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Emotional Impact of breast cancer-related genetic mutation diagnosis: a systematic review

Impacto Emocional do diagnóstico de mutação genética relacionada ao câncer de mama: uma revisão sistemática

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Abstract

Objective
Based on the premise that the diagnosis of a genetic mutation related to breast cancer causes emotional distress for the patient and their family members, a systematic literature review was conducted to clarify this relationship commonly observed in oncologic clinical practice.

Method
In total, 18 articles confirmed through bias analysis were reviewed. The articles were retrieved from the PubMed, Cochrane Wiley, SciELO, and APA-PsycInfo databases.

Results
These studies confirmed the hypothesis that a positive result in the genetic test triggers significant distress for both the patient and their family members, although each individual reacts in a unique way. The researchers recommend that the diagnosis should not be considered the sole factor for the studied outcome. It should be related to personal or family history of illness, previous experiences, and previous mental health.

Conclusion
We conclude, by a slight tendency, to include qualitative studies as a way to evaluate experiences in a more in-depth manner.

Keywords: Breast cancer; Emotional impact; Hereditary cancer; Psychology.

Resumo

Objetivo

Partindo da premissa que o diagnóstico de mutação genética relacionada ao câncer de mama acarreta sofrimento emocional para a paciente e seus familiares, foi realizada revisão sistemática de literatura para esclarecer essa relação comumente observada na clínica oncológica.

Método

Buscas realizadas nas bases PubMed, Cochrane Wiley, SciELO e APA-PsycInfo, resultaram em um total de 18 artigos, após aplicação dos critérios de inclusão, cuja boa performance foi atestada pela análise de viés.

Resultados

Tais estudos confirmaram a hipótese de que o resultado positivo para o teste genético desencadeia sofrimento significativo tanto para a paciente quanto para seus familiares, embora cada qual reaja de modo singular. Os pesquisadores recomendam que o diagnóstico não seja considerado fator único para o desfecho estudado, mas relacionado à história pessoal ou familiar de doenças, experiências anteriores e saúde mental prévia.

Conclusão

Concluímos por uma discreta tendência à inclusão de estudos qualitativos, como forma de avaliar as experiências de maneira aprofundada.

Palavras-chave: *Câncer de mama; Impacto emocional; Câncer hereditário; Psicologia.*

With over 2.3 million cases annually, breast cancer is the most diagnosed type of neoplasm worldwide. It is the most common type of tumor in women, accounting for 11.7% of all neoplasms, and the fifth leading cause of cancer-dependent death in the world (Sung et al., 2021).

According to data from the *Instituto Nacional do Câncer* (INCA, Brazilian National Cancer Institute), breast cancer is the most common type of cancer among women in Brazil, followed by non-melanoma skin cancer, accounting for approximately 28% of new cases each year. Its incidence progressively increases, especially after the age of 50. The estimated number of new cases per year is 66,280, with 18,295 deaths related to the disease in 2020 (Instituto Nacional do Câncer, 2022).

The incidence of the disease is influenced by some risk factors, including genetic mutation. Genetically proven hereditary tumors represent 5-10% of all breast cancers (Bray et al., 2018; Ferlay et al., 2014).

There are various mutations related to breast cancer, with the most frequent ones being Breast and Ovarian Syndromes (BRCA1 and BRCA2 genes), Li-Fraumeni Syndrome (TP53 gene), Cowden Syndrome (PTEN gene), Peutz-Jeghers Syndrome (STK11 gene), and diffuse gastric cancer (CDH1 gene) (Parkes et al., 2017). Statistically, BRCA1 and BRCA2 mutations increase the estimate of a patient developing breast cancer by 70% by the age of 80 (Feng et al., 2018).

For individuals at high risk of developing this neoplasm and, consequently, experiencing reduced life expectancy, preventive measures such as early screening (annual mammography and breast magnetic resonance imaging starting at the age of 30) or risk-reducing surgeries (bilateral mastectomy and bilateral salpingo-oophorectomy) can be offered, depending on the diagnosed mutation (Lim et al., 2017). Another aspect related to this scenario is heredity, which emphasizes the importance of mutation diagnosis as a disease prevention measure (Li et al., 2017).

This scenario carries an emotional burden with significant impact on both personal and family health due to the risk of transmission. According to Dean and Davidson (2018), the diagnosis of a genetic mutation related to breast cancer brings uncertainty about one's own health, leading to the development of stress, anxiety, depression, and a reduction in quality of life and decision-making capacity.

When patients are diagnosed with a genetic mutation related to breast cancer, in our clinical routine and as highlighted in the literature, feelings related to one's own health and survival emerge. However, there are also dramas involving family members, as this condition permeates familial bonds, exacerbating conflicts and destabilizing family relationships, creating an overlap of vulnerabilities.

