 000 were leukemias, and 188 000 were myelomas [1]. In Poland, data from the National Cancer Registry show that the incidence rates for blood cancers do not differ significantly from those in other European countries. A marked increase in the incidence of blood and lymphatic system cancers is common to the populations of all developed countries due to changes in demographic structure [2]

At the same time, recent years have seen dynamic progress in understanding the pathogenesis of blood diseases, which has led to many changes in their treatment. The rapid development of targeted therapies and immunotherapy, both cellular and humoral, has increased the survival rate of patients with hematological cancers [3]. Thus, the percentage of cancer survivors is increasing [4].

Consequently, there is an increasing need to introduce rehabilitation from the moment of diagnosis, both during and after treatment. Regular physical activity is essential for preventing functional decline, preserving muscle mass, and reducing the severity of cancer-related fatigue. The most common adverse effects of cancer treatment are anemia, thrombocytopenia, neutropenia, peripheral neuropathy, fatigue, and reduced physical performance. At the same time, these symptoms may potentially be reduced through appropriately tailored individual exercise programs. The toxicity profile of the drugs used (monoclonal antibodies administered as monotherapy or combination therapy as immunochemotherapy) may limit a patient's ability to engage in physical activity, leading to further functional decline. To avoid this vicious circle, patients with hematological cancers should be encouraged to undertake physical activity.

Physical activity is a complementary, non-pharmacological method of alleviating symptoms and improving mental and physical health [5,6]. Due to the proven effects of physical activity on mental functioning and quality of life, it is necessary to continuously raise the awareness among patients with hematological cancers in this area [7]. Guidance on physical activity should become an integral part of the treatment plan for these patients [6].

According to World Health Organization (WHO) and American Cancer Society guidelines, adults, including patients with cancer, should engage in at least 150 to 300 minutes of moderate physical activity or 75 to 150 minutes of intense physical activity per week, as well as limit the time spent in a sitting position. In clinical practice, however, a significant proportion of patients with hematological cancers do not achieve the recommended level of activity, which may adversely affect the course of treatment, quality of life, and risk of complications, especially in older adults, who experience a decline in physical activity with age [8].

Büntzel et al demonstrated a decrease in physical activity in patients with cancer from 71% before onset to 50% during treatment and 40% after anticancer treatment [9]. In turn, Sweegers et al pointed to the preference for a sedentary lifestyle among oncology patients [10].

Therefore, in this study, we aimed to assess the level of physical activity and sedentary lifestyle of patients with hematological cancers treated with monoclonal antibodies as a monotherapy or combination therapy (immunochemotherapy), compared with that of healthy individuals.

Material and Methods

Participants and Recruitment

A cross-sectional comparative study was conducted with 292 participants, including 155 individuals in the study group consisting of patients from the Hematology and Transplantation Center of the Lower Silesian Center for Oncology, Pulmonology, and Hematology, in Wrocław. The reference group consisted of 137 healthy individuals with no history of cancer or comorbidities. Both groups were divided according to age, following WHO recommendations on physical activity, into groups of adults aged 18 to 64 years and older adults aged 65 years and above.

In addition, the study group was divided into 4 subgroups according to diagnosis of chronic lymphocytic leukemia (n=27), multiple myeloma (n=34), Hodgkin lymphoma (n=34), and follicular lymphoma (n=60).

The inclusion criteria for the study group were (1) age of 18 years or older, (2) a diagnosis of hematological cancer based on current diagnostic standards, (3) treatment with immunochemotherapy or, in the case of chronic lymphocytic leukemia, anti-CD-20 antibodies in combination with B-cell receptor inhibitors and B-cell lymphoma 2 inhibitors (Venetoclax), and (4) clinical status allowing completion of the questionnaires and written consent to participate in the study. The criteria for inclusion in the reference group were (1) age of 18 years or older, (2) being healthy (no comorbidities), (3) never having been treated for a malignancy or other chronic diseases, and (4) not taking regular medication.

The exclusion criteria were intellectual or physical disability and lack of consent to participate in the study.

