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PREDICTORS OF CHANGES IN THE COURSE OF BREAST CANCER: THE RESULTS OF LONGITUDINAL STUDY

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ПРЕДИКТОРЫ ИЗМЕНЕНИЯ ТЕЧЕНИЯ РАКА МОЛОЧНОЙ ЖЕЛЕЗЫ: РЕЗУЛЬТАТЫ ЛОНГИТЮДНОГО ИССЛЕДОВАНИЯ

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Objective. To investigate the predictors of changes in the course of breast cancer in a longitudinal study.
Materials and methods. Women with the diagnosis of breast cancer underwent psychological diagnostics at the stage of diagnosis (*n*=201 at the first section of the longitudinal study, *n*=149 at the second section, *n*=94 at the third section, *n*=81 at the fourth section five years after the diagnosis). Methods of research: scale

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of basic beliefs, life orientations test, questionnaire “Ways of coping behavior”, test of vitality, questionnaire of subjective control, personal helplessness questionnaire, quality of life questionnaire.
Results. Predictors of changes in the course of cancer are the basic belief “I-Image”, the level of vitality, the locus of control in relation to health, the course and stage of the disease.
Conclusions. While conducting the study, it was found out that the course of the disease is associated with medical and psychological indicators. The data obtained as a result of the study are necessary for solving practical problems of increasing life expectancy and providing psychological care to women with breast cancer who are a socially vulnerable category of the population of the Russian Federation.
Keywords. Medical psychology; breast cancer; oncopsychology; course of the disease; predictors of the course of the disease; longitudinal study.

Цель. Изучить предикторы изменения течения рака молочной железы в ходе лонгитюдного исследования.
Материалы и методы. Психологическую диагностику прошли женщины с диагнозом рака молочной железы на этапе постановки диагноза ($n = 201$ при первом срезе лонгитюдного исследования, $n = 149$ при втором срезе, $n = 94$ на третьем срезе, $n = 81$ на четвертом срезе по прошествии пяти лет с момента постановки диагноза). Методики исследования: шкала базисных убеждений, тест жизненной ориентаций, опросник «Способы совладающего поведения», тест жизнестойкости, тест-опросник субъективного контроля, опросник личностной беспомощности, опросник качества жизни.
Результаты. Предикторами изменения течения онкологического заболевания выступают базисное убеждение «Образ “Я”», уровень жизнестойкости, показатель локуса контроля в отношении здоровья, течение и стадия заболевания.
Выводы. В результате проведенного исследования обнаружено, что динамика течения болезни связана с медицинскими и психологическими показателями. Полученные данные являются необходимыми для решения практических задач увеличения продолжительности жизни и оказания психологической помощи социально уязвимой категории населения РФ – женщинам с раком молочной железы.
Ключевые слова. Медицинская психология, рак молочной железы, онкопсихология, течение болезни, предикторы течения болезни, лонгитюдное исследование.

Introduction

Breast cancer is the most common cancer among women worldwide, with 2.3 million women diagnosed with breast cancer in 2020. Several factors increase the risk of breast cancer, including older age, obesity, family history of breast cancer, postmenopausal hormone therapy, history of radiation exposure, smoking, and alcohol consumption. Family history increases the risk of breast cancer; however, most women with this diagnosis have no known family history of the disease. The absence of a known family history does not automatically indicate that a woman is at less risk. Risk factors for poor outcome in breast cancer include the size of the primary tumor, histological grade, hormone receptor status, and the presence of regional lymph nodes and distant metastases [1]. Other crucial risk factors for an unfavorable course of cancer include obesity, smoking, alcohol consumption, social factors (e.g., marital status, standard of living, access to medical care), and certain psychological variables [1].

An integrated approach to breast cancer treatment involves linking the aspects of other sciences, including psychology, to medical research. The relationship between the psychological char-

acteristics of patients with breast cancer and disease course and survival has been confirmed in several studies. Cerezo et al. emphasized that "personality traits may influence the psychological adjustment and subjective well-being of breast cancer survivors" [2].

Increased survival is associated with depression [3], role functioning [4], social support [4–7], extraversion [8], participation in religious/non-religious groups [9], having hobbies [10], and having children and a spouse [10], whereas decreased survival with stressful events [11], anxiety/stress [12], hopelessness [12], and depression [7; 13–16]. A meta-analysis by Kim et al. showed a significant effect of depression and/or anxiety on cancer mortality [1].

Presently, the study of the relationship between medical, psychosocial factors, and survival is an urgent problem. However, the results of studying psychological, social, and sociodemographic variables affecting survival and disease outcome do not coincide in different studies.

Therefore, *this study aimed to* examine predictors of change in the course of breast cancer in a longitudinal study.

Verification of predictors of changes in the course of cancer contributes to better understanding of the needs of individual patients and is beneficial for providing appropriate psychological assistance. Investigating predictors of change in breast cancer course over a 5-year period may help in identifying patients at risk for poor disease outcomes.