Therefore, this systematic review aims to assess the emotional impact of the diagnosis of a genetic mutation related to breast cancer on the patient – whether or not they have a diagnosis of neoplasia - as well as on their family members.

Method

This systematic literature review was conducted according to the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines (Page, McKenzie et al., 2021; Page, Moher et al., 2021). As a strategy to enhance rigor in the search and selection stages, three researchers simultaneously conducted the literature search, and a fourth researcher, granted with decision-making authority, was available to resolve any disagreements if necessary. However, their involvement was not needed.

We conducted the search in the PubMed-MedLine, Cochrane-Wiley, American Psychological Association (APA), and Scientific Electronic Library Online (SciELO) databases on July 26, 2020, and reevaluated it on September 25, 2022. To encompass a broader scope of articles, no specific start date was set. We used the following terms, cataloged in the Health Sciences Descriptors (DeCS) and Medical Subject Headings (MeSH) vocabularies, along with boolean operators: ([breast cancer] OR [breast neoplasms] OR [breast neoplasm]) AND ([psychological distress] OR [psychological stress] OR [emotional stress] OR [emotional distress]) AND ([genetic testing] OR [genetic screening] OR [genetic screenings] OR [deletion mutation] OR [deletion mutations]).

As inclusion criteria, we selected empirical, prospective, or retrospective articles published in peer-reviewed journals, involving adult participants aged 18 and above, diagnosed with a genetic mutation related to breast cancer, with or without neoplasia, focusing on the emotional impact of the mutation diagnosis. Therefore, literature review articles, meta-analyses, theoretical articles, dissertations, theses, and studies focusing on other aspects such as the evaluation of the diagnostic method were excluded for not meeting the inclusion criteria. To map the landscape of scientific publications on the investigated topic over the years, no restrictions were imposed on the language of the articles or their publication dates.

The risk of bias assessment was performed using two tools, adjusted for each type of article: the Cochrane Risk of Bias tool (Rob 2) for analyzing randomized trials; and the adapted Newcastle-Ottawa Scale (NOS) for longitudinal, cross-sectional, and cohort studies.

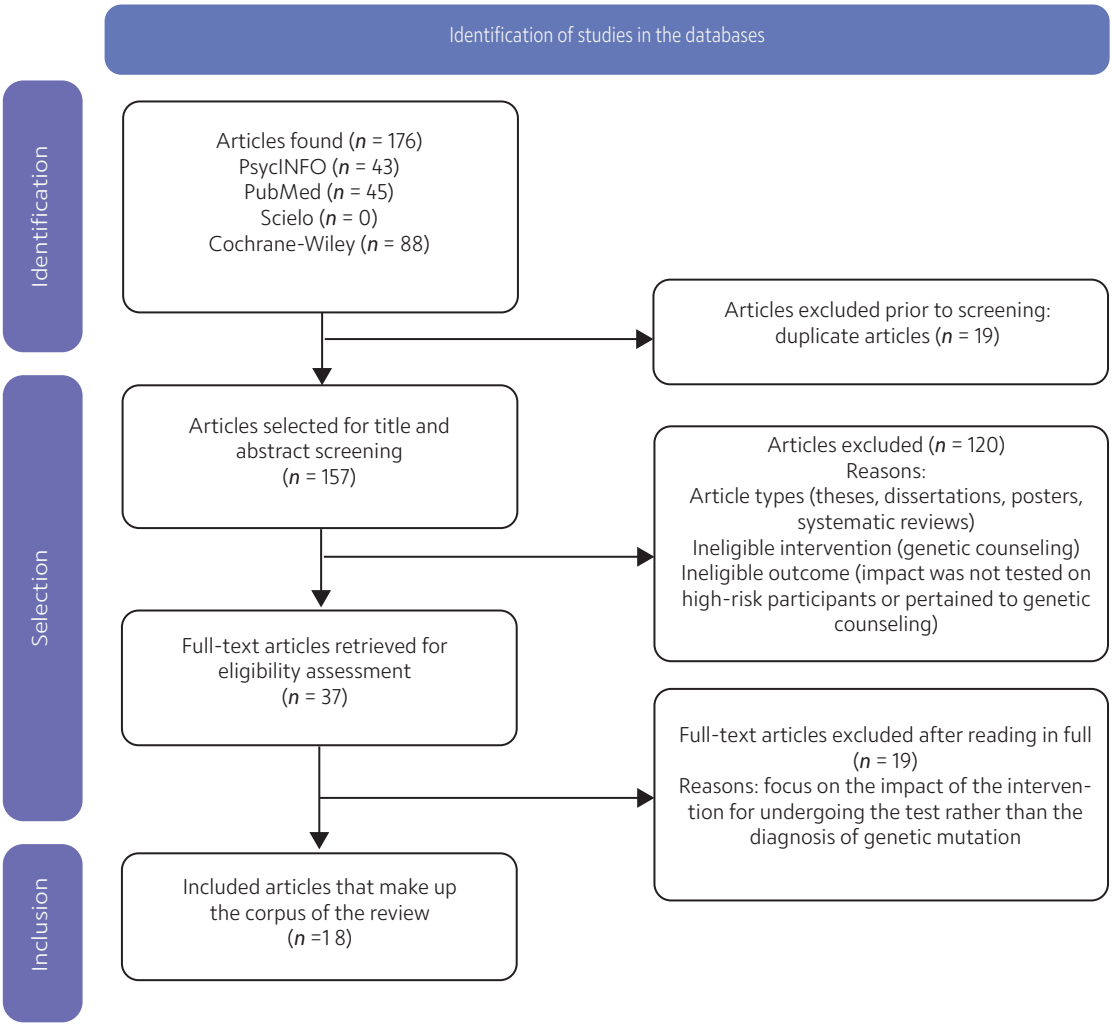
After reading, the articles were organized into two axes for discussion: emotional impact for the participants and emotional impact for the family members.