Indexed in: [Current Contents/Clinical Medicine] [SCI Expanded] [ISI Alerting System] [ISI Journals Master List] [Index Medicus/MEDLINE] [EMBASE/Excerpta Medica] [Chemical Abstracts/CAS]

Research Methods and the International Physical Activity Questionnaire

The International Physical Activity Questionnaire (IPAQ) assessed the level of physical activity and sedentary lifestyle. The short version of the IPAQ was used in this study. This version was selected due to the specific characteristics of the study group. The use of the short IPAQ reduces respondent burden and shortens the time required to complete the questionnaire, which may improve the completeness of the collected data and minimize the risk of errors resulting from participant fatigue. The IPAQ is a self-assessment tool for physical activity. All patients completed the questionnaire independently after receiving detailed instructions from the medical staff. The IPAQ consists of 7 questions. The questions concern physical activity undertaken in the last 7 days, considering activities related to important areas of human life, such as professional work, household and garden activities, moving from place to place, and leisure and sports in free time. In addition, the time spent sitting is determined. Physical activity includes activities that last at least 10 minutes without interruption.

The types of activity measured are: walking, moderate activity, and intense activity. Individual types of physical activity are expressed in metabolic equivalent of task (MET) units (min/week). Respondents are classified into 1 of 3 activity categories: insufficient (below 600 MET), sufficient (600-1500 or 600-3000 MET), or high (above 1500 or 3000 MET) [11].

For this questionnaire, the standardized Cronbach alpha test showed values from 0.63 to 0.85 [12]. The IPAQ has demonstrated validity and reliability across diverse contexts, including the Polish population [13].

Ethics

All participants provided written informed consent to participate in the study. The Senate Research Ethics Committee, Wroclaw University of Health and Sport Sciences, approved the study (consent number: 28/2023; date of approval: January 12, 2024).

Statistical Analysis

The Shapiro-Wilk test assessed the normality of the data distribution. Due to the non-normal distribution of the analyzed characteristics, the median was used as a measure of central tendency and the interquartile range (IQR) as a measure of dispersion. Analysis of differences between the groups was conducted using the Mann-Whitney U test or Kruskal-Wallis analysis of variance (ANOVA) with the Dunn's post hoc test with Bonferroni-Holm correction. The effect size for the Mann-Whitney U test and Kruskal-Wallis ANOVA was estimated using the Eta squared (η^2) value transformed to the Cohen's d coefficient [14]. The significance level was set at $P<0.05$. All analyses used Statistica 13.1 software and an online effect size calculator: https://www.psychometrica.de/effect_size.html (accessed on July 15, 2025).

The sample size was determined using G*Power 3.1.9.2 software (G*Power, Heinrich-Heine University Düsseldorf, Düsseldorf, Germany). It was assumed that the study group differed from the reference group. The test power was calculated a priori for independent samples, assuming a significance level of $\alpha=0.05$, test power $(1-\beta)=0.95$, and an average effect size (Cohen's d=0.42). The analysis indicated that the minimum total sample size should be 260 (130 participants in each group). The sample size was increased to compensate for possible participant dropouts, assuming a 12% dropout rate, and ultimately 292 participants were recruited.

Results

Basic Sociodemographic Data

The study groups did not differ significantly in terms of age, sex, education, marital status, and place of residence. However, a significant difference was found between the study group and reference group, regardless of age group (adults and older adults), in terms of employment. Furthermore, a lower body mass index (BMI) was found in the older adult group than in the reference group. **Table 1** presents the sociodemographic characteristics of the groups.

General Physical Activity Level

The IPAQ questionnaire results indicated a lack of moderate and intense physical activity among patients with hematological cancers, regardless of age group. Although these patients showed significantly lower activity levels compared with healthy individuals, adherence to WHO guidelines was also low among the healthy group (**Tables 2, 3**).

Physical Activity Level by Age Group, According to WHO Recommendations on Physical Activity

For the younger adult group of the study and reference groups, significant differences were obtained for intense activities expressed in minutes per week (Me [IQR], 0.00 [60.00] vs 60.00 [180.00]; $P<0.0001$) and METs (Me [IQR], 0.00 [480.00] vs 480.00 [1440]; $P<0.0001$), and for moderate activities expressed in minutes per week (Me [IQR], 80.00 [180.00] vs 135.00 [300.00]; $P=0.0018$) and METs (Me [IQR], 320.00 [720.00] vs 540.00 [1200.00]; $P=0.0013$). The study group also differed significantly in terms of sitting time (Me [IQR], 1200.00 [900.00] vs 360.00 [360.00]; $P<0.0001$) and overall IPAQ score (METs) (Me [IQR], 1235.00 [2550.00] vs 3186.00 [3711.00]; $P<0.0001$) (**Table 2**).

