

Article

# Exploration of emotional journey navigation with coping approaches for breast cancer patients

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**Abstract:** Breast cancer survivors face significant obstacles even after receiving effective treatment, including problems with body image, anxiety and despair, stress from lifestyle changes, and ongoing difficulties managing their health. Among female-specific illnesses, breast cancer ranks high. Although mortality rates have decreased due to therapies and prevention efforts, patients' physical, emotional, cognitive, social, and spiritual lives are still profoundly affected by their diagnosis and subsequent treatment. It is conceivable that targeted psychosocial therapies to improve the health and well-being of women living with breast cancer may be better designed if there is a better understanding of how these people, both mentally and emotionally, reflect their disease and coping mechanisms. This study explored the illness perceptions and coping strategies among women receiving care for breast cancer. This study seeks to explore the experiences of the different stages women with breast cancer go through employing a patient journey. In this research, 15 adults who had breast cancer surgery were interviewed individually using a web-based survey (WBS) within three months after the procedure. Foundational data (such as sociodemographics) was derived via quantitative surveys. This study used thematic analysis to examine each interview separately. Suicide ideation and mental health concept validation was the goal of the quantitative data analysis that made use of confirmatory factor analysis. Afterwards, this study isolated and scaled the significant relationships between mental health and suicidal thoughts for additional bivariate analysis. Interview transcripts and survey replies were subjected to a qualitative inductive theme analysis. Patient journey and patient diagnosis and continuing during therapy, sentiment analysis was used to enhance the thematic results.

**Keywords:** breast cancer; emotional journey navigation; coping strategies; web-based survey; thematic analysis; quantitative and qualitative data analysis

## 1. Introduction

Breast cancer survivors can have a better experience with treatment when they follow the principles of person-centred care [1]. Care plans that use this method prioritize the importance of the patient-provider relationship by considering the patient's values and priorities. Healthcare providers and patients should work together to educate women about their treatment options and encourage active participation in their care [2]. Both urban and rural cancer patients face the same problem: a lack of oncology care coordination, which frequently causes treatment delays that aren't essential [3]. Breast cancer patients living in rural areas may face more obstacles, such as longer treatment times, higher transportation costs, and less availability of supportive care services [4]. Due to limited access to treatment, women living in rural

areas who have breast cancer may have to undergo more invasive surgical procedures [5].

Prior research has seen cancer as a stressful event, with an emphasis on how younger individuals deal with the disease [6]. This research stands out because it examines the cancer experience from a multi-stage perspective, concentrating on the perspectives of older persons throughout the three stages of illness: diagnosis, treatment, and survival. In most contexts, “coping” refers to how people deal with difficult circumstances and lessen the impact of negative outcomes [7]. A person’s cognitive, behavioural, or emotional reactions to stressful events are all part of their coping strategy. Previous studies have shown that cancer patients experiencing future uncertainty often have intense negative emotional reactions [8]. The devastating news of a metastatic disease, cancer, may be a very stressful event. Many cancer patients report that receiving a diagnosis is one of the most stressful aspects of their disease [9]. A cancer diagnosis may shatter the illusions of invulnerability that the majority of healthy people hold onto the WBS. Many things might stress a patient out, such as the physical symptoms that made them want to get a diagnosis, the emotional toll that the diagnosis had on them, and the pain and difficulty of undergoing more tests and treatments [10].

At this point in their sickness journey, patients may be most concerned with learning about their treatment choices and making an informed decision about which one to choose [11]. In most cases, therapy begins soon after a cancer diagnosis. Concerns about intrusive procedures and side effects of therapy are common concerns for individuals at this stage [12]. Patients are more likely to communicate with their healthcare professionals regularly during this time; therefore, they must have good conversations with their doctors and other medical personnel [13]. One prominent coping mechanism is the regulation of communication. There is a high rate of psychological distress among breast cancer women, and this is on top of the fact that breast cancer patients experience negative physical, psychological, and social effects of cancer treatment as well as the initial shock, terror, anxiety, and uncontrollable emotions of uncertainty and death that accompany a breast cancer diagnosis [14]. When faced with a potentially fatal disease and arduous treatment, breast cancer survivors use a variety of coping mechanisms, including decision-making, according to prior research. The majority of newly diagnosed chronic cancer patients relied on emotional journey navigation as a coping approach [15].

The main contribution of this paper is as follows:

- By illuminating women’s perspectives on the disease and coping strategies, this research contributes significantly to the understanding of the complex experiences of breast cancer patients.
- This paper offers valuable insights into the components linked to suicidal thoughts among breast cancer survivors and helps validate mental health ideas using quantitative analysis, specifically confirmatory factor analysis.
- To provide a more complete picture of the emotional journey that breast cancer patients take, this research combined sentiment analysis with an emotional approach to find the patient journey.

This paper is structured as follows: Section 2 studies the related research work of the cancer survivors' journey. In Section 3, the proposed methodology of the emotional journey navigation with coping approaches is explained, and in Section 4, the efficiency of this approach is discussed and analyzed.

## **2. Related study**

By exploring aspects through qualitative analysis, much research has been done to improve patient outcomes and experiences, especially during difficult medical journeys such as breast cancer treatment. Using patient acceptance and adaption, as well as patterns as a lens, this research explores the promise and challenges of these technologies by demonstrating the revolutionary potential of research on human-computer interaction in healthcare and highlighting the need for portable, integrated, and flexible tools to empower patients with breast cancer. This research clarifies many approaches to maximize patient care and support via examining integrative navigation therapy, interpersonal communication methods, healthcare professionals' viewpoints, and collaborative writing in imaginal conversation.

### **2.1. Mobile tool management (MTM)**

A tool for managing health using a tablet was made and utilized to get an insight into the potentials and hindrances of this line of approach. Within one month after the start of chemotherapy, twelve women were interviewed on their first adoption, adaptation, use or non-use. Jacobs et al. [16] discovered that creating a tool that was adaptable, portable, and integrated with the patient's healthcare system led to a surprising range of tasks that breast cancer patients used. It discusses how HCI research may affect current healthcare systems and how technology in health management might improve the cancer treatment experience.

### **2.2. Integrative navigation treatment (INT)**

In addition, important care-related barriers raised by participants include psychological problems, difficult relationships among couples, the stigma associated with breast cancer diagnosis, as well as misinterpretation surrounding it and interactions with medical staff. At a city hospital in the eastern part of the country where she was employed as a nurse, a patient navigation approach emphasizing integrative treatments was implemented. Additionally, during follow-up phone interviews involving another 37 African-American participants, the integrated patient navigation is rated successful at 3.8 to 3.9 out of four. The fact that more than half of the survivors said they continued to use supplementary approaches after treatment ended suggests that the integrative techniques had a long-term positive impact on their quality of life by Chatman et al. [17].