Results

A total of 176 articles were retrieved from the initial search, 19 of which were duplicate articles and thus excluded, resulting in a total of 157 articles that were considered for title and abstract screening. After screening, 120 articles were excluded, resulting in 37 articles considered potentially eligible for full-text reading. After a complete reading of the 37 articles, 19 were excluded for the following reasons: evaluation of the genetic counseling, not of the participants; assessment of emotional distress before genetic testing; and relation of genetic testing to other tumors, not

breast cancer. After applying the selection criteria, 18 articles were included as the corpus of this review. Figure 1 presents the aforementioned steps in a flowchart (Page, Mackenzie, et al., 2021; Page, Moher, et al., 2021)

Figure 1
Flowchart on literature search



All articles were interpreted, and the data were extracted and organized in the table below. The articles were sorted in ascending order by date to contextualize the research question over time (Table 1).

The methodological quality of the reviewed studies was assessed using the following instruments: Revised Cochrane risk-of-bias tool for randomized trials (RoB 2) for assessing randomized clinical trials and the Adapted Newcastle-Ottawa Quality Assessment Scales (NOS) for longitudinal, cross-sectional, and cohort studies. The articles were associated with low risk of bias, indicating that they are studies of good quality, i.e., reliable in terms of methodological rigor, except for one study that did not provide data comparison between groups. The bias analysis is described in Table 2.

Table 1
Presentation of the selected articles (sorted by date)