Indexed in: [Current Contents/Clinical Medicine] [SCI Expanded] [ISI Alerting System] [ISI Journals Master List] [Index Medicus/MEDLINE] [EMBASE/Excerpta Medica] [Chemical Abstracts/CAS]

Table 1. Sociodemographic characteristics of the groups.

Variable	Adults 18-64 years			Adults ≥65 years		
	Study group	Reference group	*P* value*	Study group	Reference group	*P* value*
n	82	107	–	73	30	–
Age, [years]; Median (IQR)	47.00 (18.00)	52.00 (23.00)	0.21	71.00 (7.00)	69.00 (5,99)	0.17
BMI, [kg/m^2]; Median (IQR)	24.96 (6.45)	25.90 (5.57)	0.39	25.99 (4.34)	29.06 (7.10)	0.009*
Sex, n (%)						
Female	51.22	42.06	0.21	47.22	46.67	0.95
Male	48.78	57.94		52.78	53.33	
Education, n (%)						
Primary/vocational	19.51	16.82	0.48	36.67	35.21	0.35
Secondary	34.15	28.04		46.67	35.21	
Higher education	46.34	55.14		16.67	29.58	
Marital status, n (%)						
Single/widowed/divorced	17.07	28.04	0.07	33.80	23.33	0.29
Married/cohabiting	82.93	71.96		66.20	76.67	
Residential status, n (%)						
Village	32.93	30.84	0.76	28.27	36.67	0.39
Town/city	67.07	69.16		71.83	63.33	
Employment, n (%)						
Employed	59.76	90.65	<0.0001*	5.56	20.00	0.025*
Unemployed/retired	40.24	9.35		94.44	80.00	

IQR – interquartile range; BMI – body mass index; * Mann-Whitney U test; χ^2, chi-square test; $P<0.05$.

In the older adult group of the study and reference groups, significant differences in results were observed for moderate activities expressed in minutes per week (Me [IQR], 30.00 [180.00] vs 100.00 [200.00]; *P*=0.03) and METs (Me [IQR], 0.00 [720.00] vs 400.00 [800.00]; *P*=0.01). Significant differences were also observed in the performance of intense activities expressed in METs (Me [IQR], 0.00 [240.00] vs 0.00 [960.00]; *P*=0.04), as well as in sitting time (Me [IQR], 900.00 [600.00] vs 300.00 [300.00]; *P*<0.0001) (**Table 3**).

Physical Activity Based on Clinical Diagnosis

Regardless of age group, significant differences (*P*<0.05) were found in the duration of sitting when considering diagnosis (chronic lymphocytic leukemia, multiple myeloma, Hodgkin lymphoma, or follicular lymphoma) between the study and reference groups.

In the younger adult groups, patients diagnosed with myeloma exhibited the longest sitting times compared with the reference group (Me [IQR], 1650.00 [600.00] vs 360.00 [360.00]; *P*<0.0001). In the older adult groups, the longest sitting times were observed in patients diagnosed with myeloma (Me [IQR], 1200.00 [900.00] vs 300.00 [300.00]; *P*=0.0004) and Hodgkin lymphoma (Me [IQR], 1200.00 [300.00] vs 300.00 [300.00]; *P*=0.03).

Among younger adults, patients with myeloma also had significantly lower levels of intense activities compared with the reference group, both in minutes per week (Me [IQR], 0.00 [0.00] vs 60.00 [180.00]; *P*=0.01) and in METs (Me [IQR], 0.00 [0.00] vs 480.00 [1440.00]; *P*=0.01), as well as in overall IPAQ scores (Me [IQR], 900.00 [1035.75] vs 3186.00 [3711.00]; *P*=0.01).

