

RESEARCH ARTICLE

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Subjective and Personal Characteristics of Women with Breast Cancer: A Factorial Model of Disease Risks and the Course of Disease

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Abstract

Objective: The purpose of this study was to evaluate psychological factors influencing the incidence of breast cancer in women. **Methods:** Basic beliefs, coping strategies, hardiness, subjective control, personal helplessness and independence were studied in 184 women, of which 80 women diagnosed with breast cancer, 104 women without a cancer diagnosis. All study participants completed psychodiagnostic methods and sociodemographic questionnaires. First, we analyzed differences in the psychological characteristics of women depending on the presence of an oncological diagnosis (F - Fisher's test). Second, we conducted factor analysis (principal component analysis with Varimax with Kaiser Normalization) to obtain psychological risk factors for breast cancer in women. **Results:** Distinctive psychological characteristics of women with breast cancer have been discovered. Women with breast cancer underestimate their worth and importance ($p=0.021$), as well as their luck ($p=0.006$) and the ability to control events in their lives ($p=0.019$). Women with breast cancer are very independent (arrogance) ($p=0.000$), rarely use confrontation-type coping ($p=0.05$), positive reappraisal ($p=0.05$), and planful problem-solving ($p=0.035$). Women diagnosed with breast cancer have an external locus of control ($p=0.002$), and are low hardiness ($p=0.029$). The listed features that distinguish women with breast cancer from cancer-free women were considered as probabilistic psychological risk factors for breast cancer. As a result of factor analysis, a model was obtained that included psychological factors associated with breast cancer in women: Independence (arrogance) (28.88% of variance), Belief system (24.83% of variance), Maladaptive coping (20.17% of variance). **Conclusions:** Extreme independence, beliefs about one's failure, insignificance and inability to control life, as well as maladaptive coping are probabilistic psychological risk factors for breast cancer among Russian women.

Keywords: Breast cancer- risk factors- coping, beliefs- independence

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Introduction

Breast cancer is the most common type of cancer among women and is associated with numerous risk factors (Bray et al., 2018). In 2018, there were a total of 2.1 million new cases of breast cancer registered worldwide and 0.63 million deaths from breast cancer, with a trend towards an increase in most countries (GBD, 2018). Lack of knowledge about symptoms, incidence and prevention can lead to late diagnosis and decreasing of survival rate, that underscores the need to identify risk factors for breast cancer and describe risk models to be included in breast cancer control programs. Women at high risk for breast cancer should be offered more intensive screening and preventive measures.

Psychological factors are gaining attention as potential factors that may affect the risk of developing breast cancer. An accurate and individualised assessment of the risk of

breast cancer plays a central role in making decisions regarding the strategy for preventing the development of the disease. Psychosocial risk factors allow for a more precise differentiation of the risk of developing the disease, which will ensure a personalised approach for prevention and treatment, as well as early detection of breast cancer. Psychological factors leading to the development of malignant neoplasms have been described in a number of studies (Ren et al., 2022; Wang et al., 2020; Sun et al., 2015; Yeh and Lee, 2016; Butow et al., 2000; Bleiker and Ploeg, 1999; Cooper and Faragher, 1993; Price et al., 2001; McKenna et al., 1999; Lutgendorf et al., 2010).

Some authors point out that psychological factors such as a tendency to depression, anxiety, emotional suppression, experiencing severe life events, coping strategies, an absence of emotional and social support, implication of protective mechanisms such as denial and suppression, an avoiding conflict style in difficult

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situations, and chronic stress have been identified as risk factors for the development of malignant neoplasms (Yeh and al., 2016; Yıldırım et al., 2018). However, retrospective and prospective studies have provided contradictory evidence on the presence of psychological factors as a precursor to breast cancer (Bleiker et al., 2008; Lillberg et al., 2001; Zainal et al., 2021).

The absence of confirmation of the significance of psychological risk factors is explained by the small sample size, low representativeness, short observation period, and methodological shortcomings of conducted studies. Scientists note that the psychological component can indirectly affect the development of breast cancer. For example, dissatisfaction with life, psychological traumas, and personality traits can lead to risky behaviour, harmful habits, an unhealthy lifestyle, which will subsequently result in the onset of cancer (Kim et al., 2017; Ellingjord-Dale et al., 2018).