Title	Authors/Year	Data
Psychological responses to BRCA1 mutation testing: Preliminary findings.	Croyle et al. (1997)	60 participants. Assessment of the psychological impact of genetic research. Higher levels of stress were observed in mutation-carrying patients in the short and long term.
Effects of coping style and BRCA1 and BRCA2 test results on anxiety among women participating in genetic counseling and testing for breast and ovarian cancer risk.	Tercyak, Leman et al. (2001)	107 participants with a 10% chance of having the BRCA1 and BRCA2 mutation - 36% with a personal history of breast or ovarian cancer and 64% with relatives with a confirmed BRCA mutation. Evaluation of different coping strategies in high-risk patients and their families. Higher levels of anxiety observed in individuals carrying a mutation requiring more frequent psychological monitoring.
Parental communication of BRCA1/2 genetic test results to children.	Tercyak, Hughes et al. (2001)	133 participants. Evaluation of the emotional impact of communicating the genetic research results of high-risk individuals for HBOC (Hereditary Breast And Ovarian Cancer) to their children. Communicating the results to the children did not appear to increase anxiety levels in the parents.
Associations Between Relationship Support and Psychological Reactions of Participants and Partners to BRCA1 and BRCA2 Testing in a Clinic-Based Sample.	Manne et al. (2004)	271 participants (153 women and 118 partners). Evaluation of the psychological impact resulting from communication between couples during and after genetic testing. Most couples supported each other during the process, with tension observed in a minority of the evaluated couples.
Predictive genetic testing for hereditary breast and ovarian cancer: psychological distress and illness representations 1 year following disclosure.	Claes et al. (2005)	68 women (34 without mutation/34 with mutation), without a personal history of cancer. A long-term reduction in anxiety levels was observed in the non-mutation group, while anxiety levels remained stable in the mutation group.
Experience of parental cancer in childhood is a risk factor for psychological distress during genetic cancer susceptibility testing..	van Oostrom et al. (2006)	271 participants. Assessed the importance of individuals' age in relation to the timing of cancer diagnosis/death of parents and future psychological impact. Individuals with BRCA1/2 or HNPCC (Hereditary Nonpolyposis Colorectal Cancer) mutation were interviewed pre-test, at 1 week, and 6 months post-test. A greater psychological impact was observed in individuals who were children of parents with cancer, especially those under the age of 13.
Psychological distress and quality of life associated with genetic testing for breast cancer risk.	Smith et al. (2008)	126 participants. Assessed the psychological outcome for women undergoing BRCA1/2 mutation testing with a personal/family history of breast cancer. Questionnaires were conducted pre-test, at 1 week, 3 months, and 6 months post-test. Patients carrying a mutation or those who chose not to undergo testing showed higher levels of anxiety in the follow-up. The results suggested that genetic testing does not have deleterious effects on long-term quality of life.
Sisters in hereditary breast and ovarian cancer families: Communal coping, social integration, and psychological well-being.	Koehly et al. (2008)	65 participants. Assessment of the psychological impact, integration, and coping of sisters from families with a high risk of HBOC (Hereditary Breast and Ovarian Cancer). Similar levels of anxiety and somatization were observed, but there were no depressive symptoms. The understanding of the family support network facilitates the approach to families with a high risk of HBOC.
Distress in couples approached for genetic counseling and BRCA1/2 testing during adjuvant radiotherapy.	Schlich-Bakker et al. (2009)	195 couples. Assessment of the impact of genetic mutation diagnosis on the unaffected partner through serial questionnaires in the study group versus the control group. A correlation was observed between the anxiety levels of the patient and the partner, with greater vulnerability in younger individuals, i.e., in couples where the patient had an anxiety disorder and a genetic mutation diagnosis. This condition was common to the couple when compared to the control group.
BRCA1/2 testing in hereditary breast and ovarian cancer families: effectiveness of problem-solving training as a counseling intervention.	McInerney-Leo et al. (2004)	212 individuals from 13 families with HBOC (Hereditary Breast And Ovarian Cancer). 181 participants underwent genetic mutation testing, with 47 being affected. A study was conducted providing pre-test genetic counseling with a follow-up of up to 9 months. A reduction in anxiety was observed in patients who underwent testing and received a negative result, as well as in all patients who received counseling (problem-solving training). All individuals with a personal history of cancer had higher levels of anxiety.
Distress and the parenting dynamic among BRCA1/2 tested mothers and their partners.	Mays et al. (2014)	201 women and 111 partners. Assessment of the family impact of genetic testing (BRCA) conducted in mothers, showing benefits in communication and agreement within the couple, as well as in the transmission of information to their children. One partner with a confirmed BRCA1/2 mutation and the other without a mutation: it is observed that when there is agreement within the couple and open discourse about

Table 1

Presentation of the selected articles (sorted by date)

2 of 2

Title	Authors/Year	Data
Distress and the parenting dynamic among BRCA1/2 tested mothers and their partners.	Mays et al. (2014)	the topic, the communication with the children generates less emotional stress for the offspring. When there is uncertainty about how to deal with the diagnosis within the couple, the communication with the children is compromised, and the emotional stress is higher. Analysis of data from a prospective study that assessed outcomes and predictors associated with family communication. Evaluated data: demographic information, psychological stress, communication between parents and children, decision-making regarding conflict.
Preliminary report of the relationship between experience of death of a relative, illness perception, and psychological outcome among BRCA carriers.	Samama et al. (2013)	40 participants. Assessment of the experience of a relative's death from breast cancer and its impact on the perception of illness, psychological distress, and well-being in patients with a confirmed BRCA1/2 mutation. Questionnaire administered to mutation-carrying patients (group with relative's death vs. group without relative's death). There was no significant relationship between a relative's death from breast cancer and well-being or psychological distress. However, the perception of illness was significantly more evident in the group of mutation-carrying patients with a family history of death from breast cancer.
Psychological distress related to BRCA testing in ovarian cancer patients.	Bjørnslett et al. (2015)	354 patients. Assessment of the potential psychological distress related to genetic mutation testing in BRCA, through a multidimensional questionnaire (MICRA). All patients underwent genetic testing. Patients were divided into 4 groups: mutation carriers; personal history of breast/ovarian neoplasia; family history of breast/ovarian neoplasia; no personal history. Mutation carriers had higher scores compared to the other groups (direct correlation of the questionnaire).
Prognostic factors for distress after genetic testing for hereditary cancer.	Voorwinden and Jaspers (2015)	165 participants between 2007 and 2010. The objective of this study is to identify prognostic factors that can predict psychological problems in patients with confirmed mutations for BRCA and Lynch Syndrome. The following prognostic factors for the development of psychological distress were identified: pre-existing psychological condition, single individuals, unfavorable genetic testing results.
Psychosocial impact of BRCA testing in young Black breast cancer survivors.	Gonzalez et al. (2018)	215 women. Follow-up was conducted on black female breast cancer survivors (<50 years old) who underwent genetic counseling or genetic testing for BRCA1 and BRCA2 mutations. Improvement in social well-being was observed after receiving negative results, and minimal negative psychological impact for women who underwent counseling/testing, regardless of the result.
Italian Men Tested for BRCA1/2 Mutation: Psychological Distress during 6-Month Follow-Up.	Pellini et al. (2020)	26 men affected with breast cancer (35%) or at high risk for breast cancer (65%). 30% tested positive for genetic mutations. There was no difference in psychological impact between the analyzed groups (with mutation vs. without mutation). Critiques: small sample size, short follow-up.
Communication processes about predictive genetic testing within high-risk breast cancer families: a two-phase study design.	Blomen et al. (2021)	79 participants. The study was divided into two stages: quantitative, in which a questionnaire with sociodemographic data and psychological assessment through scales (anxiety, depression, impact on lifestyle) was administered; and qualitative, aimed at an in-depth understanding, through semi-structured interviews, of the process of communication among family members about the diagnosis of genetic mutation.
A qualitative study of unaffected *ATM and CHEK2* carriers: How participants make meaning of "moderate risk" genetic results in a population breast cancer screening trial.	James et al. (2022)	22 participants. Participants diagnosed with ATM and CHECK2 genetic mutations underwent qualitative interviews. The research demonstrates that these participants downplay their risk of developing cancer when compared to women with BRCA1/2 mutations. It is also analyzed that, in the case of the participants in this study, the cascade effect of recommending testing to family members is lower.