### **2.3. Interpersonal communication approach (ICP)**

According to Gallups et al. [18] interpersonal communication is essential for the patient navigator to lower barriers to treatment and enhance cancer care outcomes, according to research on the relational aspects of patient navigation. Despite being a fundamental skill for patient navigation, interpersonal communication's essential

elements are often ignored and understudied. This research aimed to find the essential interpersonal communication elements of patient navigation in breast cancer care that patients and patients navigation administrators thought had an influence on the patient-navigator relationship.

## **2.4. Health care professionals (HCP)**

People living with and beyond breast cancer are expected to self-manage portions of their treatment by health professionals as breast cancer survival rates rise and structural health resources are more strained. Healthcare providers must be more aware of and receptive to the idea that women may use various social media platforms as instruments for self-management. HCPS must start value-free conversations and provide a safe space for women to explain how social media tools help them take a timely, individualized, self-managed approach to meeting their specific psychosocial needs. As healthcare systems become more overburdened and substantial gaps in the availability of resources for healthcare arise, individuals' capacity to use constructive self-management techniques while dealing with chronic illnesses will grow, as analyzed by Ure et al. [19].

## **2.5. Collaborative writing in imaginal dialogue (CW-ID)**

Chan et al. [20] find that CW-ID as a research technique helps me better understand how people face and navigate their existential vulnerability as their disease progresses. Ironically, CW-ID serves as a therapeutic tool since it allows me to communicate my intense feelings to my supervisor while I'm traversing the transitional phases of my condition. The study's significance is that it provides an alternative to the autoethnographic method for examining the in-depth, individual experiences of health issues that disrupt one's biography. It extends an invitation to individuals wanting to engage in an imaginary conversation with me and others to push the boundaries of collaborative work. This may advance understanding of how people with illnesses could regain their sense of self while traversing the transitional areas along their sickness trajectory.

From July 2016 through September 2018, data was collected from a main cohort of 498 patients with invasive breast cancer. The study of Yan et al. [21] creates a prediction model using this cohort. Both pCR and tumour shrinking size were used as endpoints. Nomograms were developed in the original cohort, the HER2-positive cohort, and the triple-negative cohort using multivariate logistic regression analysis to screen for relevant clinical and clinicopathological characteristics. The risk variables determining the amount of tumour reduction were tested in the luminal group using multivariate linear regression analysis. The area under the receiver operating characteristic curve (AUC) and calibration curves were used to assess and analyze the nomograms' discriminatory and calibration capabilities. Using our prediction model, we can identify patients with a high chance of pCR following NAC. Clinicians can categorize these individuals and then provide treatment suggestions that are unique to each person.

Network pharmacology and experimental verification revealed *Ecliptae Herba*'s core components and molecular mechanisms that fight breast cancer [22]. In UPLC-

MS/MS, *Ecliptae Herba* compounds were discovered. The active components of *Ecliptae Herba* were tested for breast cancer effects using public databases. Both STRING and Metascape databases found hub genes. *Ecliptae Herba*'s ten active components identified 178 targets and analyzed 3431 breast cancer targets. 144 targets intersected in the disease. The PPI hub subnetwork identified EGFR and TGFB1 more closely. GO and KEGG research link *Ecliptae Herba* to various cancer therapy pathways. Our molecular docking tests showed that the major components bonded efficiently to key targets. Cytological studies suggest that *Ecliptae Herba* treats breast cancer by targeting TGF- $\beta$ 1, and the TGF- $\beta$ 1/Smad signalling cascade may be a crucial therapeutic mechanism. The molecular mechanisms, active components, and key targets of *Ecliptae Herba* were revealed, providing a strong scientific foundation and therapeutic mechanism for Traditional Chinese medicine to prevent and cure breast cancer.

In the work of Wang et al. [23], using a mouse xenograft model of human breast cancer, isomangiferin was tested *in vivo*. Isomangiferin's mode of action and breast cancer cell inhibition were examined *in vitro*. VEGF transmits messages by binding to VEGFR-2. Downstream signalling proteins mediate VEGF's effects on tumour formation, metastasis, and blood vessel production, promoting cancer progression. Breast cancer seems to stimulate VEGFR-2 signalling as a therapeutic target. The research examines how the small molecule isomangiferin regulates the VEGFR-2 signalling pathway. Xenograft tumours were suppressed by isomangiferin. Isomangiferin inhibited cancer cell adhesion, migration, invasion, and proliferation *in vitro*. Angiogenesis inhibition and isomangiferin's effect on breast cancer development were coordinated. A rat aortic ring experiment found that isomangiferin significantly reduced blood vessel formation during VEGF-induced microvessel sprouting. We found that isomangiferin decreases breast cancer risk by inhibiting VEGFR-2. Pharmaceutically targeting VEGFR-2 by isomangiferin may treat breast cancer.

Breast cancer patients have a multitude of issues while they undergo therapy. The significance of being able to adapt and integrate into current healthcare systems, as well as the critical role of mobile health management technologies in meeting these issues. The efficacy of integrated navigation therapy in reducing healthcare-related challenges and improving quality of life over the long run. Especially in increasing treatment demands and limited resources, the changing role of healthcare providers in assisting breast cancer survivors with self-management. To learn more about existential vulnerability and how it might help people develop as individuals when sick, we need to investigate the therapeutic and research possibilities of group writing. The information from these studies may be used to improve breast cancer treatment by examining various therapies and techniques.

### **3. Proposed methodology**

For a successful journey through breast cancer, A path through emotions offers a multi-faceted plan. Medical, psychological, social, spiritual, educational, practical, and supplementary support are all necessary for patients from diagnosis to survival. Through fostering resilience and overall well-being, this comprehensive approach

seeks to tackle the many obstacles encountered by individuals undergoing treatment for breast cancer.

A path through emotions. A multi-faceted strategy that considers the many phases of a breast cancer patient's journey is essential for effective navigation. Accurate information and education on the issue aids individuals in understanding their predicament during the Diagnosis Stage. At this stage, it is essential to have emotional support to overcome the first shock and uncertainty. Additional stress may be reduced with practical help in managing logistics. To gather necessary information, patients may benefit from psychological therapy during the treatment planning stage to help them overcome concerns and anxieties related to making treatment choices, as shown in **Figure 1**. Another way to help people feel more at home and understood is to encourage them to build relationships with others. Having someone near so can talk to or get information from at all times is crucial throughout the Active Treatment Stage. Help with everyday activities and other practical matters reduces the impact of treatment side effects. It is easier to adapt to life after cancer treatment with the help