In the same younger adult group, patients diagnosed with Hodgkin lymphoma demonstrated significantly lower moderate activity compared with the reference group, both in minutes per

Indexed in: [Current Contents/Clinical Medicine] [SCI Expanded] [ISI Alerting System] [ISI Journals Master List] [Index Medicus/MEDLINE] [EMBASE/Excerpta Medica] [Chemical Abstracts/CAS]

Table 2. Comparison of physical activity in the adult group aged 18-64 years (study group vs reference group).

	Study group (n=82)		Reference group (n=107)		MWU	Cohen's d
	Median	IQR	Median	IQR	*P*	
Intense activities (min/week)	0.00	60.00	60.00	180.00	<0.0001*	0.543
Moderate activities (min/week)	80.00	180.00	135.00	300.00	0.0018*	0.464
Walking (min/week)	240.00	300.00	300.00	460.00	0.19	0.183
Sitting (min/week)	1200.00	900.00	360.00	360.00	<0.0001*	1.273
Intense [MET]	0.00	480.00	480.00	1440.00	<0.0001*	0.522
Moderate [MET]	320.00	720.00	540.00	1200.00	0.0013*	0.462
Walking [MET]	792.00	990.00	990.00	1518.00	0.15	0.192
IPAQ total MET	1235.00	2550.00	3186.00	3711.00	<0.0001*	0.571

IPAQ – International Physical Activity Questionnaire; IQR – interquartile range; MET – metabolic equivalent of task; MWU – Mann-Whitney U test; * *P*<0.05.

Table 3. Comparison of physical activity in the older adult group aged 65 years and over (study group vs reference group).

	Study group (n=73)		Reference group (n=30)		MWU	Cohen's d
	Median	IQR	Median	IQR	*P*	
Intense activities (min/week)	0.00	40.00	0.00	120.00	0.05	0.328
Moderate activities (min/week)	30.00	180.00	100.00	200.00	0.03*	0.431
Walking (min/week)	210.00	360.00	167.50	360.00	0.63	0.096
Sitting (min/week)	900.00	600.00	300.00	300.00	<0.0001*	0.978
Intense [MET]	0.00	240.00	0.00	960.00	0.04*	0.338
Moderate [MET]	0.00	720.00	400.00	800.00	0.01*	0.483
Walking [MET]	594.00	1180.00	552.75	1188.00	0.79	0.053
IPAQ total MET	1188.00	2970.00	1777.00	2298.00	0.25	0.227

IPAQ – International Physical Activity Questionnaire; IQR – interquartile range; MET – metabolic equivalent of task; MWU – Mann-Whitney U test; * *P*<0.05.

week (Me [IQR], 10.00 [90.00] vs 135.00 [300.00]; *P*=0.002) and in METs (Me [IQR], 40.00 [360.00] vs 540.00 [1200.00]; *P*=0.02).

Tables 4-6 provide detailed results of the levels of physical activity and sedentary lifestyle based on clinical diagnosis.

Discussion

The use of blood cancer therapy, long-term treatment, including hospitalization, and low physical activity can not only lead to decreased energy and fatigue, but can also contribute to loss of skeletal muscle mass, strength, and function [15]. Indeed, sarcopenia and cachexia are common disorders in patients undergoing treatment for hematological cancers. Sarcopenia is observed in approximately 51% of patients with hematological cancers and may be associated with poor chemotherapy tolerance, poorer prognosis, and lower overall survival [16]. Cachexia is a complication of cancer treatment and affects approximately 25% of patients with hematological cancers, exacerbating a sedentary lifestyle [17]. It can lead to muscle wasting, weight loss, and functional impairment and is a common cause of death [16]. The optimal methods of treating sarcopenia and cachexia in patients with cancer are unknown; however, physical activity is recommended for both disorders. As such, physical activity and therapeutic education are advisable in this population at every stage of cancer [18].

The study group showed a lack of moderate and intense physical activity, regardless of age group, engaging in almost no

Indexed in: [Current Contents/Clinical Medicine] [SCI Expanded] [ISI Alerting System] [ISI Journals Master List] [Index Medicus/MEDLINE] [EMBASE/Excerpta Medica] [Chemical Abstracts/CAS]

Table 4. Physical activity in adults based on clinical diagnosis.