Table 2

Risk of Bias analysis of the included articles

1 of 2

Title	Author/ Year	Study Type	Bias scale	Note
Associations Between Relationship Support and Psychological Reactions of Participants and Partners to BRCA1 and BRCA2 Testing in a Clinic-Based Sample.	Manne et al. (2004)	Cohort	NOS-Cohort	7/9
BRCA1 2 testing in hereditary breast and ovarian cancer families: effectiveness of problem-solving training as a counseling intervention.	McInerney-Leo et al. (2004)	ECR	RoB2	Low risk

Table 2
Risk of Bias analysis of the included articles

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Title	Author/ Year	Study Type	Bias scale	Note
Distress and the parenting dynamic among BRCA1 2 tested mothers and their partners.	Mays et al. (2014)	Longitudinal	NOS-CS	7/10
Distress in couples approached for genetic counseling and BRCA1 2 testing during adjuvant radiotherapy.	Schlich-Bakker et al. (2009)	Longitudinal	NOS-CS	8/10
Effects of coping style and BRCA1 and BRCA2 test results on anxiety among women participating in genetic counseling and testing for breast and ovarian cancer risk.	Tercyak, Leman et al. (2001)	Longitudinal	NOS-CS	10/10
Experience of parental cancer in childhood is a risk factor for psychological distress during genetic cancer susceptibility testing.	van Oostrom et al. (2006)	Longitudinal	NOS-CS	9/10
Italian Men Tested for BRCA1 2 Mutation Psychological Distress during 6-Month Follow-Up.	Pellini et al. (2020)	Longitudinal	NOS-CS	7/10
Parental communication of BRCA1 2 genetic test results to children.	Tercyak, Hughes et al. (2001)	Longitudinal	NOS-CS	7/10
Predictive genetic testing for hereditary breast and ovarian cancer: psychological distress and illness representations 1 year following disclosure.	Claes et al. (2005)	Cohort	NOS-Cohort	7/9
Preliminary report of the relationship between experience of death of a relative, illness perception, and psychological outcome among BRCA carriers.	Samama (2013)	Cross-sectional	NOS-CS	3/10
Prognostic factors for distress after genetic testing for hereditary cancer.	Voorwinden and Jaspers (2015)	Longitudinal	NOS-CS	9/10
Psychological distress and quality of life associated with genetic testing for breast cancer risk.	Smith et al. (2008)	Cross-sectional	NOS-CS	7/10
Psychological distress related to BRCA testing in ovarian cancer patients.	Bjørnslett et al. (2015)	Cross-sectional	NOS-CS	7/10
Psychological responses to BRCA1 mutation testing Preliminary findings.	Croyle et al. (1997)	Cross-sectional	NOS-CS	7/10
Psychosocial impact of BRCA testing in young Black breast cancer survivors.	Gonzalez et al. (2018)	Longitudinal	NOS-CS	8/10
Sisters in hereditary breast and ovarian cancer families Communal coping, social integration, and psychological well-being.	Koehly et al. (2008)	Cross-sectional	NOS-CS	8/10
Communication processes about predictive genetic testing within high-risk breast cancer families: a two-phase study design.	Blomen et al. (2021	Longitudinal	NOS-CS	8/10
Participants diagnosed with ATM and CHECK2 genetic mutations underwent qualitative interviews. How participants make meaning of "moderate risk" genetic results in a population breast cancer screening trial.	James et al. (2022)	Cross-sectional	NOS-CS	9/10