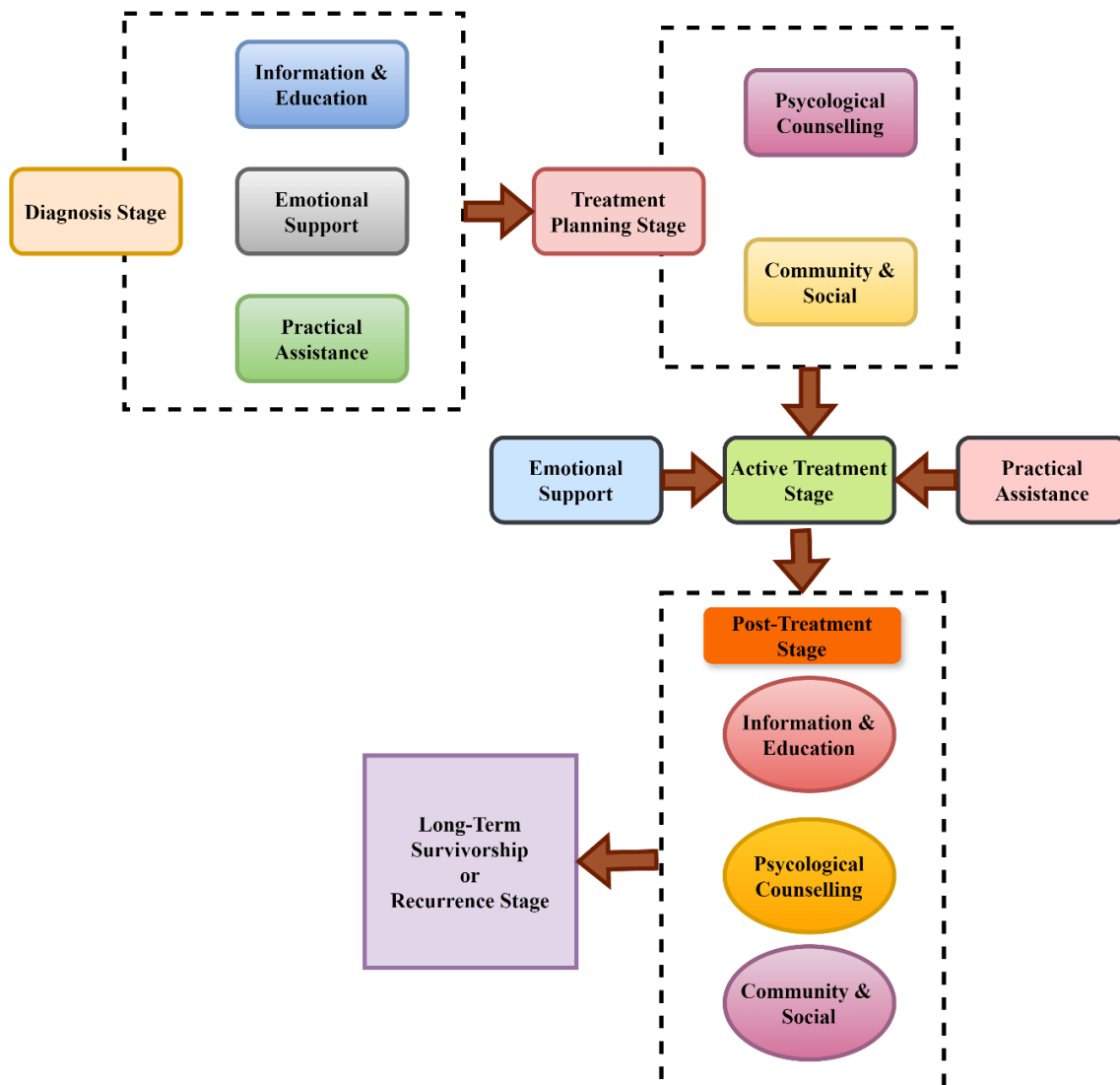


**Figure 1.** Emotional journey navigation for breast cancer patients.

of continuous psychological assistance. Getting back into the swing of things and making new friends requires active participation in one's community. The patient's general health and ability to face future challenges are enhanced in the Long-term Survivorship or Recurrence Stage via knowledge, emotional support, and the facilitation of community connections.

$$\frac{eF(u)}{eu} = -\partial F(u) + \nabla_1 T(u) + \nabla_2 D(u) - \alpha_1 S(k) + \nabla_2 Q(u) \quad (1)$$

The emotional state is represented by the Equation (1), while the impression of treatment and diagnostic are denoted by the Equation (1) of  $\frac{eF(u)}{eu}$  and  $\partial F(u) + \nabla_1 T(u)$  accordingly. It is important to note that the coefficients  $\alpha_1 S(k)$  represent the influence of social support, while the gradient  $\nabla_2 Q(u)$  represents the quality of coping methods.

$$F(u) = F_0 f^{-\partial u} + \int_0^u f^{-\nabla(u-C)} [g(D(\partial)) + h(T(\alpha))] e \nabla \quad (2)$$

The Equation (2) aligns the function  $F(u)$  to represent the emotional state, which is impacted by an initial mental baseline  $F_0 f^{-\partial u}$  and the functional  $f^{-\nabla(u-C)}$  raised to the power with negative partial derivatives  $g(D(\partial))$ . An accumulated effect of strategies for coping  $h(T(\alpha))$  and attitudes toward therapy  $e \nabla$  over time is accounted for by the integral.

$$F_j(u+2) = F_j(u) + \sum_{k=1}^P B_{jk} (F_k(u) - F_j(u)) + C_j D j_k(u) \quad (3)$$

The state of emotion at a time  $u+2$  is represented by the term  $F_j(u+2)$  in Equation (3). This state is impacted by the emotional states that are present at the moment's time step  $F_j(u)$  as well as their relationships with other emotional states  $B_{jk}$ . The coefficients  $F_k(u)$  and  $F_j(u)$  are responsible for capturing the influence of inter-emotional interactions and coping strategies  $C_j D j_k(u)$ , respectively.

$$S(u) = S_0 + \int_0^u \left[ \beta \times \frac{eF(\nabla)}{e \nabla} + \alpha \times \frac{Ed(\nabla)}{er} \right] \delta \varepsilon + \exists F D \quad (4)$$

The change in social assistance  $S(u)$  as breast cancer patients go through coping mechanisms is represented by Equation (4). The baseline  $\beta$  level of social support is denoted by the term  $S_0$  and the overall effect of psychological influence  $\frac{eF(\nabla)}{e \nabla}$  and diagnostic impact  $\alpha \times \frac{Ed(\nabla)}{er}$  over time, controlled by constants  $\delta \varepsilon$  is accounted for by the integral. The stochastic component is denoted by  $\exists F D$ .

---

#### Algorithm 1 Data collection

---

```

1: patientProfile = {
2:   "personalDetails": {
3:     "age": 0,
4:     "gender": "",
5:     "familySupport": False

```

---

---

```

6:   },
7:   "medicalDetails": {
8:     "diagnosis": "",
9:     "treatmentPlan": ""
10:  },
11:  "emotionalAssessment": {
12:    "anxietyLevel": 0,
13:    "depressionScale": 0
14:  }
15: }

```

---

The patient profile data structure is designed to comprehensively collect and store essential information about a breast cancer patient to provide tailored emotional support, as explained in Algorithm 1. It includes three main categories: personal details, medical details, and emotional assessment. The personal details section records demographic information such as age, gender, and the presence of family support. The medical details section captures the patient's diagnosis and the specifics of their treatment plan. The emotional assessment section tracks the patient's current emotional state through metrics of anxiety level and depression scale. This structured approach ensures that all relevant information is gathered, enabling the development of personalized coping strategies and support plans based on each patient's individual needs.

