

# Can personality traits affect the quality of life of women with the *BRCA1/BRCA2* mutations before and after prophylactic adnexectomy?

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**Abstract.** – **OBJECTIVE:** Ovarian, fallopian tube, and peritoneal carcinomas are the most common hereditary gynecological cancers associated with the *BRCA1* and *BRCA2* mutations. It is recommended to radicalize management, using RRSO. Personality traits are regarded as significant contributors to human QoL and adaptability to the changed conditions of functioning. The aim of this study was to demonstrate the effect of personality on the QoL of women with the *BRCA1* and *BRCA2* mutations before and after RRSO.

**PATIENTS AND METHODS:** The study involved 62 patients with the *BRCA1* and *BRCA2* mutations referred to hospital for RRSO. The research instruments were the WHQ, NEO-FFI, and self-developed sociodemographic data collection tool.

**RESULTS:** Highly neurotic patients with the *BRCA1* and *BRCA2* mutations had lower QoL, especially in the domains of depressed mood, anxiety/fears, and sleep problems. At the same time, higher levels of conscientiousness, openness to experience, extroversion, and agreeableness were associated with better QoL outcomes.

**CONCLUSIONS:** (1) Personality traits can contribute to the QoL of women with the *BRCA1* and *BRCA2* mutations before and after RRSO. (2) Identification of personality traits may be an important prognostic factor indicating potential changes in the QoL of patients after RRSO.

*Key Words:*

Personality traits, Quality of life, *BRCA1*, *BRCA2*, Prophylactic adnexectomy.

## Introduction

Ovarian, fallopian tube, and peritoneal carcinomas are the most common hereditary gynecological

cancers associated with the presence of the *BRCA1* and *BRCA2* mutations. Due to non-specific symptoms, their early detection and treatment are still difficult, which often results in diagnosing cancer at a late-stage of disease. In addition, the available screening tests are not sufficiently effective. Hence, the recommendations to radicalize management, using risk-reducing salpingo-oophorectomy (RRSO), in order to decrease the mortality rate among women with a genetic risk.

Such surgeries are recommended for women over 35 years of age and those whose reproductive plans are completed. They significantly affect many aspects of functioning, leading to a loss of fertility and to climacteric symptoms<sup>1</sup>. Postoperative menopause has numerous health, psychological, and social consequences, such as depressed mood, sleep problems, psychosexual dysfunction, a decline in cognitive function, and difficulties in fulfilling roles in society<sup>2</sup>. Both genetic predisposition to cancer, and the need to take radical measures in this regard may generate psychosocial dysfunctions, cause a decline in quality of life (QoL), and have serious consequences for mental health. Patients who decide to undergo prophylactic adnexectomy are in most cases aware of the advantage of this operation over its negative consequences. Despite this, such a procedure can adversely affect patients' health, functioning, and general well-being.

In medical and health sciences, the more appropriate term of health-related quality of life (HRQoL) is used to describe the physical, mental, and social well-being of an individual, and to in-

dicating its relationship with health status. HRQoL is usually measured using health self-assessment tools and interpreted in the context of a given disease or disability. The HRQoL measurement is particularly useful in the provision of health services, as it allows to determine the impact of disease and its treatment on various dimensions of life. An undoubted advantage of having access to HRQoL reports is the opportunity to use them to improve the quality of treatment and patient care, especially in terms of the functioning of health care systems<sup>3-6</sup>.

One of the most important factors that determine the adaptive processes of an individual in the environment is personality, defined as a set of relatively constant human characteristics. Personality traits are regarded as significant contributors to human QoL and adaptability to the changed conditions of functioning, associated with diagnosis or coexistence of the disease. Strong neuroticism predisposes to depressive and anxiety symptoms, as well as a negative emotional response to stress<sup>7-9</sup>. According to Lai et al<sup>10</sup>, personality traits are strongly correlated with HRQoL in patients with breast cancer. These authors observed that neuroticism was strongly associated with the physical and mental components of HRQoL<sup>10</sup>. Similarly, Izci et al<sup>11</sup> concluded that highly extroverted women with breast cancer are characterized by lower levels of anxiety and depression, which translates into better QoL, while the QoL of highly neurotic patients is likely to be lower.

A holistic approach to the patient, which is the foundation of modern medicine and public health, is the reason why a psychological component is taken into account in the context of various disease entities.

Women with the *BRCA1* and *BRCA2* mutations who decide to undergo RRSO face numerous physical and mental problems. Hence, attempts to determine the influence of personality traits on QoL seem to be important from the point of view of care for this group of patients.

The purpose of this study was to demonstrate the impact of personality traits on the QoL of women with the *BRCA1* and *BRCA2* mutations before and after RRSO.