To ensure a transparent systematic review, this work was registered in the International Prospective Register of Systematic Reviews (Prospero) platform on the National Institute for Health Research (NIHR) under code CRD42021274319. It is part of a research project already approved by the Ethics Committee of the Pontifícia Universidade Católica de Campinas under the CAAE number 47852621.0.0000.5481, approved on June 28, 2021.

The results of this review will be discussed qualitatively based on two thematic axes: (1) The emotional impact on the participant who receives the diagnosis of a genetic mutation related to breast cancer; (2) The emotional impact on family members, whether they are blood relatives or those who are close.

Discussion

In total, 18 articles were selected for final reading, of which 11 discuss the emotional impact on participants (both men and women) who received a diagnosis of genetic mutation related to breast cancer, and 7 focus on the emotional experiences of family members – partners/spouses, children, and sisters.

Emotional impact on patients

This thematic axis begins with the question: does a positive diagnosis of genetic mutation related to breast cancer cause emotional distress for the patient? The reading of the articles that address this question allowed us to identify both factors associated with psychological distress and protective factors for patients, expanding our knowledge about the repercussions of a diagnosis. For example, the pre-test period was identified as anxiety-inducing in all patient groups, highlighting the need for psychological intervention during this phase.

In the study by McInerney-Leo et al. (2004), out of 181 participants, 47 received a confirmed positive result for genetic mutation in the BRCA1/2 genes. During the pre-test period, all patients experienced anxiety, although higher levels were observed in women who had already been diagnosed with neoplasia, due to the fear of recurrence. After receiving the test result, anxiety levels were lower in patients with a negative result compared to those who received a diagnosis of genetic deletion. At this post-test moment, no difference was noted between the groups with and without cancer.

Tercyak, Leman et al. (2001) administered an anxiety scale to women who had at least a 10% chance of developing breast cancer, meaning they were considered high-risk patients for developing neoplasia due to their family history. The participants were invited to undergo genetic testing. Anxiety levels were measured at pre-test and post-test moments and were related to other factors: age, marital status, educational level, personal history of cancer, and coping style. The authors concluded that anxiety levels, at both moments, were more related to personal coping strategies than to the actual test result.

Claes et al. (2005) assessed 68 participants – 34 with a positive test result for BRCA1/2 and 34 with negative results – who did not possess a personal history of cancer, 1 year after testing. In patients with a negative result, psychological distress and anxiety levels decreased compared to the pre-test period. However, in the mutated group, cancer-dependent worry (fear of developing the disease or fear of dying from cancer) and anxiety persisted, especially in women who did not undergo risk-reducing surgeries. From a psychological standpoint, we can assume that these women chose to preserve their breasts, exposing themselves to a higher risk and having to undergo screening more frequently, despite the surgical recommendation, in order to preserve an organ typically associated with femininity and motherhood. However, despite their power of choice, their well-being continues to be negatively affected by the possibility of disease, suggesting paths for a psychological intervention in addressing the issue.

Following this perspective of the threat faced by mutation-carrying women, Samama et al. (2013) demonstrated that women carrying the BRCA1/2 genes experience higher levels of stress when faced with the news of a relative's death from breast cancer, and they have a higher perception of disease compared to the non-mutated group. Croyle et al. (1997) also assessed psychological distress in the short (1 to 2 weeks after the result) and long term (6 months, 1 year, and 2 years) of 60 participants who underwent genetic testing for BRCA1 and found higher distress (anxiety) in patients with confirmed mutations, which persisted over time.

Bjørnslett et al. (2015) used The Multidimensional Impact of Cancer Risk Assessment (MICRA) instrument to evaluate the potential emotional distress (anxiety and depression) of 354 participants, who were divided into 4 groups: mutation carriers; personal history of breast/ovarian neoplasia; family history of breast/ovarian neoplasia; and no personal history. The study concluded that the group with mutation carriers has a higher vulnerability for emotional distress. Furthermore,

the instrument allowed for identifying particularities within each group, which could establish personalized planning for the care of these patients.