The population characteristics of the included research were mapped across designated categories to display the population characteristics. Tables and, where applicable, figures were used to display the data. Frequencies and percentages were used to characterize the data. The use of the theoretical framework to classify and tabulate concerns according to broad areas of reported symptoms or stressors, as well as coping techniques. Emotion-based coping strategies include reaching out to loved ones, learning relaxation methods, or participating in expressive therapies to alleviate the emotional pain associated with a cancer diagnosis and treatment. However, problem-based coping is more concerned with dealing with the real-world difficulties that come with the condition, such as finding a medicine that works, following doctors' orders, or getting help financially. Through the integration of these methods, individuals coping with breast cancer may strengthen their ability to bounce back from the many challenges they will face throughout treatment and after. People living with Breast cancer benefit from having someone to lean on emotionally while they face this disease. It includes listening with empathy, validating emotions, and creating a safe environment for expression. Anxiety, despair, and feelings of loneliness may be alleviated with the help of loved ones, support groups, and healthcare providers from the time of diagnosis to survival, as explained in **Figure 2**.

$$F(u) = \beta_0 + \gamma_1 \times D_1(u) + \gamma_2 \times D_2(u) + \dots + \gamma_n \times D_n(u) \quad (5)$$

The emotional state denoted as  $F(u)$ , is described in Equation (5) as a linear mixture of many components associated with diagnostic experiences, denoted as  $\beta_0$ . Each component connected to the diagnosis is given a weight in the coefficients  $\gamma_1 \times D_1(u)$ , which shows the level of impact  $\gamma_2 \times D_2(u)$  it has on the emotional state of the patient  $\gamma_n \times D_n(u)$ .

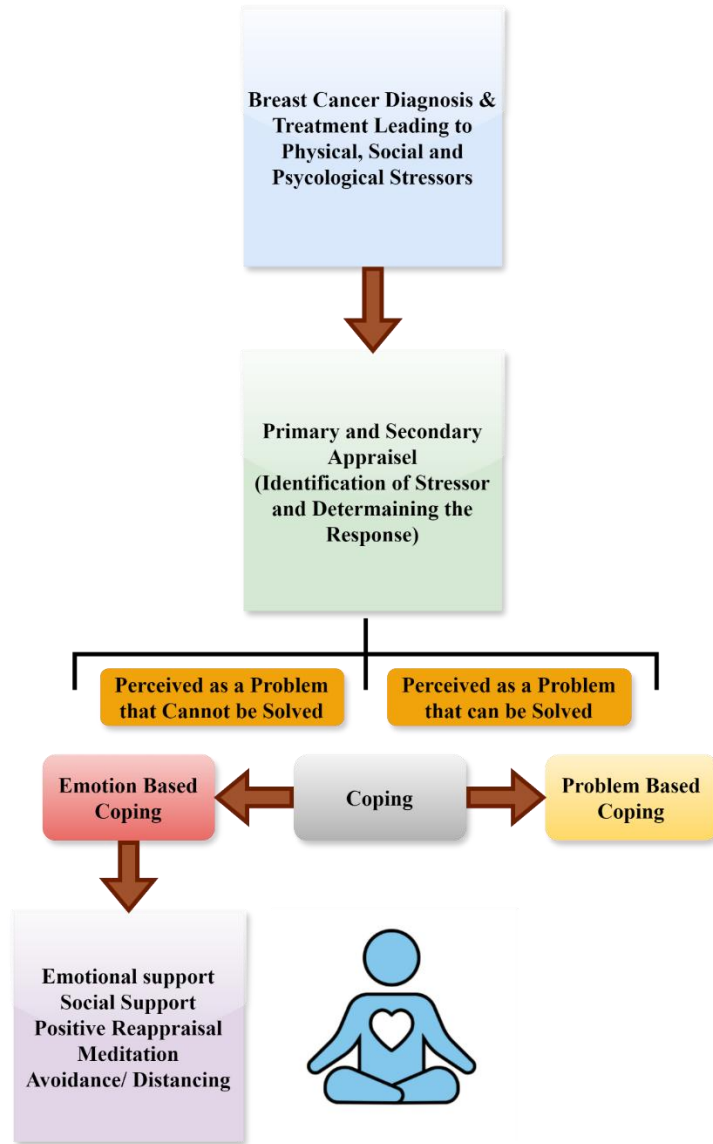


**Figure 2.** Breast cancer patients' anxieties and coping approach.

$$fP(u) = (\rho F(u) + \sigma D(u) + \theta T(u)) \times eu + \forall eQ(u) \quad (6)$$

The state of mind  $fP(u)$  is represented in Equation (6) by the suggested technique using several variables, including the state of mind  $F(u)$ , experiences with diagnosis ( $\sigma D(u)$ ), and perceptions regarding treatment ( $\theta T(u)$ ). The weights of each element, represented by the coefficients  $eu$ , show their effect on the emotional state. The temporal dynamics are indicated, whereas extra external impacts are captured by  $\forall eQ(u)$ .

$$\frac{\propto F(y, u)}{\propto U} = E\Delta^2 F(y, u) + g(F(y, u), D(y, u), T(y, u)) \quad (7)$$

Integrating the emotional gradient  $\frac{\propto F(y, u)}{\propto U}$  and the impact of diagnosis experiences and therapy perceptions  $E\Delta^2 F(y, u)$  with the change in the state of mind ( $g(F(y, u), D(y, u), T(y, u))$ ) as time passes, Equation (7) aligns with the suggested method. In this case, the weighting coefficient is represented.

$$\frac{eD_j(u)}{eu} = -\partial_j(u) + \forall r_j(u) - \partial_k F(p) + \gamma_j v(k) \quad (8)$$

By representing the rate shift of diagnostic experiences ( $\frac{eD_j(u)}{eu}$ ) across time  $u$  as a function of several parameters, Equation (8) aligns with the suggested approach. The term denotes the deterioration or decay of diagnostic experiences  $\partial_j(u)$  and the impact of external circumstances on these experiences is denoted by  $\forall r_j(u)$ . Furthermore, emotional states are captured by  $\partial_k F(p)$ , and the importance of coping methods to the shift in diagnostic experiences is denoted by  $\gamma_j v(k)$ .

---

**Algorithm 2** Identification of emotional state

---

```

1: def identify_emotional_state(emotionalAssessment):
2:   if emotionalAssessment["anxietyLevel"] > 7:
3:     return "High Anxiety"
4:   elif emotionalAssessment["depressionScale"] > 7:
5:     return "High Depression"
6:   # Add more conditions as necessary
7:   else:
8:     return "Stable"

```

---

The `identify_emotional_state` function determines a patient's emotional state based on their anxiety and depression levels, which is explained in Algorithm 2. It evaluates the emotional assessment dictionary: if the anxiety level exceeds 7, it returns "High Anxiety"; if the depression scale exceeds 7, it returns "High Depression". If neither condition is met, it returns "Stable". This method helps categorize the patient's emotional status for appropriate support.

