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The characteristic of activity limitations caused by lung cancer

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ABSTRACT

This article presents the characteristics of activity limitations caused by lung cancer, considering clinical data, stages of the disease, and severity of the disability. The dynamics shows that the restrictions of the first, second, and third degrees relating to self-care, movement, and labor activity make up the largest share in the structure of activity limitations, while the restrictions of the first, second, and third degrees relating to communication constitute the smallest share.

Keywords: *disability; impairment; activity limitations; lung cancer.*

INTRODUCTION

A sharp increase in lung cancer cases is becoming a serious medical and social problem. Around 1.6 million new cases of malignant tumors are identified each year worldwide of which 13% is accounted for by lung cancer. In Russia, 63,000 people are annually diagnosed with lung cancer, which is ranked the first among male malignant

tumors and the ninth in female malignant tumors. The incidence of lung cancer is increased by 0.6–0.8% annually.

The maximum morbidity rate is observed among people aged from 55 to 70.[1–5] In the structure of the disability, malignant tumors are ranked the second, and in several of the Russian regions they are on top. In the structure of the people firstly recognized as disabled owing to malignant tumors, lung cancer is accounted for by 50–70%; in the structure of the people repeatedly recognized as disabled, lung cancer cases substitute 3–5%. In the age structure, the impaired people above the working age and the disabled people of the first and second degrees prevail.[6–11]

RESEARCH OBJECTIVE

To assess activity limitations and the degree of their severity based on the degree of impairment of the body functions of the disabled people, caused by lung cancer.

MATERIALS AND METHODOLOGY

The methods used in the research were as follows: a documentary method and copying of data (250 units). For processing and analysis, the primary database was loaded into the R-environment (environment for statistical data analysis [http://www.r-project.org]. For continuous distribution of variables, we calculated the mean value, the standard ratio, used the t-test when comparing two groups and ANOVA when comparing several groups. For continuous abnormally distributed variables, we calculated the median, the first and the third quartiles and used the Kruskal–Wallis test for comparison. For categorical variables, we calculated the absolute and relative frequencies and used the Chi-squared test when checking the contingency tables. If there were more than two categories in the variable, the contingency table was calculated by many comparisons, and the P-value was adjusted by the Benjamini–Hochberg procedure.

Categorical variables are ordinal, and for each change threshold from the Spearman test P-values were calculated; with $P \leq P$ critical, the Spearman correlation coefficient was calculated. P-criterion was taken as equal to 0.05.

RESEARCH RESULTS

The medical and social characteristics of the people with disabilities caused by lung cancer were as follows. Men accounted for 77%, while women represented 23%. People with higher, secondary vocational, and secondary education constituted 36%, 44%, and 13%, respectively. The average height of women was 164.5 cm, while average height of men was 176.2 cm. Among young people, men accounted for 63.6%, while women accounted for 36.4%; among the middle-aged people, men made up 91.2%, and 8.8% was accounted for by women. Among people above the working age, men constituted 69.3%, while women represented 30.7%.

The majority were disabled people with Stage III and Stage IV lung cancer (45.0 and 23.0%, respectively). The disabled people with Group I prevailed (60%), and among them 92.9% had Stage III disease and 52.1% had Stage IV lung cancer. Ordinal correlation coefficient was equal to 0.72. The largest share in the structure of disability caused by lung cancer was accounted for by adenocarcinoma (29%), squamous cell cancer (26%), and small cell cancer (17%).

The most clinically observed conditions were general weakness (63.2%), shortness of breath on walking (55.6%), fatigue (23.3%), chest pains (22.4%), wet cough (21.2%), weight loss (15.6%), dizziness (14.4%), and dry cough (14.6%).

With the aggravation of the disease from Stage I to Stage III, the proportion of complaints about shortness of breath decreased from 82.1 to 55.6% (cor = −0.1). This is probably because the patients pointed out at the shortness of breath more seldom on the background of more significant complaints, whereas the complaint about the shortness of breath

at Stage IV is much higher (63.4%) than at Stage III. Complaints about edema are presented only by patients with Stage III or Stage IV disease (2.8-7.1%), cor = 0.12. Complaints about chills are presented by persons with disability at Stage III or IV of the disease (4.2–7.1%), P = 0.05.

Table 1 shows the joint frequencies of the two symptoms. The grouping symptom splits the sampling into two groups, with the presence of the grouping symptom (yes) and without it (no). In Column N, the number of patients in each group is written, in the % column, the frequency of the second symptom in percent in both groups is indicated, in Column P, the result of the corresponding chi-squared test is stated, in the cor-column, the Spearman correlation value is specified.