A study by Gonzalez et al. (2018), which included 215 young (<50 years) Black women, breast cancer survivors, who underwent genetic testing, noted an improvement in well-being in patients with negative mutation results, which is consistent with most of the articles described here. Telephone interviews were conducted before and after the test. The choice of this specific group was motivated by the fact that most studies related to genetic testing have predominantly included Caucasian women, with a small sampling of Black women, serving as an inclusion criterion for this study.

Based on this compilation of studies, it can be concluded that the diagnosis of genetic mutation related to breast cancer brings emotional distress to the carrier – anxiety and depression – which implies concern about one's own health, fear of developing the disease, and fear of death. In these studies, the diagnosis of neoplasia increases the anxiety experienced by the group of mutation carriers, as it amplifies the fear of disease recurrence.

However, some studies did not identify differences in levels of depression and anxiety between groups of mutation carriers and non-carriers. Smith et al. (2008) assessed the psychological outcome for women undergoing BRCA1/2 mutation testing with a personal/family history of breast cancer. Their results suggest that patients with confirmed mutations and women who chose not to undergo testing had higher levels of anxiety during follow-up, although there were no detrimental changes in long-term quality of life in this group compared to the non-carrier group.

Pellini et al. (2020) worked with a different sample: men at high risk for breast cancer or with a diagnosis of the disease who underwent genetic testing. Regarding the comparison of emotional impact between the mutation carrier and non-carrier groups, there was no difference in levels of anxiety and depression. We suppose that the sample size (26 participants) is due to the fact that breast cancer is a rare condition in men. However, as this is a quantitative study, the sample size directly affects its results and may not correspond to reality.

Amidst this scenario of discrepancies, Voorwinden and Jaspers (2015) sought to identify prognostic factors for the emotional distress of patients (both men and women) with a diagnosis of genetic mutation related to breast cancer (Li-Fraumeni syndrome and Hereditary Breast and Ovarian Cancer syndrome) and found that the main determinants of post-test emotional conditions were the individuals' pre-existing psychological condition, being single, and the status of the genetic test. Based on the presented variables, the group of women with a personal history of depression/anxiety, who were single, and who tested positive for genetic mutation showed a higher level of concern about their health. From this, we can infer that prior emotional distress affects patients' internal resources for coping with the diagnosis of mutation, and the presence of a partner plays an important supportive role in facing this new condition.

In a more recent article, James et al. (2022) conducted a qualitative analysis with findings that diverge from the previously presented articles. A sample of participants with mutations in ATM and CHEK2 – genes with a moderate risk for developing breast cancer – showed less concern about the development of neoplasia compared to participants with mutated BRCA1/2 genes. The cascade effect on family members (informing them about the result and guiding them to seek genetic counseling) was also less significant.

Based on the reading of this group of studies, it is assumed that the diagnosis of genetic mutation, even in the absence of neoplasia, already carries with it a series of outcomes: death, disease, family transmission, and impact on femininity depending on the decision-making regarding risk-reducing surgeries.

It becomes evident here that the pre-test moment is an anxiety-inducing factor. However, regarding the post-test moment, the studies still diverge. Some demonstrate that anxiety levels equalize over time between the groups of mutation carriers and non-carrier patients, but this was not a consistent result across all studies. This difference can be explained by the singularities of the participants, showing that the test result is not the sole factor responsible for emotional distress. It is advisable to consider personal and/or family history of neoplasia, age, available support network, as well as gender.

Regarding the fact that patients diagnosed with genetic mutation and patients who refused to take the test present higher levels of anxiety, it is supposed that in the former case, patients experience a concrete threat to their physical and psychological integrity, while in the latter, the threat remains in the realm of imagination. Regardless, emotional distress is present in both situations.

Emotional Impact on Family Members

Based on a clinical observation, it is assumed that family members are emotionally affected by the diagnosis of genetic mutation in one of their own, interfering with their relationship with children and spouses, as well as with other blood relatives, siblings, and parents, since it is a transgenerational clinical condition that can generate suffering and guilt.

Regarding spouses, Manne et al. (2004) state that most participants in their study (>95%) discussed the decision to undergo genetic testing with their spouses. With the confirmed result of genetic mutation, the participants' partners showed concern for the health of the mutation-carrying women and demonstrated a protective attitude, but not empathy. The authors also suggest that when distress regarding the result persists, partner support can mitigate the negative impact of the test, corroborating the findings of Voorwinden and Jaspers et al. (2015) regarding the presence of the partner as a protective element.

Mays et al. (2014) analyzed data obtained from a prospective study that evaluated outcomes and predictors associated with family communication. They concluded that the couple's behavior regarding screening and the result of genetic testing directly impacts communication with their children. When decisions regarding these procedures were shared, it allowed for more open discussion on the topic and less suffering for the children. On the other hand, children whose parents had difficulty communicating about the test result and its implications had higher levels of anxiety and depression. It can be concluded that transparency in family relationships here becomes a protective factor for the children.