MATERIALS AND METHODS

A study of the relationship between the psychological characteristics of patients with lung cancer with early diagnosis and subsequent disease course was performed at the Chelyabinsk Regional Clinical Center of Oncology and Nuclear Medicine (Chelyabinsk, Russia). This study assumes the use of a longitudinal method, which can be used to solve the significant problem of the dynamics of the course of the disease in connection with the individual characteristics of the patient with malignant neoplasms. The longitudinal nature of this study enables to note changes in the course of the disease associated with the sociodemographic, medical, and psychological characteristics of women with breast cancer. The longer the period of longitudinal research, the greater the probability and reliability of assessing the effects of the studied predictors of changes in the disease course of women with breast cancer.

During the entire period of the study, considerable unique empirical data were collected and processed. The study involved women aged 45–78 years diagnosed with breast cancer (n = 201 at section 1 of the longitudinal study, n = 149 at section 2, n = 94 at section 3, and n = 81 at section 4, 5 years after diagnosis establishment). When studying psychological predictors of changes in the course of breast cancer, data from section 4 of a longitudinal study were used. Initially, a large sample size of the longitudinal study was planned (201 respon-

dents) owing to the predicted decrease in the number of study participants in subsequent sections due to possible changes in life circumstances (e.g., change of place of residence, etc.), disease outcome (death), and changes in attitude towards treatment (e.g., refusal of any stage of antitumor treatment), and/or research (i.e., refusal of psychodiagnostics). In addition to psychological diagnostics, the sample collected data on the course of the disease over a 5-year period. Then, to study predictors of changes in the course of breast cancer, the sample of respondents was combined into three groups.

1) Patients whose disease course remained unchanged throughout the study (n = 35), including women with stable remission

2) Patients whose disease course changed from unfavorable (generalization, tumor progression) to favorable (remission, stabilization followed by remission) (n = 25)

3) Patients whose disease course changed from favorable (remission) to unfavorable (generalization, relapse, progression, diagnosis of a second concomitant cancer, death due to cancer) (n = 21)

We considered predictors of changes in the course of cancer, namely, disease stage, extent of surgical intervention (i.e., sectoral resection or mastectomy), sociodemographic indicators (i.e., marital status, work status, level of education), behavioral characteristics, and cognitive parameters (i.e., vitality, basic beliefs, locus of control, life orientation), as indicators of personal helplessness/independence.

This study included women with luminal breast cancer who underwent radical surgery. Patients with advanced unresectable breast cancer were excluded.

The study was conducted using standardized authoritative questionnaires that had undergone preliminary psychometric preparation, namely, Janoff-Bulman's Basic Beliefs Scale (adapted by Padun and Kotelnikova), Scheier and Carver's Life Orientation Test (adapted by Tsiring and Evnina), Lazarus' "Methods of coping behavior" questionnaire (adapted by Kryukova, Zamyshlyaeva, and Kuftyak), Maddi's Resilience test (adapted by Leontyev and Rasskazova), Rotter's subjective control test questionnaire (adapted by Bazhin, Golynkina, and Etkind), Tsiring and Stepanenko's questionnaire of personal helplessness, and quality of life questionnaire (SF-36).

The methods of mathematical statistics were methods of descriptive statistics, discriminant analysis (method of step-by-step selection of predictors based on the value of ʎ (Wilks' lambda)). Data on the course of the disease and its changes and the stage of diagnosing breast cancer were obtained from patient medical records.

The study was approved by the Bioethics Committee of the Tomsk National Research State University (Tomsk, Russia) (no. 5, dated February 11, 2021). Patients were informed of the aims and objectives of the study and signed written informed consent for participation.

RESULTS AND DISCUSSION

Discriminant analysis was used to determine the set of predictors associated with changes in the course of breast cancer, which resulted in a list of variables classifying the sample of respondents with different courses of cancer over 5 years. The predictors were methods of coping behavior, cognitive characteristics, systemic personal characteristics (personal helplessness/independence), and sociodemographic and medical parameters, and the grouping factor was the subject's assignment to a group depending on whether the course of the disease had changed or not.

Discriminant analysis results revealed that 92.1 % of the original grouped cases were classified correctly. Table 1 presents the coefficient ϧ (Wilks' lambda), *F*-criterion, and significance level, characterizing significant differences for each of the studied variables for groups of patients with different disease courses.

Moreover, the results showed with a high degree of significance that belonging to groups of subjects, depending on changes in the course of the disease over 5 years, is determined by indicators of resilience, the pronouncement of the basic belief "self-image", internality in relation to health, as well as the course and stage of the disease.

According to the data obtained, the sociodemographic variables considered in this study were not predictors influencing changes in the course of cancer. The characteristics used as discriminant variables (Table 1) were used as variables, and the differences in which between groups of women with different disease courses over 5 years were significant.

Table 2 presents the values of the discriminant functions.