Six out of 20 patients who reported throat-neck-hand-collarbone symptom (30.0%) and 18 of 230 patients who did not report this symptom (7.8%) noticed pain in joints, P = 0.005). The rank correlation coefficient between these two symptoms was cor = 0.2, which indicated a weak direct correlation.

Eight out of 23 people who reported pain and weakness in the lower limbs noticed pain in joints, which accounted for 7.0% (cor = 0.27). Ninteen out of 167 people who reported weakness and fatigue noticed headaches in the morning (11.4%), and 2 out of 83 patients reported this symptom (2.4%); P = 0.030, cor = 0.15. Thirty-six people reported dizziness, and 13 noted headaches (3.7%), cor = 0.41 (direct average correlation). Six out of 23 patients who reported mental disorders noticed

TABLE 1. Results of contingency tables for complaints of disabled people due to lung cancer.

Grouping symptom	Group	Number of patients in a group	Symptom	Number of patients with a symptom	Share of patients with a symptom (%)	P	cor
Throat, neck, arm, collarbones	No	230	Pain. Joints	18	7.8	0.005	0.2
	Yes	20		6	30		
Pains, weakness in the lower limbs	No	227	Pain. Joints	16	7	0	0.27
	Yes	23		8	34.8		
Weakness, fatigue	No	83	Pain. Headaches	2	2.4	0.03	0.15
	Yes	167		19	11.4		
Dizziness	No	214	Pain. Headaches	8	3.7	0	0.41
	Yes	36		13	36.1		
Mental disorders	No	227	Pain. Headaches	15	6.6	0.005	0.2
	Yes	23		6	26.1		
Weakness, fatigue	No	83	Throat, neck, arm, collarbones	12	14.5	0.016	−0.17

a headache (26.1%), and only 15 people out of 227 people noticing mental disorders have a headache (6.6%); P = 0.005, cor = 0.2, which indicate a direct weak correlation. Eight out of 167 disabled people who reported weakness and fatigue (4.8%) and 12 out of 83 people who did not report weakness and fatigue (14.5%) noticed sore throat and pain in the neck, arms, and collarbones; P = 0.016, cor = 0.17, which indicate a weak inverse correlation. Six out of 8 impaired people who reported sweating (75.0%) and 64 out of 242 people who did not report sweating (26.4%) noticed chest pains; P = 0.009, cor = 0.19, which indicates a direct weak correlation according to Spearman. Five disabled people who reported pains in the back also reported of chest pains (26.5%); P = 0.002, cor = 0.23.

Ninety out of 110 disabled people who reported cough also noticed edema (81.8%), while 73 out of 140 patients who did not report cough noticed the shortness of breath (52.1%); cor = 0.31.

Ten out of 23 people who reported pain and weakness in the lower limbs (43.5%) and 153 out of 227 people who did not report pain and weakness in the lower limbs (67.4%) noticed the shortness of breath; P = 0.039, cor = −0.15.

Thirty two out of 36 disabled people who reported dizziness (88.9%) and 135 out of 214 people who did not report dizziness (63.4%) noticed weakness and fatigue (63.4%); P = 0.004, cor = 0.19.

Eight out of 28 impaired people with reported mental disorders noticed dizziness (34.8%), while 135 out of 227 people who did not report these disorders also noticed dizziness.

Neuromuscular, skeletal, and statodynamic impairments were reported as mild among 73 people (29%) and as moderate among 14 people (5.6%); 4.4% and 1.6% were accounted for by significant and highly significant impairments, respectively. The impairment of the cardiovascular system was mild in 48% of cases (120 people), moderate in 6.8%, and significant in 0.4% of cases.