Schlich-Bakker et al. (2009) assessed the impact of the genetic mutation diagnosis on the unaffected partner in 195 couples through serial questionnaires in the study and control groups. They observed that the distressed male partners had highly distressed wives, as if there was a kind of psychological contagion. Furthermore, stress levels in the male partners were higher when patients had a diagnosis of breast cancer, which may indicate concern for their partner and/or fear of losing them.

In relation to the children, the articles demonstrate that the suffering of offspring is related not only to the result of the mutation test but also to how it is communicated and to the children's experience of living with parents diagnosed with cancer. van Oostrom et al. (2006) interviewed 271 children who underwent genetic testing due to family risk and concluded that the confrontation in childhood with the parents' cancer diagnosis is a risk factor for emotional distress. It was found that

those who had an affected parent or those who lost a parent to cancer before adolescence became psychologically more vulnerable and therefore experienced more distress when undergoing the test.

The study by Tercyak, Hughes, et al. (2001) assessed the impact on children of parental communication about the results of genetic testing related to BRCA1 and BRCA2 mutations. A model with multivariable communication of the test result was used, and a logistic regression analysis was conducted to identify the influence of the following communication-related factors: gender, mutation status, personal history of cancer, and stress levels. A total of 133 adult participants were interviewed. Half of the participants did not to disclose the mutation to their children, while the other half did. The participants' children were either adolescents (13-18 years) or pre-adolescents (10-13 years). The study concluded that although the participants who chose to communicate their diagnosis - whether positive or negative - did not consider the age of their children, there was no increase in stress levels among those who were informed about their parents' diagnosis.

In the only article that highlighted sibling relationship, Koehly et al. (2008) evaluated the psychological impact, integration, and coping of sisters from families at high risk of hereditary breast cancer. The authors concluded that the larger the family support network, the easier it is to communicate about the hereditary nature of the disease, and levels of anxiety and somatization decrease.

Blomen et al. (2021) conducted a mixed-methods study, with both quantitative and qualitative assessments. Participants with a diagnosis of BRCA1 and BRCA2 gene mutations (79) were asked to complete a questionnaire on sociodemographic data and psychological evaluation (quality of life, anxiety, and depression). The innovative aspect of this article, however, is the inclusion of a qualitative approach, in which a structured interview is conducted with the mutation-carrying participant and up to two family members to assess the communication about the diagnosis in greater depth.

As we can see, in this thematic area focusing on family members, the researchers' discussion centered around communication, leading us to conclude that communication between spouses regarding the results of genetic mutation research depends not only on the outcome but also on the quality of the marital relationship prior to the examination. The support of the spouse, in these studies, reveals its protective nature but not empathy.

Regarding children, the pattern repeats itself, as the communication of the diagnosis will result in less anxiety depending on the dynamics of the parent-child relationship. For children, having a parent diagnosed with cancer is an anxiety-inducing factor and may impact their decision to undergo genetic testing or not. In the case of sisters, the support network during the decision-making process for testing and receiving the results was crucial in mitigating emotional distress.

According to the methodological criteria for conducting this literature review, no studies addressing the relationship between mutation-carrying parents and children were identified, limiting the assessment of the role of family relationships in this situation.

One limitation of this systematic review may have been the exclusion of interesting articles due to the application of inclusion criteria. On the other hand, it is believed that the good performance in bias analysis of the compiled articles ensures the reliability of the conclusions in this review.

Regarding the profile of the studies included in this review, quantitative studies predominate, which provide valuable contributions that allow us to glimpse the relevance of this research topic. However, it is observed that more recent articles employ a qualitative approach, which may suggest a trend towards studying the emotional experience of those involved with genetic

mutation and/or breast cancer, to explore experiential nuances not captured by quantitative approaches. This opens the possibility of expanding the study and discussion of this intriguing and necessary topic.

Conclusion

This literature review allows us to conclude that the diagnosis of genetic mutation is accompanied by emotional distress for both the patient and their family members, although it is not the sole factor determining the psychological outcome. Personal and/or family history of breast cancer, as well as the psychological condition prior to genetic testing, are equally relevant factors. It is also important to consider, as some studies underline, the significance of family and marital dynamics, parental communication, and the support network available to family members. There is also a recommendation not to consider the genetic mutation result as the exclusive factor for emotional distress.

The set of reviewed studies suggests the need for preventive psychological approaches for patients and family members who have just received a genetic mutation diagnosis, are about to receive one, or are in the process of deciding whether to undergo testing. These conclusions can provide insights for oncologists and hospital psychologists, as they directly or indirectly deal with the suffering of their patients.

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