## Patients and Methods

The study involved 62 patients with the *BRCA1* and *BRCA2* mutations, referred to hospital for RRSO. The questionnaires of one patient were

excluded from further analysis as she did not meet the inclusion criteria (presence of the *CHEK2* mutation). The project was approved by the Bioethical Commission of the Pomeranian Medical University, Szczecin (Poland) (approval No. KB-0012/117/15). The inclusion criteria were: the documented *BRCA1* or *BRCA2* mutations, a normal cytology result, the documented CA125 and HE4 test results within normal limits, not using menopausal hormone therapy (MHT), and the patient's informed written consent to participate in the research. The exclusion criteria were: suspicion of ovarian cancer or changes in the vicinity of the appendages requiring further diagnosis or surgical intervention other than prophylactic surgery, and using MHT. This survey-based study was carried out in two stages:

- before prophylactic surgery of the reproductive organs (during hospitalization) – via a direct contact with the patients and the delivery of the questionnaires directly to them;
- one year after prophylactic surgery of the reproductive organs (having obtained the result of histopathological examination) – via e-mail, phone, mail, or a direct contact, depending on the patient's preferences and location.

The QoL of the women with the *BRCA1* and *BRCA2* mutations, before and after prophylactic surgery of the reproductive organs, was analyzed using the following self-designed and the standardized research instruments:

- the two-version self-developed sociodemographic data collection tool;
- the Polish adaptation of the Women's Health Questionnaire (WHQ);
- the Neuroticism-Extroversion-Openness-Five Factor Inventory (NEO-FFI).

The self-developed sociodemographic data collection tool consisted of two versions:

**Version 1** – was completed by the patients before prophylactic surgery; it included sociodemographic and medical data;

**Version 2** – was completed by the patients after about one-year interval from prophylactic surgery of the reproductive organs.

The mean time from the prophylactic surgery of the reproductive organs (between the first and the second stage of the research) was 353 days.

The Women's Health Questionnaire (WHQ) is a measure of self-reported somatic and psycho-

logical symptoms experienced by middle-aged women. It is used to evaluate nine aspects of physical and emotional health, namely: depressed mood (DEP), somatic symptoms (SOM), memory/concentration (MEM), vasomotor symptoms (VAS), anxiety/fears (ANX), sexual behavior (SEX), sleep problems (SLE), menstrual symptoms (MEN), and attractiveness (ATT). The Polish version of this instrument includes 36 closed-ended questions.

The Neuroticism-Extroversion-Openness-Five Factor Inventory (NEO-FFI) is an instrument widely used to explore the big five personality traits: neuroticism, extroversion, openness to experience, agreeableness, and conscientiousness. According to the Big Five model, these factors are stable, universal, and biologically determined. The NEO-FFI consists of 60 statements answered on a five-point scale ranging from “I absolutely disagree” to “I absolutely agree”. Raw results are converted into sten scores.

The variables were presented using descriptive statistics. Metric (quantitative) variables were described in terms of the following measures: central tendency (mean, median), dispersion (standard deviation, interquartile range, coefficient of variation), and location (minimum and maximum). A measure of the structure (frequency) was used for non-metric (qualitative) variables<sup>12</sup>.

In accordance with the variable characteristics in the validation study, the parametric approach assuming that dependent variables have normal distribution was applied for all standardized psychometric scales<sup>13</sup>. Analysis of the relationship between two metric variables was performed using Spearman’s (rho) rank correlation coefficient<sup>14</sup>.

### Statistical Analysis

All calculations were performed using Statistica version 13.1 (Dell, Inc. 2016). The level of statistical significance assumed *a priori* for the null hypothesis was 0.05.

## Results

The structure of the study sample in terms of the BRCA1 and BRCA2 mutations and the type of surgery is shown in Table I. The mean age of the studied women was 44.7 years, and the median was 41 years. 52.4% of the respondents had secondary education, 77.0% were married. Women having two children were the most numerous and constituted 45.9% of all participants. Over half of the patients (62.3%) were premenopausal when they made decision to undergo prophylactic surgery of the reproductive organs. As many as 57.4% of the women were diagnosed with and treated for breast cancer prior to prophylactic surgery. In one case, histopathological analysis of the material obtained during RRSO revealed ovarian cancer. Apart from reproductive cancer, 4.9% (n = 3) of the women were diagnosed with tumors in other organs despite prophylactic adnexectomy.