Table 1

Discriminant analysis results: Wilks' lambda coefficients, *F*-test values, and significance level

Parameter	Wilks' lambda	*F*	*P*
Disease course	0.234	44.151	< 0.001
Basic belief "self-image"	0.105	17.368	< 0.001
Resilience	0.07	16.714	< 0.001
Disease stage	0.026	18.968	< 0.001
Internality in the field of health	0.017	20.077	< 0.001

Table 2

Discriminant analysis results: basic statistics of the canonical discriminant function

Function	Personal value	Proportion of explained variance, %	Wilks' lambda	Chi-square	*p*
1	16.959	88.1	0.017	97.93	< 0.001
2	12.295	81.9	0.303	88.61	< 0.001

Research results showed that the presented discriminant functions are informative and explain 88.1 % and 81.9 % of the variance. Considering the value of ϰ = 0.017 and ϰ = 0.303 with statistical significance $p < 0.001$, we conclude that the set of discriminant variables has good discriminative ability. Thus, changes in the course of the disease in women with breast cancer depend on the level of resilience, self-image, internal locus of control regarding health, and stage and course of the disease.

Furthermore, the study results revealed that women with stable remission (5 years) have a more pronounced belief in their own significance, are convinced that they are worthy of love and respect compared to patients whose disease course changed during the study ($M_1 = 31$; $M_2 = 20$; $M_3 = 29.5$ [hereinafter, M_1 is the average value of the indicator for patients whose disease course has not changed, M_2 is the average value of the indicator for patients whose disease course has changed from favorable to unfavorable, and M_3 is the average value of the indicator for patients whose disease course has changed from unfavorable to favorable]). Women with breast cancer, whose disease course changed from favorable (remission) to unfavorable (generalization, relapse, progression, diagnosis of a second concomitant cancer, death due to cancer) during a longitudinal study, are less likely to consider themselves attractive and interesting, have low opinion about themselves, and pay attention primarily to their own shortcomings, and not to their merits. Nevertheless, this group of patients has high resilience indicators ($M_1 = 80.48$; $M_2 = 81$; $M_3 = 65.25$). Regarding resilience, attention is drawn to the fact that patients whose disease course has changed from unfavorable to favorable have a low degree of resilience compared to those whose disease course has not changed or has changed from favorable to unfavorable. Women who have coped with unfavorable disease course have a low level of resilience. According to Leontiev, "resilience is a trait characterized by the degree to which a person overcomes given circumstances, and ultimately by the degree to which a person overcomes himself" [17]. However, the present study found conflicting findings regarding resilience, which requires further consideration. Most likely, in combination with other psychological characteristics, particularly with a positive self-image and externality in relation to health, a low level of resilience enables women to trust specialists and follow recommendations while maintaining a positive image of themselves. These features appear to protect against psychological maladaptation, helping patients cope more effectively with the cancer experience.

Locus of control is another predictor of changes in the course of breast cancer ($M_1 = 1.56$; $M_2 = 12$; $M_3 = 3.5$). According to the data obtained, internality in relation to health was expressed in patients with a change in the course of the disease from favorable to unfavorable compared to those whose course of the disease has not changed or has changed from unfavorable

Table 3

Results of discriminant analysis: coefficients of the canonical discriminant function

Function	Self-image	Internality in relation to health	Resilience	Disease stage	Disease course
1	−2.968	0.668	2.042	0.987	1.802
2	−1.803	0.441	1.605	0.594	1.292

to favorable. Women with breast cancer, characterized by an unfavorable course of the disease by the year 5 of the study, tend to rely on themselves in matters of health, consider themselves responsible for the state of their health, usually find the causes of the disease in themselves, and believe that recovery largely depends from their own actions. The listed features, combined with negative self-image and high level of resilience, are predictors of changes in the course of breast cancer from favorable to unfavorable.

Table 3 presents the coefficients of the standardized canonical discriminant function, which characterize the contribution of each variable to the value of the discriminant function, considering the influence of other variables.

The basic belief of self-image, resilience, and the course and stage of the disease greatly contribute to the value of the discriminant function that separates women depending on the change in disease course. Thus, in addition to psychological predictors of changes in the course of breast cancer, the set of discriminant variables that determine belonging to groups of subjects depending on changes in the disease course includes medical parameters of the stage and course of the disease. Patients whose disease course has changed from favorable to unfavorable are at stages III and IV of the disease and are characterized by an unfavorable course of the disease (mainly generalization and progression of the disease) when compared with data from patients whose disease course has not changed or changed to favorable during the longitudinal study.

CONCLUSIONS

The study of predictors of changes in the course of breast cancer is longitudinal, which shows the dynamics of the disease course associated with subjective psychological factors and the individual characteristics of the sick person over a 5-year period. The longer the period of longitudinal research, the greater the probability and reliability of assessing the effects of the studied predictors during the disease course of women with breast cancer.

The study results established that the dynamics of the disease are associated with medical and psychological indicators. The stage and course of the disease, basic belief about the significance and value of own "self", and level of resilience and locus of

control in relation to health are significant predictors of changes in the course of breast cancer.

The data obtained are crucial for solving problems of increasing life expectancy and providing psychological assistance to a socially vulnerable category of the population of Russia, namely, women with breast cancer. Understanding the mechanisms underlying psychological factors in survival is key to helping patients. The results can serve as basis for developing a system of psychological support for patients with malignant neoplasms at various stages of diagnostics and treatment.

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