The impairment of the respiratory system was mild in 13% of cases, moderate in 18% of cases (45 people), significant in 15% of cases (37 people), and highly significant in 21% of cases (53 people). The impairment of the blood and immune system was reported as highly significant in 42% of cases (104 people), as significant in 21% of cases, as moderate in 23% of cases, and as mild in 0.8% of cases. The impairments of the functions of the digestive and endocrine systems were mild (Table 2). Patients at the first and second stages of the disease had mild impairments of the sensory functions. The neuromuscular, skeletal, and statodynamic impairments were observed in 19%, 12%, 31%, and 38% at Stages I, II, III and IV, respectively. The largest proportion of moderate impairments of the statodynamic functions (64%) was reported among patients at Stage IV; significant impairments of the statodynamic functions were characterized as significant at Stage III (36%) and Stage IV (55%); highly significant impairments of the statodynamic functions were also observed at Stage IV. The largest proportion of moderate and significant impairments of the functions of the cardiovascular system was noticed at Stages III and IV, while mild impairments of the functions of the cardiovascular system were observed at Stages I and II. The impairments of the functions of the respiratory system were mild in 25% of cases at Stage I, in 44% of cases at Stage III, and in 22% of cases at Stage IV; moderate impairments of the functions of the respiratory system were observed in 18% of cases at Stages I and II and in 36 and 49% of cases at Stages III and IV, respectively; they were described as significant and highly significant in 38% and 25% of cases, respectively, at Stage III and in 51 and 73% of cases, respectively, at Stage IV. The impairment of the functions of the digestive system was mild at all stages (ranging from 19 to 26%) and significant only at Stages III and IV. The impairment of the functions of the blood and immune system was moderate in 49% of cases at Stage I, in 9% of cases at Stages II and III, and in 33% of cases at Stage IV, significant in 32 and 53% of cases at Stages II and III, respectively, as well as in 8% of cases at Stages I–IV; the largest

TABLE 2. Characteristics of the main types of permanent impairments of the body functions caused by lung cancer with regard to their severity (absolute number, %).

The name of the main types of permanent impairments of the human body	Severity									
	Normal		Mild		Moderate		Significant		Highly significant	
	Absolute number	Proportion	Absolute number	Proportion	Absolute number	Proportion	Absolute number	Proportion	Absolute number	Proportion
The impairment of language and speech functions	247	99.0	2	0.8	1	0.4	–	–	–	–
The impairment of sensory functions	242	97.0	8	3.2	–	–	–	–	–	–
Neuromuscular, skeletal, and statodynamic impairments	148	59.0	73	29.0	14	5.6	11	4.4	4	1.6
The impairments of the functions of the cardiovascular system	112	45.0	120	48.0	17	6.8	1	0.4	–	–
The impairment of the functions of the respiratory system	83	33.0	32	13.0	45	18.0	37	15.0	53	21.0

The impairment of the functions of the digestive system	224	90.0	21	8.4	–	–	4	1.6	1	0.4
The impairment of the functions of the endocrine system	231	92.0	14	5.6	3	1.2	1	0.4	1	0.4
The impairment of the functions of blood and immune system	34	14.0	2	0.8	57	23.0	53	21.0	104	42.0
The impairment of the functions of the urinary system	237	95.0	4	1.6	2	0.8	6	2.4	1	0.4
The impairment of the functions of the skin and the systems related to it	249	99.6	1	0.4	–	–	–	–	–	–

TABLE 3. The structure of the severity of the main types of permanent impairments of the body functions depending on the disease stages (absolute, %).

Type of impairment	Degree of severity	The disease stages							
		I		II		III		IV	
		Absolute number	%	Absolute number	%	Absolute number	%	Absolute number	%
The impairment of sensory functions	Normal	38	16	25	10	73	30	106	44
	Mild	1	12	1	12	—	—	6	75
	Moderate	—	—	—	—	—	—	—	—
	Significant	—	—	—	—	—	—	—	—
	Highly significant	—	—	—	—	—	—	—	—
The impairment of neuromuscular, skeletal and statodynamic functions	Normal	21	14	18	12	43	29	66	45
	Mild	17	23	6	8	23	32	27	37
	Moderate	—	—	2	14	3	21	9	64
	Significant	1	9	—	—	4	36	6	55
	Highly significant	—	—	—	—	—	—	4	100
The impairment of the functions of the cardiovascular system functions	Normal	15	13	11	10	28	25	58	52
	Mild	23	19	14	12	37	31	46	38
	Moderate	1	6	1	6	7	41	8	47
	significant	—	—	—	—	1	100	—	—
	Highly significant	—	—	—	—	—	—	—	—
The impairment of the functions of the respiratory system	Normal	21	25	12	14	16	19	34	41
	Mild	9	28	2	6	14	44	7	22
	Moderate	8	18	8	18	16	36	13	29
	Significant	—	—	4	11	14	38	19	51
	Highly significant	1	2	—	—	13	25	39	74
The impairment of the functions of the digestive system	Normal	35	16	21	9	64	29	104	46
	Mild	4	19	5	24	6	29	6	29
	Moderate	—	—	—	—	—	—	—	—
	Significant	—	—	—	—	2	50	2	50
	Highly significant	—	—	—	—	1	100	—	—
The impairment of the functions of the endocrine system and metabolism	Normal	36	16	24	10	68	29	103	45
	Mild	3	21	1	7	4	29	6	43
	moderate	—	—	1	33	—	—	2	67
	Significant	—	—	—	—	—	—	1	100
	Highly significant	—	—	—	—	1	100	—	—