Analysis of the NEO-FFI results showed that the mean sten scores for the subscales of conscientiousness ( $6.0 \pm 2.05$ ), extroversion ( $6.5 \pm 2.33$ ), agreeableness ( $6.4 \pm 1.98$ ), and openness to experience ( $5.6 \pm 1.89$ ) were on a medium level. The mean score for the subscale of neuroticism was on a low level ( $4.0 \pm 2.73$ ), with higher scores denoting higher neuroticism (Table II).

The study demonstrated a statistically significant correlation between neuroticism and the QoL in all domains except for vasomotor symptoms, both before and after RRSO. Statistically significant negative correlations between neuroticism and the majority of the QoL domains were observed, both before and after surgery. The strongest relationships were observed in the domains of depressed mood (rho \* -0.57 vs. -0.54), anxiety/fears (rho \* -0.67 vs. -0.64), and sleep problems (rho \* -0.43 vs. -0.47).

The only domain that differed was the domain of sexual behavior, for which a statistically signif-

**Table I.** Characteristics of the study sample (N = 61).

Variable		N	%
Mutation in the gene	BRCA1	58	95.1
	BRCA2	3	4.9
Type of prophylactic surgery	ADNEX	46	75.4
	LASH	14	23.0
	TLH	1	1.6

ADNEX – bilateral adnexectomy, LASH – laparoscopic supracervical hysterectomy, TLH – total laparoscopic hysterectomy, N – number of cases, % – percentage of the study sample.

**Table II.** General characteristics of the study sample with regard to the Big Five model (N = 61).

Variable	M ± SD	Me	Min-Max	CV [%]
Conscientiousness	6.0 ± 2.05	6.0	1-10	34.1
Extroversion	6.5 ± 2.33	7.0	1-10	36.0
Agreeableness	6.4 ± 1.98	6.0	1-10	30.9
Neuroticism	4.0 ± 2.73	3.0	1-10	68.2
Openness to experience	5.6 ± 1.89	6.0	1-9	33.7

M ± SD – mean and standard deviation, Me – median, Min-Max – minimum and maximum, CV – coefficient of variation.

icant weak negative correlation ( $\rho^* -0.28$ ) was noted before surgery, suggesting that highly neurotic women faced sexual problems. There was no correlation between neuroticism and sexual behavior after surgery ( $\rho^* -0.23$ ).

Analysis of the data showed a statistically significant positive correlation between the level of conscientiousness and the QoL of the patients with the *BRCA1* and *BRCA2* mutations in the domains of somatic symptoms ( $\rho^* 0.37$  vs. 0.27), memory/concentration ( $\rho^* 0.3$  vs. 0.31), and anxiety/fears ( $\rho^* 0.33$  vs. 0.26) both before and after surgery. This means that women with higher levels of conscientiousness had higher QoL in these domains, irrespective of whether they had undergone surgery or not. The only QoL domain which differed before and after surgery was the depressed mood domain ( $\rho^* 0.37$  vs. 0.22). A statistically significant positive correlation was noted before surgery, showing that women with increased conscientiousness were more depressed, however after surgery this domain appeared to be statistically insignificant. No statistically significant correlations were found in other QoL domains, depending on the level of conscientiousness, before and after surgery.

A statistically significant positive correlation was found between extroversion and the QoL of women with the *BRCA1* and *BRCA2* mutations in all domains, except for vasomotor symptoms ( $\rho^* 0.07$  vs. 0.02) and menstrual symptoms ( $\rho^* 0.10$  vs. 0.08), both before and after surgery.

There was also a statistically significant positive correlation between agreeableness and the QoL of patients with the *BRCA1* and *BRCA2* mutations in the domain of anxiety/fears ( $\rho^* 0.29$  vs. 0.26), both before and after surgery, and a statistically significant weak positive correlation between agreeableness and the QoL in the depressed mood domain ( $\rho^* 0.28$ ) after surgery. A similar correlation between agreeableness and

depressed mood ( $\rho^* 0.22$ ) was not observed before surgery. Agreeableness did not correlate with the level of QoL in other domains.

The opposite situation was observed in the case of openness to experience, which statistically significantly positively correlated with the depressed mood domain ( $\rho^* 0.32$ ) before surgery, but not after it ( $\rho^* 0.18$ ). The remaining QoL domains did not correlate with openness to experience in the studied group of women before or after surgery (Table III).

## Discussion

Of all personality traits assessed by the NEO-FFI, neuroticism is the one that predisposes people to experience negative emotions, and has an impact on their adaptation to the environment and functioning in society. This has been observed by Cocker et al<sup>15</sup>, in which neuroticism was the most important predictor of a lower QoL and severe stress among patients after pelvic exenteration. Similarly, Qi et al<sup>16</sup> claim that neuroticism inclines to negative feelings, having an effect on QoL and return of knee function in patients after total knee replacement.