This study examines a set of subjective personal characteristics as psychological risk factors for the development of breast cancer. Firstly, these are the personality characteristics such as helplessness/independence are considered. Previous researches have shown that personality characteristics of those with oncological diseases such as increased anxiety, tendency to depression, and pessimistic attributional style reduce psychological resources in overcoming illness (Zhilayeva, 2008; Arpentieva, 2016). In this regard, it is important to study the role of these indicators not only in survival but also as risk factors for breast cancer. These characteristics are included in the symptom complex of learned helplessness (Tsiring, 2010).

Among the psychological factors that have a positive impact on the course of oncological diseases, contribute to improving patients' quality of life and increase life expectancy there are such characteristics as optimism, determination, belief in a better outcome and experiencing positive emotions (Bukhtoyarov, 2006). These characteristics correspond to the signs of independence as a phenomenon that is opposite to personality helplessness, which will also be studied in this work.

Secondly, this study analyses cognitive beliefs (locus of control, basic belief systems, life orientations and Hardiness). In modern psychological science, cognitive beliefs among women with breast cancer are studied on two levels: content and regulatory. In domestic research, the studies that describe the content of cognitive beliefs, their connection with psychological trauma, and post-traumatic syndrome predominate (Padun and Kotelnikova, 2012). There are also studies by Sirota N.A. et al. (Sirota et al., 2016; Sirota et al., 2018) related to the metacognitive level. A review of foreign research practice confirms the relevance of the metacognitive approach to studying cognitive features of cancer patients, showing the peculiarities of metacognitive beliefs of women with breast cancer and their interrelation with chronic fatigue, fear of disease recurrence, as well as proving the effectiveness of psychotherapy based on the metacognitive approach (Millar et al., 2005; Mutlu et al., 2018; Thewes et al., 2013; Cheli et al., 2019).

Regarding the locus of control, it should be noted that during the review of research data, three tendencies were identified in the study of this phenomenon in patients with cancer:

1) the positive role of an internal locus of control during the disease, contributing to a positive trend in recovery (Goldzweig et al., 2016; Van der Biessen et al., 2018);

2) the positive effect of an external locus of control on the state during treatment and its outcomes (Allart et al., 2013; Cousson-Gelie, 2014; Lima et al., 2018);

3) the absence of a correlation between the locus of control and various aspects of cancer (Iskandarsyah et al., 2014).

Therefore, the literature provides contradictory data on the relationship between cognitive characteristics and cancer. This makes it important to study basic (cognitive) beliefs, life orientations, locus of control, and hardiness as psychological risk factors for breast cancer.

Thirdly, the specificity of coping behaviour is related to the ability to overcome stress and difficult life situations. The theoretical analysis highlights the relevance of studying coping features in the context of oncological diseases compared to respondents without a history of cancer (Sizova and Tsiring, 2019). It has been shown that cancer patients, perceiving the disease and the likelihood of its progression as controllable, cope with difficulties using problem-focused strategies and positive reappraisal of current conditions (Moskovchenko, 2016). Besides, malignant tumor patients are more inclined to psychological defense mechanisms in complex situations than to conscious coping strategies (Rusina, 2011). The data obtained on the role of coping behavior allows one to include it in the system of risk factors for breast cancer development.

These psychological factors would allow the consideration of the personality of a breast cancer patient in a multiple coordinate system and identify risk factors for breast cancer among Russian women.

The study aims to identify the psychological characteristics of Russian women diagnosed with breast cancer. The hypothesis that there are psychological characteristics of women with breast cancer related to the risk of the disease is being tested in the study.

Materials and Methods

Study design

The study is aimed at identifying the psychological characteristics of Russian women diagnosed with breast cancer at various stages. The study tests the hypothesis that there are psychological characteristics of women with breast cancer associated with disease risk that form a factor model.