(*continues*)

TABLE 3. Continued

Type of impairment	Degree of severity	The disease stages							
		I		II		III		IV	
		Absolute number	%	Absolute number	%	Absolute number	%	Absolute number	%
The impairment of the functions of the blood and immune system	Normal	2	6	—	—	13	38	19	56
	Mild	—	—	1	50	—	—	1	50
	Moderate	28	49	5	9	5	9	19	33
	Significant	4	8	17	32	28	53	4	8
	Highly significant	5	5	3	3	27	26	69	66
The impairment of the functions of the urinary system	Normal	38	16	25	11	68	29	106	45
	Mild	1	25	1	25	2	50	—	—
	Moderate	—	—	—	—	1	50	1	50
	Significant	—	—	—	—	1	17	5	83
	Highly significant	—	—	—	—	1	100	—	—

proportion of such impairments was accounted for by cases at Stages III and IV. The correlation coefficient between the impairments of the functions of the respiratory system and the disease stages was equal to 0.31, and it was 0.26 between the impairments of the functions of the blood and endocrine system and the disease stages.

Table 4 presents the results of the analysis of the relationship between permanent impairments of the body functions and the symptoms. In the upper cell, you can see a statistically significant correlation coefficient, and in the lower cell you can see the results of the Chi-squared test of the 2×2 table made up in accordance with the order of the degrees of impairment, categorized into two groups (1–3 and 4–5)—normal, mild, moderate, significant, and highly significant—with the greatest difference between them. There is a weak inverse correlation between pain in joints and the function of the blood system (cor = −0.13, P[1–3/4–5] = 0.013). Between pain, weakness in the lower limbs, and neuromuscular, skeletal, and statodynamic dysfunctions, there is a weak correlation direct relationship (cor = 0.14, P[1–2/3–5] = 0.009). The correlation between pain, weakness in the lower limbs, and the impairments of the functions of the urinary system equals to 0.11, P(1–3/4–5) = 0.05. Between headaches and statodynamic function, the correlation equals to 0.09, P(1–3/4–5) = 0.032; the correlation between headaches and the function of the respiratory system is 0.14, P(1–2/3–5) = 0.0057. The correlation between the symptoms of dizziness and the impairment of neuromuscular and skeletal functions is 0.11, P(1–2/3–5) = 0.0015. There is a weak inverse correlation (cor = −0.13), P(1–4/5) = 0.033, between the clinical symptom of cough and the dysfunction of the blood and immune system. There is a direct weak correlation between the shortness of breath and impaired statodynamic function, cor = 0.16, P(1/2–5) = 0.003. The correlation between the shortness of breath and the impairment of the blood and immune system is weak and inverse, (cor = −0.13), P(1–4/5) = 0.002. The correlation between mental disorders and the impaired statodynamic function is 0.1, and the correlation between mental disorders and the impairment of the urinary system is cor = 0.18, P(1–2/3–5) = 0.002.

TABLE 4. Correlation coefficients between clinical symptoms and impaired body functions of disabled people caused by lung cancer.

Symptom	The impairment of neuromuscular, skeletal, and statodynamic functions	The impairment of the functions of the respiratory system	The impairment of the functions of the urinary system	The impairment of the functions of the blood and immune system	The impairment of the functions of the endocrine system and metabolism
Pains in joints				Cor = −0.13 P(1–3/4–5) = 0.013	
Pains and weakness in the lower limbs	0.14 P(1–2/3–5)=0.009		0.11 P(1–3/4–5) = 0.05		
Chest pains				−0.16 P(1–3/4–5) = 0.014	
Headaches	0.09 P(1–3/4–5) = 0.032	0.14 P(1–2/3–5) = 0.057			
Dizziness	0.11 P(1–2/3–5) = 0.015				
Cough				−0.13 P(1–4/5) = 0.033	
Shortness of breath	0.16 P(1/2–5) = 0.003			−0.19 P(1–4/5) = 0.002	
Mental disorders	0.1 P(1–2/3–5) = 0		0.18 P(1–2/3–5) = 0.002		
Weakness and fatigue		−0.17 P(1–4/5) = 0.001			
Fever and high temperature					0.16 P(1/2–5) = 0.053
Edema					0.1 P(1–2/3–5) = 0.003

TABLE 5. Characteristics of the life limitations of disabled people caused by lung cancer (absolute number, %).