Understanding how women with breast cancer perceive their condition and cope with it requires a multi-step study design. Individual interviews provide a more in-depth look at the data collected from the WBS, which focuses on socio-demographics, as shown in **Figure 3**. Patterns and insights may be uncovered from interview data via Thematic Analysis, which employs Qualitative Inductive Theme Analysis. Sentiment analysis improves theme findings by exploring emotional subtleties, which are

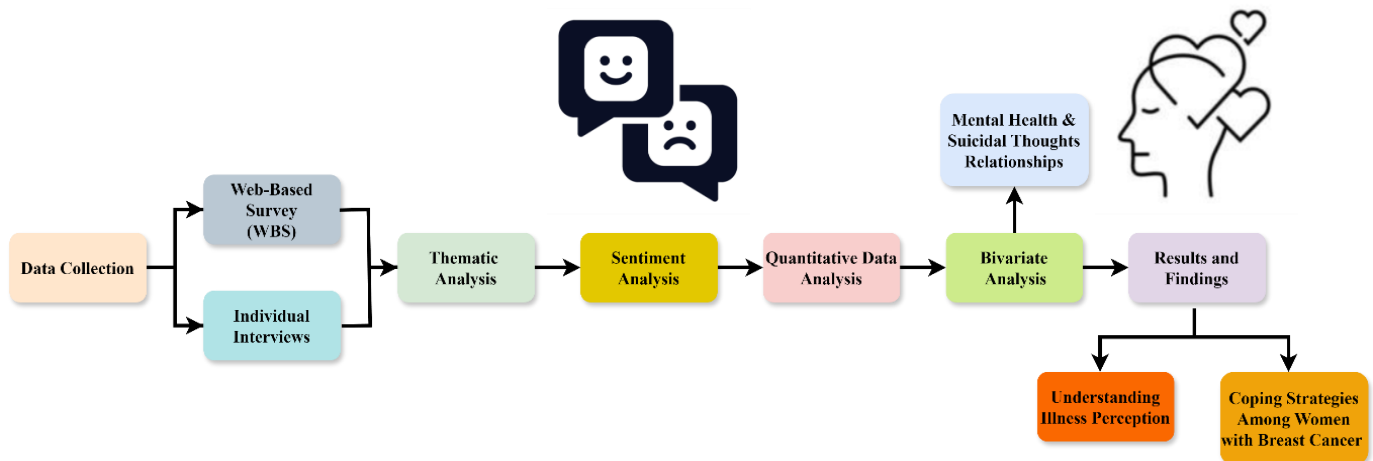


**Figure 3.** Web-based survey for breast cancer.

supplemented by this. Analyses using quantitative data, such as bivariate and confirmatory factor analyses, investigate connections between mental health and thoughts of suicide. This statistical investigation provides a quantitative interpretation of the acquired data. The summation of Results and Findings is the final product of these investigations. Insights for healthcare treatments and support services may be gleaned from this thorough study of women's unique coping techniques and sickness beliefs in the face of breast cancer.

$$F(u) = \forall + C_d \times Q(u) + \forall_2 T(u) + \forall_3 T(u) + \phi up(t + 1) \quad (9)$$

The suggested technique is consistent with Equation (9) as it represents the emotional state ( $F(u)$ ) as a combination of several elements. A baseline state of mind is denoted by  $\forall + C_d \times Q(u)$  and the impact of coping strategies on emotional well-being is denoted by  $\forall_2 T(u)$ . Furthermore, the effects of therapeutic perceptions on the emotional state are shown by  $\forall_3 T(u)$ , with coefficients  $\phi up(t + 1)$  indicating possible differences in weight. The word ( $\phi$ ) represents the change in emotional states with time.

$$eF(u) = \omega \left( F(r), D(u), W(u)ep + \pi(F(u), D(u), Q(s))Fg(u) \right) \quad (10)$$

In Equation (10), the term  $eF(u)$  represents the impact on the mental trajectory of regulating emotions ( $F(r), D(u), W(u)ep$ ), diagnosis experience ( $F(u), D(u), Q(s)$ ), and outside support systems ( $Fg(u)$ ). The connection between emotional state, diagnostic experiences, and coping methods is also denoted.

$$F_j(u + 1) = F_j(u) + \sum_{k=1}^P b_{jk} \left( F_k(u) - F_j(u) + c_j D_j(u) \right) \quad (11)$$

By modelling the development of cancer patients' feelings  $F_j(u + 1)$  Equation (11) closely matches the suggested strategy as a function of several variables. A person's emotional condition at time  $u$  is denoted by the term  $F_j(u)$ , while the impact of other people's emotional states on  $j$  is captured by the term  $b_{jk}$ . Furthermore, the effect of illness experiences on the emotional condition of a person  $F_k(u)$  is denoted by  $F_j(u) + c_j D_j(u)$ .

$$F(u) = \int_0^h g(D(\partial), T(\partial), \forall) e\delta + \int_0^u h(F(\beta), G(\alpha), \beta) e\gamma + \nabla \quad (12)$$

Equation (12) is in good agreement with the suggested approach, which models breast cancer patients' emotional states ( $F(u)$ ) as a complicated integral of several components. The first integral,  $g(D(\partial), T(\partial), \forall)$ , takes into consideration the total impact of first-hand experiences with diagnosis ( $e\delta$ ) and therapy ( $\nabla$ ) up to a specific time  $\nabla$ , with a constant  $F(\beta), G(\alpha)$  modulating the effect and representing the impact of emotional states ( $e\gamma$ ) and coping methods across time. The slope term captures a further set of dynamics.

A multi-faceted support structure is necessary for complete treatment for breast cancer patients in **Figure 4**. Assisting with the physical symptoms of a disease is the primary goal of medical care, which aims to promote overall health and well-being. When people have one other's backs, it helps their mental health and makes them feel

they belong somewhere. There is solace and calmness inside when one has spiritual support. Patients may better understand their ailment and available treatment choices with the help of educational tools. To improve one's quality of life, practical aid is necessary to lessen the burdens of everyday living. Alternative and complementary medicine (CAM) offers other ways to treat symptoms and improve health in general. Throughout their breast cancer journey, patients may get holistic care that promotes resilience and facilitates recovery by combining these multiple types of support. This care covers patients' physical, emotional, social, and spiritual needs.