RRSO can affect the psyche of a woman, but considering the risk of cancer, a decision to undergo this surgery seems reasonable. Xiao et al<sup>17</sup> and Vecchio et al<sup>18</sup> demonstrated that RRSO reduced the risk of breast cancer due to the *BRCA* mutations. RRSO performed in carriers of the *BRCA1* and *BRCA2* mutations has an impact on various aspects of their psychosocial functioning. According to Powell et al<sup>19</sup>, it affects sexual functions, and contributes to climacteric and depressive symptoms. The literature has not so far provided unequivocal reports on the influence of personality factors on the QoL of women with the *BRCA1* and *BRCA2* gene mutations after prophylactic surgery of the reproductive organs.

**Table III.** Personality traits and the QoL of women with the *BRCA1/BRCA2* gene mutations before and after prophylactic surgery of the reproductive organs (N = 61).

Variable		Neuroticism			Conscientiousness			Extroversion			Agreeableness			Openness to experience		
		rho	t	p	rho	t	p	rho	t	p	rho	t	p	rho	t	p
DEP	Before*	-0.57	-5.375	< <b>0.0001</b>	0.37	3.040	<b>0.004</b>	0.60	5.688	< <b>0.0001</b>	0.22	1.752	0.085	0.32	2.596	<b>0.012</b>
	After**	-0.54	-4.938	< <b>0.0001</b>	0.22	1.737	0.088	0.41	3.417	<b>0.001</b>	0.28	2.264	<b>0.027</b>	0.18	1.394	0.169
SOM	Before*	-0.34	-2.816	<b>0.007</b>	0.37	3.106	<b>0.003</b>	0.35	2.901	<b>0.005</b>	0.05	0.416	0.679	-0.05	-0.364	0.717
	After**	-0.37	-3.098	<b>0.003</b>	0.27	2.197	<b>0.032</b>	0.35	2.868	<b>0.006</b>	0.24	1.896	0.063	0.03	0.267	0.791
MEM	Before*	-0.33	-2.683	<b>0.009</b>	0.30	2.433	<b>0.018</b>	0.28	2.276	<b>0.026</b>	-0.07	-0.510	0.612	0.12	0.916	0.363
	After**	-0.34	-2.821	<b>0.007</b>	0.31	2.524	<b>0.014</b>	0.35	2.876	<b>0.006</b>	0.06	0.439	0.662	0.15	1.150	0.255
VAS	Before*	0.08	0.635	0.528	0.10	0.772	0.443	0.07	0.570	0.571	-0.18	-1.384	0.172	-0.09	-0.724	0.472
	After**	-0.08	-0.614	0.541	0.16	1.239	0.220	0.02	0.166	0.869	0.11	0.851	0.398	0.01	0.104	0.918
ANX	Before*	-0.67	-7.019	< <b>0.0001</b>	0.33	2.695	<b>0.009</b>	0.51	4.555	< <b>0.0001</b>	0.29	2.286	<b>0.026</b>	0.09	0.661	0.511
	After**	-0.64	-6.348	< <b>0.0001</b>	0.26	2.100	<b>0.040</b>	0.46	4.003	< <b>0.0001</b>	0.26	2.066	<b>0.043</b>	0.07	0.560	0.578
SEX	Before*	-0.28	-2.237	<b>0.029</b>	0.24	1.919	0.060	0.43	3.626	<b>0.001</b>	0.05	0.415	0.679	0.03	0.193	0.847
	After**	-0.23	-1.794	0.078	0.18	1.373	0.175	0.38	3.121	<b>0.003</b>	0.05	0.370	0.712	-0.08	-0.651	0.518
SLE	Before*	-0.43	-3.616	<b>0.001</b>	0.15	1.135	0.261	0.50	4.477	< <b>0.0001</b>	0.20	1.563	0.123	0.12	0.935	0.354
	After**	-0.47	-4.064	< <b>0.0001</b>	0.08	0.615	0.541	0.41	3.419	<b>0.001</b>	0.21	1.652	0.104	-0.06	-0.450	0.655
MEN	Before*	-0.26	-2.047	<b>0.045</b>	0.24	1.935	0.058	0.10	0.757	0.452	-0.11	-0.850	0.399	-0.05	-0.348	0.729
	After**	-0.31	-2.484	<b>0.016</b>	0.15	1.163	0.250	0.08	0.594	0.555	0.08	0.645	0.521	-0.23	-1.813	0.075
ATT	Before*	-0.42	-3.522	<b>0.001</b>	0.25	1.961	0.055	0.31	2.536	<b>0.014</b>	0.03	0.256	0.799	0.22	1.700	0.094
	After**	-0.27	-2.175	<b>0.034</b>	0.12	0.953	0.344	0.30	2.434	<b>0.018</b>	0.14	1.056	0.295	0.16	1.238	0.221