	Leukemia n=13		Myeloma n=12		Hodgkin disease n=29		Lymphoma n=28		Reference group n=107	
	Median	IQR	Median	IQR	Median	IQR	Median	IQR	Median	IQR
Intense activities (min/week)	0.00	0.00	0.00	0.00	0.00	60.00	0.00	90.00	60.00	180.00
Moderate activities (min/week)	120.00	320.00	75.00	120.00	10.00	90.00	150.00	450.00	135.00	300.00
Walking [MET]	240.00	270.00	195.00	240.00	270.00	300.00	210.00	315.00	300.00	460.00
Sitting (min/week)	1200.00	1200.00	1650.00	600.00	1200.00	600.00	1200.00	900.00	360.00	360.00
Intense [MET]	0.00	0.00	0.00	0.00	0.00	480.00	0.00	640.00	480.00	1440.00
Moderate [MET]	480.00	1280.00	300.00	480.00	40.00	360.00	580.00	1740.00	540.00	1200.00
Walking [MET]	792.00	891.00	643.50	792.00	891.00	990.00	693.00	1064.25	990.00	1518.00
IPAQ total MET	990.00	2261.00	900.00	1035.75	1173.00	2517.00	2035.00	3880.50	3186.00	3711.00

IPAQ – International Physical Activity Questionnaire; IQR – interquartile range; MET – metabolic equivalent of task.

Table 5. Physical activity in older adults based on clinical diagnosis.

	Leukemia n=14		Myeloma n=22		Hodgkin disease n=5		Lymphoma n=32		Reference group n=30	
	Median	IQR	Median	IQR	Median	IQR	Median	IQR	Median	IQR
Intense activities (min/week)	0.00	40.00	0.00	60.00	0.00	0.00	0.00	0.00	0.00	120.00
Moderate activities (min/week)	20.00	600.00	60.00	210.00	0.00	0.00	25.00	180.00	100.00	200.00
Walking (min/week)	300.00	600.00	165.00	320.00	240.00	125.00	210.00	340.00	167.50	360.00
Sitting (min/week)	900.00	600.00	1200.00	900.00	1200.00	300.00	750.00	675.00	300.00	300.00
Intense [MET]	0.00	320.00	0.00	480.00	0.00	0.00	0.00	0.00	0.00	960.00
Moderate [MET]	80.00	2400.00	240.00	720.00	0.00	0.00	40.00	600.00	400.00	800.00
Walking [MET]	990.00	1980.00	544.50	1056.00	792.00	412.50	643.50	1188.00	552.75	1188.00
IPAQ total MET	2031.50	4487.00	1119.00	3435.00	792.00	812.50	1191.00	2529.75	1777.00	2298.00

IPAQ – International Physical Activity Questionnaire; IQR – interquartile range; MET – metabolic equivalent of task.

intensive physical activity. In relation to the reference group, a significant difference was observed for the group of patients aged up to 64 years with myeloma. Myeloma significantly reduces physical activity. Myeloma cells destroy bones, leading to pain and an increased risk of pathological fractures [19]. In the case of moderate physical activity, a significant difference was observed in relation to the reference group for patients aged up to 64 years with Hodgkin disease. Severe fatigue most likely begins with biological processes resulting from the disease itself and/or the treatment used. Most patients perceive fatigue as a signal to reduce activity and rest [20].

Advice on physical activity should therefore become an integral part of patient treatment plans. Physical activity can be an effective nonpharmacological approach to reducing symptoms and improving quality of life [21]. Liang et al also showed that physical activity by patients with hematological cancers can translate into their recovery process [22]. Therefore, based on the results obtained in the therapeutic process, it is worth considering the promotion of physical activity, as it is significantly lower than that in healthy individuals. At the same time, physical activity should be tailored not only to established recommendations but, more

Indexed in: [Current Contents/Clinical Medicine] [SCI Expanded] [ISI Alerting System] [ISI Journals Master List] [Index Medicus/MEDLINE] [EMBASE/Excerpta Medica] [Chemical Abstracts/CAS]

Table 6. Significance of the effect of clinical diagnosis on physical activity in the study groups.