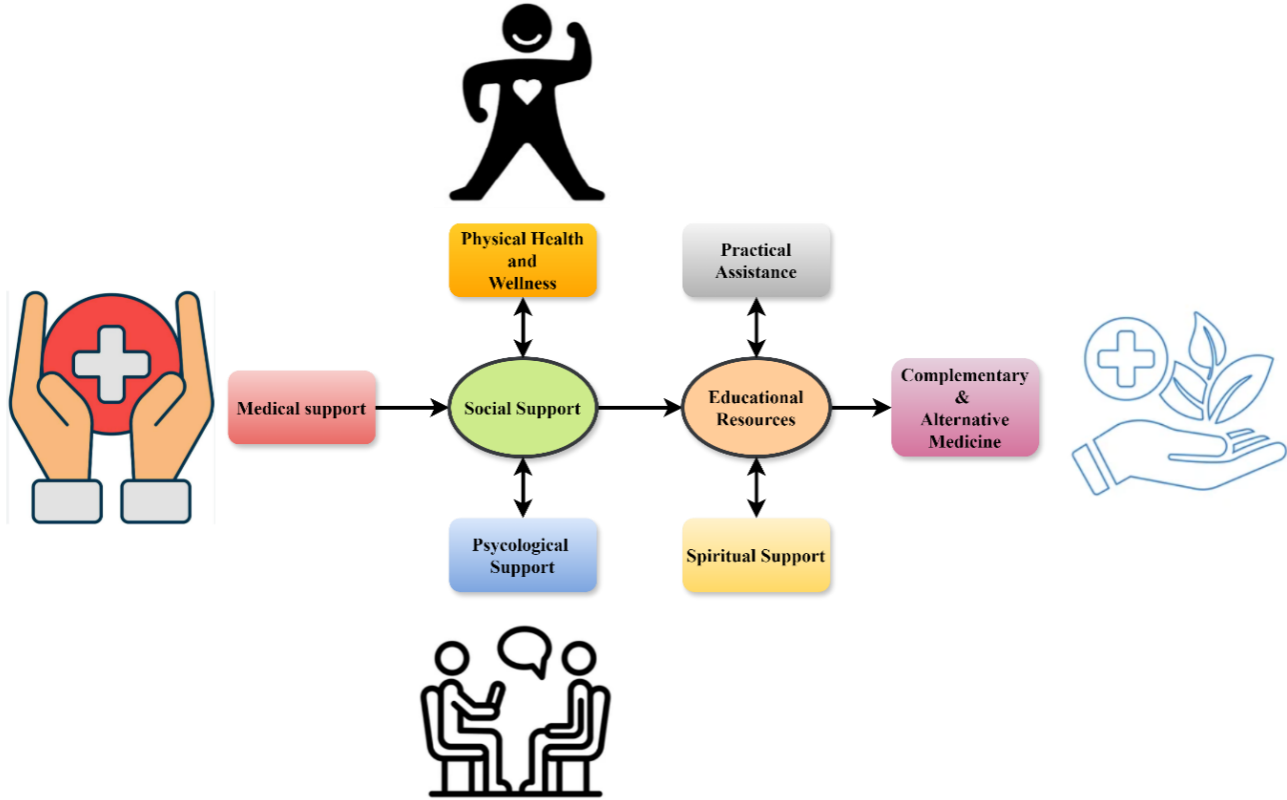


**Figure 4.** Coping approaches for breast cancer patients.

$$Q(F_{u+1}|G_u, D_u, T_u) = \frac{1}{a} f_{yz} \left( \sum_{j=1}^w \partial_k + \forall_p(F_u, D_u, T_{s_r}) \right) \quad (13)$$

The connection between the mental state at the moment ( $F_{u+1}|G_u, D_u, T_u$ ) and the parameters  $\frac{1}{a}$  is captured by the function  $f_{yz}$  in Equation (13), which is closely related to the suggested technique. Emotional states and other elements interact through the function  $\partial_k$ . The expression  $\forall_p(F_u, D_u, T_{s_r})$  combines the impact of several psychological and contextual elements.

$$\frac{eG(v)}{qp} = -\mu F(u) + \varphi D(u) + \delta D(f) + \mu(u + 1) \quad (14)$$

In terms of time  $qp$  and perception, Equation (14) is in harmony with  $(eG(v))$ . The effects of one's emotional state  $\mu F(u)$  and one's diagnostic experiences  $(\varphi D(u))$  on coping mechanisms are described by  $\delta D(f)$ , respectively. Aside from that,

$\mu(u + 1)$  represents the impact of extraneous variables on coping, and coping techniques change over time.

$$Q(F_u|D_k(u), T_h(v)) = Q(F_u) + \sum_{j=1}^v Q \times (D_f(u)) + F_u \quad (15)$$

The emotional state  $F_u$  is determined by the diagnosis experience  $D_k(u)$ , and therapy impressions  $T_h(v)$  according to Equation (15). The formula  $Q \times (D_f(u))$  represents the impact of diagnostic events on the emotional state, modified by the factor  $Q$ , whereas the term  $F_u$  represents the unconditional likelihood of the emotional state.

$$Q(F_{u+2} = f_g | F_u = g_m) = \frac{1}{a} f_{yz} \left( S_{jp} + \sum_j^{q=1} D_f(u) + \sum_l^e (u + 1) \right) \quad (16)$$

Equation (16) is a good fit for the conditional probability of the emotional state  $F_{u+2}$  given a specific emotional state  $F_u = g_m$  for Sentiment analysis. The interplay of emotional states with other elements, including coping mechanisms  $\frac{1}{a}$ , experiences with diagnosis ( $S_{jp}$ ), and changes in time ( $D_f(u)$ ), is symbolized by the function  $u + 1$ .

---

**Algorithm 3** Continuous emotional support

---

```

1:  def emotional_journey_navigation(patientProfile):
2:      # Initial assessment
3:      currentEmotionalState = identify_emotional_state(patientProfile["emotionalAssessment"])
4:      # Initial strategy recommendation
5:      patientProfile["supportPlan"] = recommend_strategies(currentEmotionalState)
6:      # Continuous monitoring and adaptation
7:      while not patientProfile["medicalDetails"]["treatmentPlan"].complete:
8:          monitor_and_adapt(patientProfile)
9:      return patientProfile

```

---

The `emotional_journey_navigation` function provides continuous emotional support to breast cancer patients, as explained in Algorithm 3. It begins with an initial emotional assessment and strategy recommendation. While the treatment plan remains incomplete, the function continuously monitors and adapts the patient's support plan by reassessing their emotional state and updating coping strategies. This ensures ongoing, personalized emotional care throughout the treatment journey.

The participants' concerns about the potential need for further treatments after primary treatment, such as radiation or chemotherapy, added to their worries about an incomplete cure and the chance of breast cancer recurrence, will be shown in **Figure 5**. The unpleasant experience of a loved one or friend undergoing radiation or chemotherapy was a major factor. Some symptoms and events made the participants suspicious of a cancer recurrence. The most common urinary tract symptoms were blood in urine, swelling and pain in testicles, inability to hold urine and repeat episodes of urethra blockages. It gave a detailed account of participants' experiences with coping strategies that aimed at reducing the anxiety caused by worry about an

incomplete cure or cancer recurrence. They mainly relied on two mechanisms: psychological approaches and spiritual coping to change their worries and concerns. Their spiritual beliefs helped them deal with their fear of cures and the return of cancer among patients. Participants hope that seeking information and necessary follow-ups can help them maintain good health, minimizing the chances of the disease returning. Following cancer treatment, they became more vigilant about their health so that they prevented future occurrences or worsening. They made an effort to reduce their stress levels since they were aware that it was a risk factor for cancer recurrence. Cultural beliefs may influence the behaviour of participants, even when scientific data suggests that avoiding stress does not significantly reduce the risk of cancer recurrence.