DEP – depressed mood, SOM – somatic symptoms, MEM – memory/concentration, VAS – vasomotor symptoms, ANX – anxiety/fears, SEX – sexual behavior, SLE – sleep problems, MEN – menstrual symptoms, ATT – attractiveness, rho – Spearman’s correlation coefficient, t – testing statistics, p – testing probability, \*examination before prophylactic surgery of the reproductive organs, \*\* examination after prophylactic surgery of the reproductive organs.

It has been suggested that personality traits may partially determine HRQoL<sup>20</sup>. This relationship was observed in such health problems as gastrointestinal disorders, cancer, oral cavity diseases, and infertility, as well as in physiological states (menopause)<sup>21-25</sup>. According to the Five-Factor Model, developed by Paul Costa and Robert McCrae, personality traits – neuroticism, extroversion, openness to experience, agreeableness, and conscientiousness – are relatively stable<sup>26</sup>. These traits have an effect on the interaction between the individual and the environment.

We noticed a relationship between particular personality traits and the QoL of carriers of the BRCA1 and BRCA2 mutations, both before and after RRSO. Of all personality traits assessed by the NEO-FFI, neuroticism was the one that enhanced the tendency to experience negative emotions. High neuroticism negatively affects people's adaptability to the environment, and thus their functioning in society. In our study, it was accompanied by lower QoL levels, especially in the domains of depressed mood, anxiety/fears, and sleep problems. Our findings confirm the results of studies suggesting that neuroticism is closely related to mental aspects of the human QoL<sup>27</sup>. Moreover, they are identical with the data obtained by Hartl et al<sup>28</sup>, Ridgewell et al<sup>29</sup>, and other authors, indicating to the adverse effect of high neuroticism on QoL. Thus a high level of neuroticism is a key risk factor for low HRQoL.

Furthermore, our investigation revealed that higher levels of conscientiousness, openness to experience, extroversion, and agreeableness were associated with a positive assessment of the QoL of women with the *BRCA1* and *BRCA2* mutations, both before and after RRSO. This may suggest that these personality traits protect the QoL of patients subjected to RRSO. In relation to the Big Five model, it should also be borne in mind that potentially favorable attributes can sometimes reinforce negative tendencies, for example, to workaholicism, narcissism, or psychosomatic diseases<sup>26</sup>. Nevertheless, our results correspond with those reported by other authors, suggesting positive correlations between QoL and personality traits, such as extroversion and conscientiousness<sup>30</sup>.

Summing up these considerations, there is a relationship between QoL and personality traits, which may be a prognostic factor for human adaptation to the changed conditions of functioning<sup>31</sup>. However, the interpretation to a large extent depends on the individual psychological analysis of the case, which is beyond the scope

of this study. Nevertheless, the awareness of this link may contribute to planning individualized care and helping patients after RRSO to adapt to changes in their lives. Above all, it promotes a holistic approach to patients, covering not only physical but also psychological aspects.

The research presented here has some limitations. We analyzed the effect of personality traits on the QoL of patients before and after RRSO. Nonetheless, apart from personality traits, QoL may also be determined by other socio-demographic, behavioral and psychological factors, such as age, education, professional activity, presence of comorbidities, smoking, the level of social support received, and having children<sup>32,33</sup>. Another variable that may play a role in the QoL assessment in women before and after RRSO is the use of MHT. It has been shown that women with a lower QoL more often decide to use MHT<sup>34</sup>. In our investigation, patients using MHT or starting MHT were excluded, regardless of the stage of its implementation. Based on the interview, information was also obtained regarding the absence of any difficult situations that could affect the QoL of the respondents (death of a close person, illness in the family, divorce, family problems, loss of job). Another limitation is the fact that our group of respondents was rather small. Therefore, further research with an appropriate sample size is needed to verify the existing data.

## Conclusions

The contribution of personality traits to the QoL of women with the BRCA1 and BRCA2 mutations cannot be clearly stated, but the identification of personality traits may be an important prognostic factor for potential changes in the quality of patients' lives. Identification of highly neurotic patients can be the first step to providing them with increased psychological care. There is a need for the therapeutic team to cooperate with psychologists on an ongoing basis and to expand the scope of their services. The results of the presented research shed new light on the scope and nature of perioperative care among patients qualified for RRSO, emphasizing the importance of individualized psychological care.

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## Conflict of Interest

The Authors declare that they have no conflict of interests.

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