Patients and methods

To test the hypothesis, two groups of study participants were formed: women with a verified diagnosis of breast cancer (N=80) and women without a history of cancer diagnosis (N=104). The inclusion criteria for subjects in

the first group were: 1) age from 25 to 80 years; 2) verified oncological diagnosis - breast cancer at various stages of the disease, who first sought professional medical help no earlier than 6 months at the time of participation in the study. The criteria for inclusion of study participants in the second group: 1) age from 25 to 80 years; 2) no history of cancer diagnosis.

The total number of study participants was 184 women living in Russia (Chelyabinsk region), the average age of the participants was 53.8 years.

The following survey methods were used as methods for diagnosing psychological risk factors for breast cancer

1. Basic Beliefs Scale (Padun and Kotelnikova, 2008).

This questionnaire, based on the cognitive concept of a person's basic beliefs, includes 5 subscales (37 items). The main purpose of the technique is clinical and psychological diagnosis of people who have experienced mental trauma and are presumably in a state of depression.

2. Questionnaire "Methods of coping behavior" (Kryukova, 2010). This methodology includes 50 assumptions grouped into 8 scales to identify coping strategies: confrontation, distancing, self-control, seeking social support, accepting responsibility, avoiding/escaping, planning the steps to solve the problem and reinterpreting the stressor as a positive or growth-oriented experience. The answered how often they tended to resort to using strategies in difficult life situations.

3. Test of vitality (Leontyev and Rasskazova, 2006). This method allows to assess one's belief system about themselves, the world, and relations with it. The test includes 45 questions, direct and reverse, of 3 scales: engagement, control, and accepting risk.

4. Subjective control test questionnaire (Bazhin et al., 1984). The technique assesses the degree of a person's readiness to take responsibility for what happens to him in various areas of his life, has 44 questions, forming 7 scales.

5. Questionnaire of personal helplessness - independence. The questionnaire is based on the concept of personal helplessness by D. A. Tsiring and assesses the systemic psychological characteristic of the subject - personal helplessness, or its opposite - independence. The questionnaire diagnoses, among other things, the components of personal helplessness - independence: motivational, cognitive, emotional, volitional and consists of 131 questions.

6. Demographic Questionnaire: Demographic characteristics that were measured included age, education level, marital status, employment status, income.

7. Clinical data on tumor type, stage of cancer, etc.

The survey was conducted in the period 2021-2022. The research procedure involved an individual, face-to-face survey of women with breast cancer. The study was approved by the Bioethics Committee of the Federal State Autonomous Educational Institution of Higher Education "National Research Tomsk State University" (Tomsk, Russia) (No. 5 of February 11, 2021). Patients were informed about the aims and objectives of the study and signed written informed consent for the study. At the

request of the study participants, the latter were given feedback on the results of undergoing psychological diagnostics during an individual consultation.

Women without a history of cancer diagnosis participated in the survey remotely using Google Forms, and they were also provided with a consultation with a psychologist based on the survey results.

Statistical Analysis

Data were analyzed using IBM SPSS software version 24.0 for Microsoft (SPSS Corp., Armonk, NY, USA) to analyze psychological disease risk factors in women with breast cancer. In this study, when analyzing the data, first of all, descriptive statistics were carried out by calculating the average values of psychological predictors: basic beliefs, coping methods, indicators of personal helplessness, indicators of subjective control, indicators of vitality. Next, using the 12 observed psychological variables, factor analysis was carried out using the method of principal components with Varimax rotation and Kaiser normalization. Factor analysis was used to establish relationships between psychological variables that pose want to develop a common factors model to determine the factors associated with breast cancer. $P < 0.05$ was considered statistically significant.

Results

Sample description

Overall, 184 Russian women who met the inclusion criteria participated in the study. Among the participants with breast cancer, the average age was 55.7 years, the majority of them had secondary vocational education (56.2%), were married (48.7%), had an average income (63.7%), and worked full time (42.5%). The average age of participants without an oncological diagnosis was 51.9 years, the majority of whom had a higher education (75%), were married (64.4%), had an average income level (61.5%), and worked full time (79.8%). All study participants were residents of the city of Chelyabinsk. The demographic characteristics of study participants presented in Table 1.