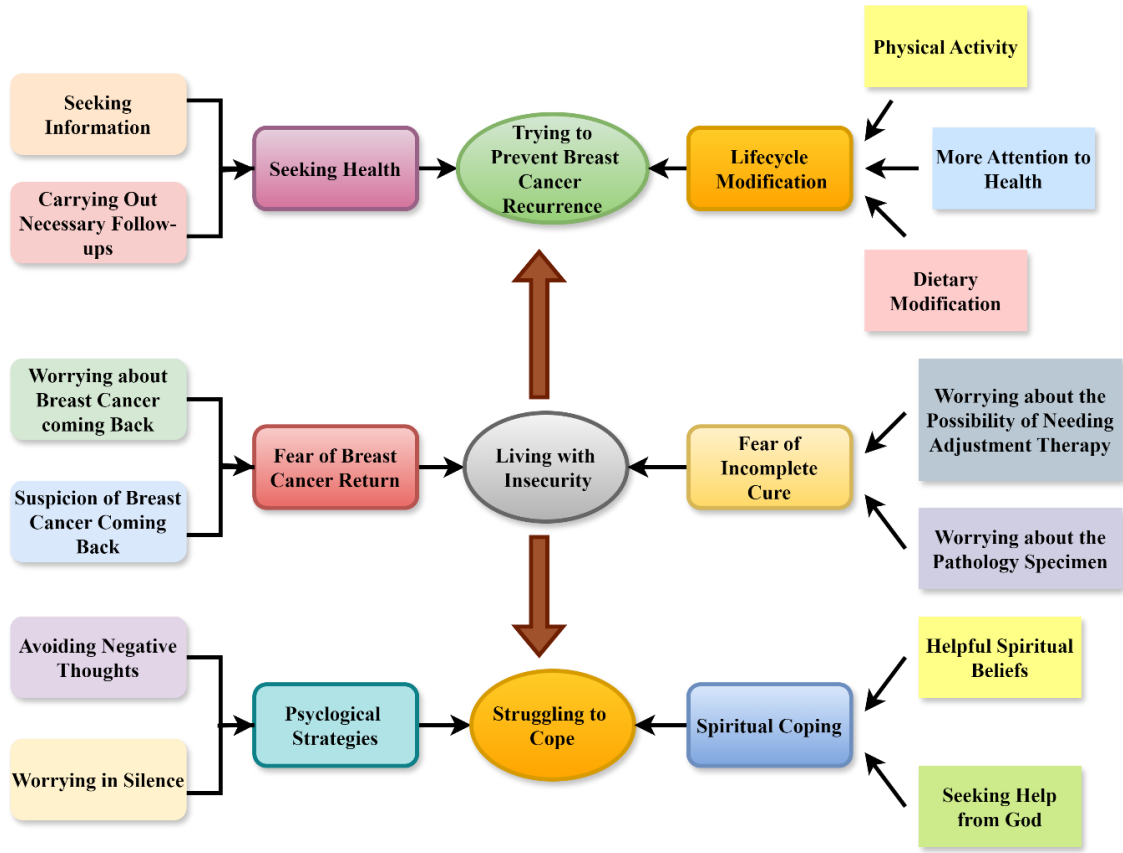


**Figure 5.** Prostate breast cancer patients' coping and recurrence.

$$F_j(u + 1) = Q_p(u) + \sigma_p(u + 1) + K(m(n - 1)) \quad (17)$$

Equation (17) represents the Thematic Analysis of Patient Experiences between ways of coping ( $Q_p(u)$ ), temporal changes ( $F_j(u + 1)$ ), and external influences ( $K(m(n - 1))$ ) as they pertain to individual  $j$  at time  $u + 1$ . The term denotes the impact of coping strategies on emotional states, whereas  $\sigma_p(u + 1)$  records change over time. The influence of extraneous variables on emotional paths is represented.

$$S(u) \sim P(d_{level} + \forall_{age} + \varphi_{treatment} + \pi_{interaction}, \theta^2) \quad (18)$$

Equation (18) represents the Analysis of the Correlation Between Mental Health and Suicidal Thoughts, which involves casting breast cancer patients' social support

( $S(u)$ ) as affected by different variables. The level of social support is symbolized by  $d_{level}$  and the influence of age is represented by  $\forall_{age}$ . Furthermore,  $\varphi_{treatment}$  represents the treatment's influence, and  $\pi_{interaction}$  represents the effects of factors interacting with each other. The value for the parameter represents the variation of a distribution  $\theta^2$ .

$$T(p + 1) = g \left( q_{FF} \times f(U) + Q_{Fg}D(u) + c_d(u + 1) \right) \quad (19)$$

The Analysis of Psychological Impact is shown in Equation (19), which models the therapeutic perceptions  $T(p + 1)$  as a function of several parameters. The  $q_{FF}f(U)$  reflects the effect of diagnosis experiences, whereas the term  $Q_{Fg}D(u)$  denotes the interplay between mental conditions and external factors on therapeutic perceptions. The effect of time dynamics on how therapy is perceived is indicated by  $c_d(u + 1)$ .

$$\frac{eF(u)}{ef} = GF(u) - \delta\mu_{(u+1)} + \gamma(S + er) + \mu_q(k - u1) \quad (20)$$

This strategy is mirrored in Equation (20), which expresses the rate of shift of the mental state  $\frac{eF(u)}{ef}$  as a function of different factors for Analyzing the Role of Coping Strategies. The inherent fluctuations in feelings are represented by the term  $GF(u)$ , whereas the influence of temporal alterations is captured by  $\delta\mu_{(u+1)}$ . Moreover,  $\gamma(S + er)$  represents the impact of interaction with others and external influences and  $\mu_q(k - u1)$  stands for the impact of coping strategies with increasing time.

This technique is necessary to fully comprehend how breast cancer patients cope with their condition and how they perceive it. To conclude, quantitative data analysis will be used in conjunction with theme and sentiment analysis to gather socio-demographic data via online surveys and in-person interviews.

## 4. Experimental results

Dataset description: Worldwide, breast cancer is the most frequent disease to affect women. It affects about 2.1 million individuals in 2015 alone and makes up 25% of all cancer cases. It all begins when breast cells start to proliferate uncontrollably [24]. Usually, these cells develop into tumours that are felt as lumps in the breast region or visible on X-rays.

The main obstacle to its discovery is determining whether a tumour is benign (not cancerous) or malignant (cancerous). Please finish the study of the Breast Cancer Wisconsin (Diagnostic) Dataset and machine learning (using SVMs) to categorize these tumours.