	Kruskal-Wallis ANOVA					Cohen's
	P	D1 vs D5	D2 vs D5	D3 vs D5	D4 vs D5	d
Age 18-64 years						
Intense activities (min/week)	0.0005*	NS	0.01*	NS	NS	0.619
Moderate activities (min/week)	0.0016*	NS	NS	0.002*	NS	0.564
Walking (min/week)	0.6029	NS	NS	NS	NS	0.167
Sitting (min/week)	<0.0001*	0.02*	<0.0001*	<0.0001*	<0.0001*	1.308
Intense [MET]	0.0006*	NS	0,01*	NS	NS	0.609
Moderate [MET]	0.0017*	NS	NS	0,002	NS	0.559
Walking [MET]	0.5641	NS	NS	NS	NS	0.151
IPAQ total MET	0.0010*	NS	0.01*	NS	NS	0.584
Age ≥65 years						
Intense activities (min/week)	0.0770	NS	NS	NS	NS	0.44
Moderate activities (min/week)	0.1236	NS	NS	NS	NS	0.378
Walking (min/week)	0.7671	NS	NS	NS	NS	0.304
Sitting (min/week)	0.0001*	0.01*	0.0004*	0.03*	0.02*	0.992
Intense [MET]	0.0578	NS	NS	NS	NS	0.47
Moderate [MET]	0.0802	NS	NS	NS	NS	0.43
Walking [MET]	0.8728	NS	NS	NS	NS	0.341
IPAQ total MET	0.6788	NS	NS	NS	NS	0.265

ANOVA – analysis of variance; D (diagnosis) 1-5: [1] leukemia, [2] myeloma, [3] Hodgkin's disease, [4] lymphoma, [5] reference group; IPAQ – International Physical Activity Questionnaire; MET – metabolic equivalent of task; * $P<0.05$.

importantly, to the individual capabilities of patients and their specific diagnosis.

All forms of physical activity are important, including low-intensity exercises, which may be particularly relevant given the nature of the disease and its treatment. Moreover, physical activity should be incorporated at every stage of care – during prehabilitation, during active treatment, and after treatment – and is especially important during chemotherapy, both in the induction phase and in patients receiving high-dose chemotherapy or undergoing hematopoietic stem cell transplantation [5]. Exercise programs are typically based on endurance and resistance training. The frequency of supervised sessions ranges from 2 to 5 times per week, with durations varying from several minutes up to 1 hour [23]. Evidence from reviews indicates that adults with hematological malignancies can reduce both fatigue and depression through moderate-intensity endurance training alone or in combination with resistance-endurance training [6,24].

Patterson et al pointed out that physical activity recommendations can be met while leading a sedentary lifestyle. Therefore, it is important to take measures aimed not only at assessing the level of physical activity but also sedentary behavior [25]. In this study, a significant increase in the duration of sitting was observed in patients with hematological cancers, regardless of age, in comparison with the reference group. Cao et al showed, by analyzing different types of cancer, that patients diagnosed with blood cancer reported one of the longest sitting times. Epidemiological studies show that prolonged sitting is associated with an increased risk of lifestyle diseases and higher overall mortality [26]. It is also worth mentioning that physical activity levels and sedentary behavior are linked to overall mental health, emotional well-being, and life satisfaction [27].

Although not the subject of the present study, analysis of sociometric data showed differences between the study group and the reference group in terms of professional activity, regardless of age group. Employment provides patients with significant psychological and financial benefits, both in terms of income and health benefits. For patients diagnosed with cancer, continuing employment and returning to work can promote a sense of normality and control. Nevertheless, only 54% of cancer survivors of working age report working full-time [28], which may confirm the differences found in our research.

Indexed in: [Current Contents/Clinical Medicine] [SCI Expanded] [ISI Alerting System] [ISI Journals Master List] [Index Medicus/MEDLINE] [EMBASE/Excerpta Medica] [Chemical Abstracts/CAS]

In the group of older adults, a significant difference was also found for the BMI index, which was lower in patients with hematological cancers. A decrease in the BMI in cancer is unfavorable and indicates malnutrition or cachexia. In patients with hematological cancers, malnutrition is associated with the Eastern Cooperative Oncology Group performance status and the Karnofsky Performance Scale Index [29]. Compared with younger adults, older adults are also characterized as having lower levels of physical activity and a more sedentary lifestyle, which may translate into a higher incidence of comorbidities associated with the underlying disease and a higher risk of death [30].

Physical activity in patients with hematological malignancies is safe and improves physical functioning and quality of life [18]. Therefore, physical activity should be an integral part of supportive care and a recommended intervention in daily clinical practice.