For women with breast cancer, the disease was diagnosed no earlier than 6 months from the time of the survey. All patients had a luminal type tumour. The moderately differentiated invasive carcinoma of the breast was more common, with 60% of cases, followed by well-differentiated cancer in 37.5% of cases, and one case each of poorly differentiated cancer and Gx. In terms of localisation, patients with left breast cancer were more commonly found, with 63.7% of cases. Given that the study included patients who underwent radical treatment surgery, the distribution by stages was as follows:

Stage I - 58.7%,

Stage II - 26.3%,

Stage III - 15%.

The clinical characteristics of research participants presented in Table 2.

The differences in psychological characteristics of women depending on the presence of an oncological diagnosis.

Table 1. Demographic Characteristics of Research Participants (n=184)

| Characteristics | Participants diagnosed with breast cancer (n=80), n(%) | Participants without breast cancer (n=104), n(%) |
|--------------------------------|---|---|
| Age, years (average±SD*) | 55.7±12.16 | 51.9±13.78 |
| Education | | |
| high education | 31 (38.7) | 78 (75) |
| Secondary vocational education | 45 (56.2) | 20 (19.2) |
| Vocational education | 4 (5) | 6 (5.7) |
| Marital status | | |
| Married | 39 (48.7) | 67 (64.4) |
| Not married | 15 (18.7) | 20 (19.2) |
| Divorced | 13 (16.2) | 16 (15.3) |
| Widowed | 13 (16.2) | 1 (0.9) |
| Income level | | |
| Higher than average | 6 (7.5) | 9 (8.7) |
| Average | 51 (63.7) | 64 (61.5) |
| Lower than average | 11 (13.7) | 18 (17.3) |
| Low | 7 (8.7) | 7 (6.7) |
| Critically low | 3 (3.7) | 6 (5.8) |
| Employment | | |
| Working full-time | 34 (42.5) | 83 (79.8) |
| Working part-time | 4 (38.4) | 2 (1.9) |
| Unemployed | 15 (18.6) | 17 (16.3) |
| Retired | 27 (33.5) | 2 (1.9) |
| Residents of the city | 80 (100) | 104 (100) |

As shown in Table 3, the results of one-way ANOVA showed that women diagnosed with breast cancer have lower fundamental beliefs compared to healthy women, specifically Self-Image ($p=0.021$), Luck ($p=0.006$), and Control Belief ($p=0.019$). Women diagnosed with cancer no later than 6 months prior to the survey report

Table 2. Clinical characteristics of Research Participants (n=80)

| Characteristics | n (%) |
|------------------------------|-----------|
| Type of tumour | |
| Luminal | 80 (100) |
| Differentiating tumor | |
| Moderately differentiated | 48 (60) |
| Highly differentiated | 30 (37.5) |
| Low-grade differentiated | 1 (1.3) |
| Gx | 1 (1.3) |
| Stage diagnosis | |
| Stage I | 47 (58.7) |
| Stage II | 21 (26.3) |
| Stage III | 12 (15) |
| Distribution by localisation | |
| Right | 29 (36.3) |
| Left | 51 (63.7) |
| Type of treatment | |
| Mastectomy | 80 (100) |

less use of coping strategies such as Confrontation ($p=0.05$), Planful problem-solving ($p=0.035$), and Positive reappraisal ($p=0.05$). Women with breast cancer have low powerlessness scores, are extremely independent ($p=0.000$), which sets them apart from women without cancer. Women diagnosed with breast cancer have an external locus of control ($p=0.002$). The willingness to take risks and the level of hardiness in women with oncological diagnosis are lower than in healthy women ($p=0.001$, $p=0.029$). The obtained set of distinctive features of women with breast cancer can be considered as probable factors of the disease in Russian women.

To build a model of psychological risk factors for breast cancer in Russian women, factor analysis was carried out. A scree plot representing the eigenvalues of the factors ordered by magnitude demonstrates that we can identify three factors. Calculation of the Kaiser-Meyer-Olkin criterion of sampling adequacy showed that factor analysis is applicable to this sample (0.653). Bartlett's test of sphericity ($p < 0.001$) also indicates that the data are suitable for factor analysis. Next, using the method of principal components with varimax rotation, we obtained a factor model, which consists of 3 factors that explain 73.88% of the total variance - more than a half, which is considered to be an acceptable result. The factor structure of indicators of psychological risk factors for breast cancer, obtained as a result of a survey of women with breast cancer ($n = 80$), is presented in Table 4.