Limitation	Degree of severity							
	Normal		I		II		III	
	Absolute number	%	Absolute number	%	Absolute number	%	Absolute number	%
Self-care	20	8.0	112	45.0	81	32.0	37	15.0
Movement	118	47.0	69	28.0	52	21.0	11	4.4
Communication	249	99.6	1	0.4	–	–	–	–
Work	6	2.4	37	15.0	63	25.0	144	58.0

TABLE 6. Characteristics of the life limitations of disabled people caused by lung cancer with regard to surgery interventions (absolute number, %)

Statistics on the relationship between the ITU indicator and the presence of an operation	Category	Number of patients	Got operated	%
Self-care ability P = 0.01 cor = −0.18 Operation = yes, 68 out 132 (51.5%) in group ≤ first degree vs 38 out of 118 (32.2%) in group ≥ second degree (P = 0.003)	Not established	20	8	40
	First degree	112	60	53.6
	Second degree	81	28	34.6
	Third degree	37	10	27
Work capability P = 0 cor = −0.45 Operation = yes, 71 out of 106 (67%) in group ≤ second degree vs 35 out of 144 (24.3%) in group ≥ third degree (P = 0)	Not established	6	1	16.7
	First degree	37	36	97.3
	Second degree	63	34	54
	Third degree	144	35	24.3

The correlation between symptoms of weakness and fatigue and the impairment of the respiratory function is (cor = 0.17), P(1–4/5) = 0.001. The correlation between symptoms of chills and high temperature and the dysfunction of the endocrine system equals to cor = 0.16, P(1/2–5) = 0.053, while the correlation between the edema and the impairment of the functions of the endocrine system is cor = 0.1, P(1–2/3–5) = 0.003. It has been found that disabled people with lung cancer have limitations regarding self-care, 45, 32, and 15% have limitation of first, second, and third degrees, respectively. Movement limitations include 28% limitations of the first degree, 21% of limitations of the second degree, and 4.4% limitations of the third degree. Regarding working limitations, they are of the first degree in 58% of cases, second degree in 25% of cases, and of the third degree in 15% of cases. Regarding self-care limitations, 68 out of 132 (51.5%) disabled people who underwent surgical interventions have the first degree of limitations, and 38 out of 118 (32.2%) have the second degree of self-care limitations; P = 0.003, cor = 0.18.

Among the disabled who underwent surgery, 71 out of 106 (67%) people have the work capability

TABLE 7. The table of correlation between impaired functions and life limitations of the disabled people caused by lung cancer.

Impairment	Self-care	Movement	Communication	Working activity
Language and speech functions	—	—	0.58	—
Neuromuscular, skeletal, and statodynamic functions	0.17	0.27	—	—
Functions of the cardiovascular system	0.12	—	—	—
Functions of the respiratory system	0.3	—	—	0.21
Functions of the blood and immune system	0.14	0.27	—	0.4
Functions of the urinary system	0.17	0.24	—	—

of the first and second degrees, while 35 out of 144 (24.3%) have third-degree work capability.

According to the data in Table 7, a direct correlation is established between the impairments of language and speech functions and the ability to communicate, (k = 0.58). The correlation coefficient between the impairments of neuromuscular, skeletal, and statodynamic functions and the self-care and movement limitations equals to 0.17 and 0.27, respectively. The correlation coefficient between the dysfunctions of the cardiovascular system and self-care limitations is k = 0.12, while the one between the dysfunction of the respiratory system and self-care and limitation and work capability equals to 0.3 and 0.21, respectively. The correlation coefficient between the impairments of the blood and immune system and self-care, movement, and working limitations is 0.14, 0.27, and 0.14, respectively.

CONCLUSION

In the process of analyzing the life limitations caused by lung cancer with respect to clinical data, disease stages, and disability severity, it was found that self-care, movement, and working limitations of the first, second, and third degrees make up the largest share in the structure of life limitations, while communication limitations of the first, second, and third degree constitute the smallest proportion.

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