Strengths and Limitations

The main limitation of this study is that it was based solely on a subjective assessment of physical activity using the IPAQ questionnaire. The use of a single subjective measure to assess physical activity limits the depth of the findings. The results obtained may be either underestimated or overestimated. However, the IPAQ is an international, standardized questionnaire for assessing levels of physical activity and sedentary behavior and is used in population and clinical studies.

Another limitation of the present study is the lack of precise information on cancer stage and performance status. However, the duration of disease across individual cases was similar, all patients were treated on an outpatient basis, and none had physical limitations that could affect their ability to engage in physical activity.

Future Research Directions

The results of the IPAQ questionnaire could be strengthened by providing additional details about the types of physical activity most commonly undertaken by patients with hematological cancers. This data could help develop educational programs promoting an active lifestyle for this group of patients. Furthermore, future research should focus on the implementation of objective tools, such as accelerometry, for assessing physical activity levels and be conducted at various stages of treatment in order to determine the possibilities for physical activity throughout the treatment process. This could strengthen the obtained results.

Conclusions

The conclusions of this study are as follows. First, patients with hematological cancers treated with monoclonal antibodies as a monotherapy or combination therapy (immunochemotherapy) show, regardless of age, lower levels of physical activity and longer sitting times than do healthy individuals, indicating the need for education and promotion of physical activity in this group of patients. Second, regardless of age, differences in employment status were observed. This result may be related to psychophysical stamina and indirectly affect the level of physical activity undertaken. Third, a lower BMI was observed in the older adult group, which may indicate cachexia, as cancer-related wasting is directly related to the level of physical activity undertaken. Finally, further longitudinal studies using objective methods of physical activity monitoring are needed to better understand these relationships.

Institution Where Work Was Done

Lower Silesian Oncology, Pulmonology and Hematology Center, Wrocław, Poland.

References:

1. Ferlay J, Ervik M, Lam F, et al. Global cancer observatory: Cancer today. Lyon, France: International Agency for Research on Cancer 2024. Available from: https://gco.iarc.who.int/today
2. Markiewicz-Melon M, Lisowska K. Haematology: A new beginning, Warszawa 2024
3. Dmoszyńska A, Robak T, Hus I. Podstawy hematologii. Czelej; 2019 [in Polish]
4. De Angelis R, Demuru E, Baili P, et al. Complete cancer prevalence in Europe in 2020 by disease duration and country (EUROCARE-6): A population-based study. Lancet. Oncol, 2024;25(3):293-307
5. de Souza BC, Carniel CF, Raimundo RD. Evaluating the effects of exercise protocols in hospitalized onco-hematological patients: A systematic review. Future Oncol. 2024;20(39): 3301-12
6. Felser S, Rogahn J, Hollenbach L, et al. Physical exercise recommendations for patients with polycythemia vera based on preferences identified in a large international patient survey study of the East German Study Group for Hematology and Oncology (OSHO #97). Cancer Med. 2023;12(17):18235-45
7. Di Blasio A, Di Dalmazi G, Morano T, et al. Relationships between daily physical activity combinations and psychophysical health status of Italian breast cancer survivors. Home Health Care Serv Q. 2022;41(3):200-18
8. Bull FC, Al-Ansari SS, Biddle S, et al. World Health Organization 2020 guidelines on physical activity and sedentary behaviour. Br J Sports Med. 2020;54(24):1451-62
9. Büntzel J, Kusterer I, Rudolph Y, et al. Cancer patients' knowledge and acceptance of physical activities for rehabilitation. In Vivo. 2017;31(6):1187-92
10. Sweegers MG, Boyle T, Vallance JK, et al. Which cancer survivors are at risk for a physically inactive and sedentary lifestyle? Results from pooled accelerometer data of 1447 cancer survivors. Int J Behav Nutr Phys Act. 2019;16(1):66
11. Biernat E, Stupnicki R, Gajewski AK. International Physical Activity Questionnaire (IPAQ) – Polish version. J Phys Educ Sport. 2007;51(1):47-54
12. Dąbrowska-Galas M, Dąbrowska J, Ptaszkowski K, Plinta R. High physical activity level may reduce menopausal symptoms. Medicina. 2019;55:466