Table 3. Univariate Analysis of Differences in Psychological Characteristics of Women Depending on the Presence of an Oncological Diagnosis (n=80)

| Psychological characteristics | Participants diagnosed with breast cancer (n=80), M±SD | Participants without breast cancer (n=104), M±SD | P |
|--|--|--|---------|
| Basic beliefs | | | |
| Image of self | 29.37±5.31 | 31.13±4.75 | 0.021* |
| Luck | 32.45±6.85 | 34.9±5.40 | 0.006* |
| Belief in control | 25.88±4.23 | 27.28±3.74 | 0.019* |
| Coping strategy | | | |
| Confrontation | 8.81±3.12 | 9.68±3.02 | 0.05* |
| Planning of problem solving | 11.68±3.73 | 12.76±3.05 | 0.035* |
| Positive reevaluation | 12.85±4.30 | 13.96±3.67 | 0.05* |
| Personal helplessness | 16.92±18.72 | 57.93±14.45 | 0.000** |
| Motivational component | 4.49±5.01 | 14.19±4.46 | 0.000** |
| Cognitive component | 4.04±4.07 | 12.5±3.51 | 0.000** |
| Emotional component | 4.35±5.57 | 14.98±6.09 | 0.000** |
| Volitional component | 3.95±4.77 | 16.25±5.37 | 0.000** |
| Locus of control | | | |
| General internality | 11.09±17.98 | 20.39±20.31 | 0.002* |
| Internality in achievement | 4.51±7.60 | 6.76±7.64 | 0.05* |
| Internality in failure | 0.65±7.48 | 3.93±6.64 | 0.002* |
| Internality in family relations | -0.72±5.32 | 1.92±5.87 | 0.002* |
| Internality in interpersonal relationships | 1.20±3.89 | 2.53±3.72 | 0.023* |
| Resilience | 71.81±22.69 | 78.40±17.20 | 0.029* |
| Risk acceptance | 13.95±7.45 | 16.93±4.55 | 0.001* |

Table 4. Factor structure of indicators of psychological risk factors for breast cancer (based on a survey of women with breast cancer, n = 80)

| Characteristics | Factor loading | | |
|---|----------------|----------|----------|
| | Factor 1 | Factor 2 | Factor 3 |
| Motivational component of self-reliance | 0.969 | | |
| Cognitive component of self-reliance | 0.962 | | |
| Emotional component of self-reliance | 0.939 | | |
| Volitional component of self-reliance | 0.935 | | |
| Resilience | | 0.853 | |
| Belief in luck | | 0.697 | |
| Externality | | 0.683 | |
| Belief in control | | 0.646 | |
| Conviction of one's own worth and self-importance | | 0.562 | |
| Confrontation | | | 0.781 |
| Planning of problem solving | | | 0.774 |
| Positive reevaluation | | | 0.742 |

Discussion

We combined the factor contents and factor loadings of the three factors into a block design in Table 5. The study is devoted to psychological factors affecting the etiology of breast cancer in Russian women. This study differs from other works on psychological factors of breast cancer by its set of instruments. Traditionally, anxiety, depression, and

stress are the focus of researchers studying psychological factors of cancer. In this study cognitive beliefs, coping, autonomy, Hardiness, and locus of control were studied.

The results of the factor analysis allow for the following interpretation. The first factor is represented by psychodiagnostic indicators of self-confidence. Self-confidence as a psychological risk factor for breast cancer in women living in large cities explains 28.88% of the variance, which indicates greater weight than all other factors obtained. Independence, as a systemic quality, defines a special realization of subjectivity, which manifests itself in interaction with the world, in particular, a person's high ability to transform reality, manage the events of his own life, set and achieve goals, overcoming various difficulties (Tsiring, 2010). Independence is manifested in activities that ensure increased success and in the behavior of the subject. Independence, representing a systemic quality that combines the characteristics of the cognitive, motivational, emotional and volitional spheres of the individual, is associated with the characteristics of individual resources on the basis of which the subject's life is realized. Extremely high rates of self-reliance may be associated with the risk of breast cancer among Russian women, as such behavior may manifest itself in excessive self-confidence and arrogance. This behavior can be risky in relation to health and compliance with doctors' recommendations. Let's call this factor "Independence (arrogance)."

The second factor is represented by beliefs about one's own insignificance, failure, and the inability to

Table 5. Contents of Breast Risk Factors in Women (Factorial Model of Disease Risks and the Course of Diseases)

| Number of the factor | The specific weight of a factor % | Filling factor | Factor name |
|----------------------|-----------------------------------|--|---------------------------|
| 1 | 28.88 | Motivational component of self-reliance (0.969) Cognitive component of self-reliance (0.962) Emotional component of self-reliance (0.939) Volitional component of self-reliance (0.935) | Self-reliance (arrogance) |
| 2 | 24.83 | Low hardiness (0.853) Belief about failure (0.697) Externality (0.683) Belief that life cannot be controlled (0.646) Belief about one's own insignificance (0.562) | Belief System |
| 3 | 20.17 | Confrontation (0.781) Planful problem-solving (0.774) Positive reappraisal (0.742) | Maladaptive coping |

control one's own life. This belief system also includes a belief about external causes of success and failure (external locus of control), and a belief system that is vulnerable to the emergence of internal tension in stressful situations (hardiness). This factor accounts for 24.83% of the total variance. The interaction of these variables forms a psychological factor, which we refer to as "Belief System," associated with the risk of breast cancer among Russian women.

The final third factor, with 20.17% of explained variance, included coping strategies called "maladaptive coping." The structure of this factor includes confrontation-type coping, planful problem-solving, and positive reappraisal. However, the meaning of these copings demonstrates their non-adaptive nature. The obtained values indicate that women with breast cancer do not have a strong preference for any one type of coping strategy; they use each in moderation. This hidden factor may be associated with the risk of breast cancer in Russian women.

In conclusion, currently, there is no reliable way to prevent breast cancer. Predisposition to the disease and risk factors are determined by a number of variables that increase the chances of developing it. Some risk factors are controllable and can be corrected by the patient and healthcare professionals such as doctors, psychologists, and psychotherapists. These risk factors include lifestyle factors (diet, physical activity, smoking, use of hormonal medications, etc.), psychological characteristics of the patient (tendency towards depressive reactions, emotional restraint, feelings of guilt and insecurity, prolonged stress, etc.).

This study has shown that extreme self-reliance, indicators of cognitive beliefs, coping, externality, and Hardiness may be associated with the incidence of breast cancer among Russian women. Furthermore, these factors have a structure, and each component contributes a certain amount to the overall picture.

These results suggest that medical staff should pay more attention to women's mental health and provide more information about breast cancer prevention, especially for those with low levels of education. There are reports

in the literature that investigate the relationship between breast cancer and psychological factors. While this study yielded some valuable results, there may have been inevitable emotional reactions to the diagnosis and the start of anti-tumor treatment. Furthermore, the period of up to 6 months at the time of women's participation in the survey is insufficient to form psychological characteristics that were not inherent to them before diagnosis.

This study showed that psychological assistance is essential for women with breast cancer, and cannot be ignored. The essence of providing psychological assistance to women with breast cancer is not only to alleviate their moral and psychological suffering but also to enhance the effect of treatment and thus increase survival. It is necessary to include psychological rehabilitation programs in the protocol of treatment for women with breast cancer to enhance the effect of treatment, improve their quality of life, and promote their health.

Author Contribution Statement

All authors contributed equally in this study.

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Approval

This study was approved by the Committee on Bioethics of Tomsk State University [date: 11/02/2021, No. 5 (7)]. Written informed consent was obtained from each respondent before administering the questionnaire. The nature of the study was adequately communicated to the participants and their right to withdraw from the study at any point in time was made voluntary. The participants were assured of confidentiality, as their names were not be required for the study.

Availability of data

Available upon demand.

Conflict of Interest

No conflict of interest.

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