Indexed in: [Current Contents/Clinical Medicine] [SCI Expanded] [ISI Alerting System] [ISI Journals Master List] [Index Medicus/MEDLINE] [EMBASE/Excerpta Medica] [Chemical Abstracts/CAS]

13. Ferreira Freitas R, Santos Brant Rocha J, Ives Santos L, et al. Validity and precision of the International Physical Activity Questionnaire for climacteric women using computational intelligence techniques. PLoS One. 2021;16(1):e0245240
14. Lenhard W, Lenhard A. Computation of effect sizes. Available from: https://www.psychometrica.de/effect_size.html (accessed on July 15, 2025)
15. Mishra SI, Scherer RW, Geigle PM, et al. Exercise interventions on health-related quality of life for cancer survivors. Cochrane Database Syst Rev 2012;8:CD007566
16. Granger CL. Physiotherapy management of blood cancers. J Physiother. 2023;69(2):70-78
17. Mallard J, Hucteau E, Hureau TJ, Pagano AF. Skeletal muscle deconditioning in breast cancer patients undergoing chemotherapy: Current knowledge and insights from other cancers. Front Cell Dev Biol. 2021;9:719643
18. Accogli MA, Denti M, Costi S, Fugazzaro S. Therapeutic education and physical activity are feasible and safe in hematologic cancer patients referred to chemotherapy: Results of a randomized controlled trial. Support Care Cancer. 2023;31(1):61
19. Thorsteinsdottir S, Gislason G, Aspelund T, et al. Fractures and survival in multiple myeloma: Results from a population-based study. Haematologica. 2019;105(4):1067
20. Oldervoll LM, Loge JH, Kaasa S, et al. Physical activity in Hodgkin's lymphoma survivors with and without chronic fatigue compared with the general population – A cross-sectional study. BMC Cancer. 2007;7:210
21. Felser S, Rogahn J, le Coutre P, et al. Anxieties, age and motivation influence physical activity in patients with myeloproliferative neoplasms – A multicenter survey from the East German study group for hematology and oncology (OSHO# 97). Front Oncol. 2023;12:1056786
22. Liang Y, Zhou M, Wang F, Wu Z. Exercise for physical fitness, fatigue and quality of life of patients undergoing hematopoietic stem cell transplantation: A meta-analysis of randomized controlled trials. Jpn J Clin Oncol. 2018;48(12):1046-57
23. Großek A, Großek K, Bloch W. Safety and feasibility of exercise interventions in patients with hematological cancer undergoing chemotherapy: A systematic review. Support Care Cancer. 2023;31(6):335
24. Knips L, Bergenthal N, Streckmann F, et al. Aerobic physical exercise for adult patients with haematological malignancies. Cochrane Database Syst Rev. 2019;1(1):CD009075
25. Patterson R, McNamara E, Tainio M, et al. Sedentary behaviour and risk of all-cause, cardiovascular and cancer mortality, and incident type 2 diabetes: A systematic review and dose response meta-analysis. Eur J Epidemiol. 2018;33:811-29
26. Cao C, Patel AV, Liu R, et al. Trends and cancer-specific patterns of physical activity, sleep duration, and daily sitting time among US cancer survivors, 1997-2018. J Natl Cancer Inst. 2023;115(12):1563-75
27. Côté A, Miquelon P, Trudel-Fitzgerald C. Physical activity, sedentary time, and psychosocial functioning among adults with cancer: A scoping review. Int J Environ Res Public Health. 2024;21(2):225
28. Blinder VS, Gany FM. Impact of cancer on employment. J Clin Oncol. 2019;38(4):302
29. Mancuso S, Mattana M, Santoro M, et al. Host-related factors and cancer: Malnutrition and non-Hodgkin lymphoma. Hematol Oncol. 2022;40(3):320-31
30. Liu L, Wen W, Andersen SW, et al. Sitting time, physical activity and mortality: A cohort study in low-income older Americans. Am J Prev Med. 2024;67(6):924-31

Indexed in: [Current Contents/Clinical Medicine] [SCI Expanded] [ISI Alerting System] [ISI Journals Master List] [Index Medicus/MEDLINE] [EMBASE/Excerpta Medica] [Chemical Abstracts/CAS]