### 4.1. Sentiment analysis

To enhance the theme findings obtained from the patients in **Figure 6**, this research used sentiment analysis, a strong method for analyzing the emotional subtleties inside textual data expressed in Equation (16). To look into the thoughts expressed during interviews and survey responses, investigators gained insights into women's emotional journeys through different stages of treatment for breast cancer

using sentiment analysis. It could, therefore, be used to identify numerous feelings about diseases, such as despair, optimism, resilience, etcetera. This made it easier to understand this matter's intricate web of sentiments fully. Paying attention to how patients feel emotionally at the diagnosis stage, after starting therapy, or while still going through problems experienced by patients' sentiments developed themes more than traditional approaches in qualitative studies. It examined emotional reactions towards diagnosis and treatment. Sentiment analysis identified changes in patients' moods over time, enabling dynamic research into how cancer survivors adapt and improve their mental states. Furthermore, 95.3% show improvement has been noted in patient care after undergoing sentiment analysis; this complex knowledge will be useful in developing psychosocial therapies to meet the unique emotional requirements of breast cancer survivors.

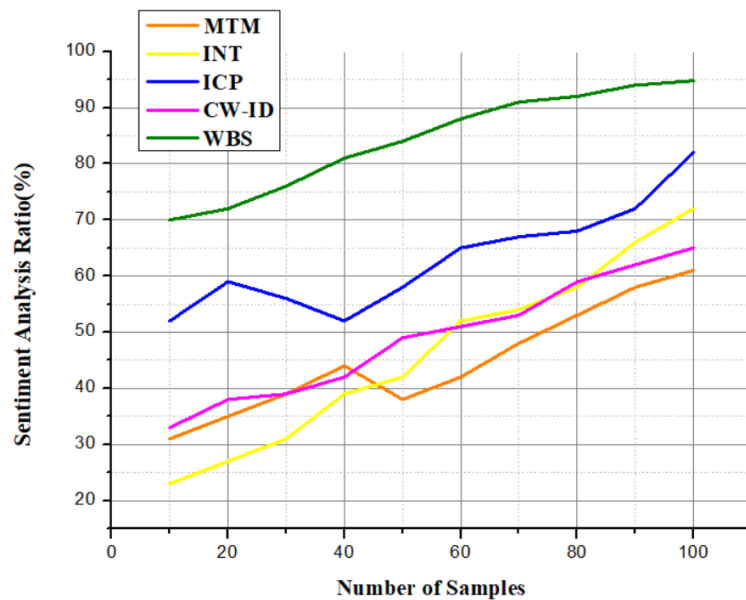


**Figure 6.** Sentiment analysis ratio.

#### 4.2. Thematic analysis of patient experiences

Thematic analysis was employed, which encompassed scrutiny of interview scripts and survey replies to find patterns regarding the baby's journey with breast cancer patients, as expressed in Equation (17). They systematically organized and classified qualitative data that helped them learn a lot about different aspects of patient's experiences, from when they were diagnosed for the first time until they started receiving treatment and the recovery process. Some reoccurring issues emerged, thus giving an insight into various challenges and coping strategies for women with breast cancer. In addition to decision-making regarding treatments, symptom management or lifestyle changes, these themes extend to feelings such as fear, hope, and resilience. Patients' experiences depended largely on social dynamics, family support networks, medical providers' contact, and community-based programs. Thematic analysis has provided a broader picture of psychological and social aspects in women who survived breast cancer that highlights issues faced by patients throughout their journey towards recovery and beyond. By finding patterns common to subjects through thematic analysis, it became possible to create personalized

supportive services and therapies for individuals who are dealing with diagnosing breast cancer as well as its subsequent treatment. The thematic patient experience in breast cancer has improved by 96.5% in this proposed method, as shown in **Figure 7**.

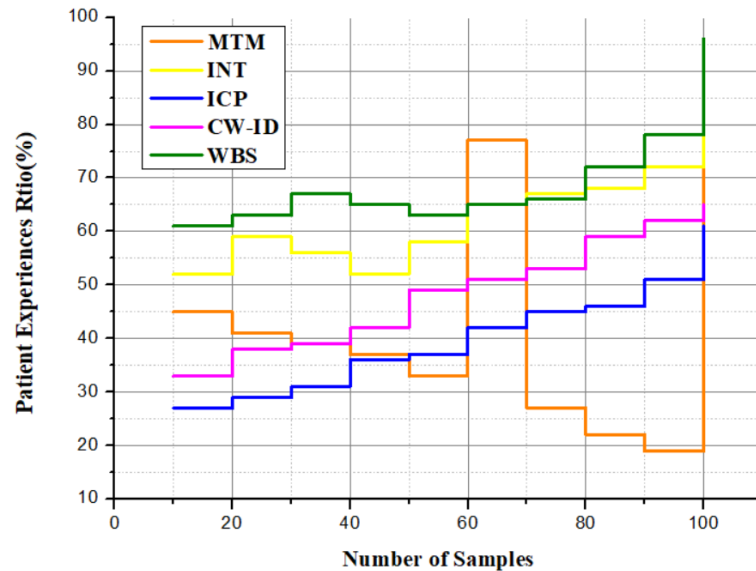


**Figure 7.** Thematic patient experiences ratio.

#### 4.3. Analysis of correlation between mental health and suicidal thoughts

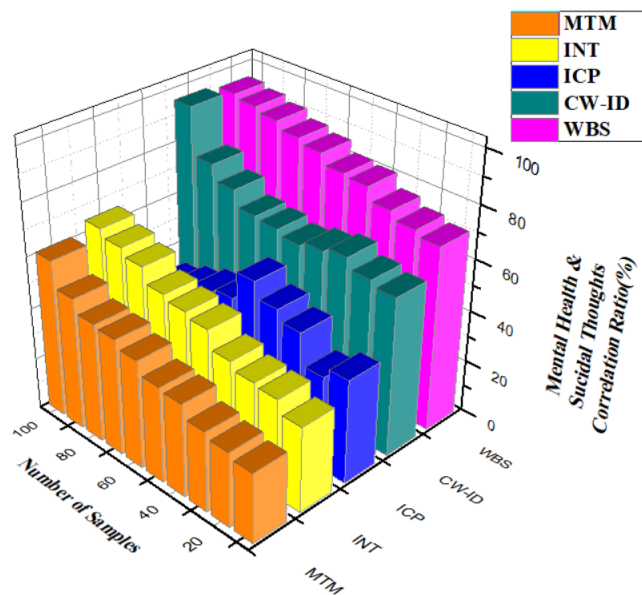


**Figure 8.** Correlation between mental health and suicidal thoughts.

**Figure 8** illustrates the discovery that mental health and suicidal thoughts are deeply intertwined has significant consequences for the well-being of breast cancer survivors, as expressed in Equation (18). Confirmatory factor analysis (CFA) was used to identify and quantify these connections between variables, which were then examined using bivariate analyses. Mental health challenges were strongly correlated with suicide attempts in people diagnosed with breast cancer. These relationships were determined to be significant. The fact that poor mental health often leads to an increase

in suicidal ideation was supported by confirmatory factor analysis, thus emphasizing the importance of careful monitoring of mental health and prompt treatment for individuals at risk. In situations where individuals have problems such as sadness, worry, or unease, their levels of suicidal thoughts become very high. This shows how emotional discomfort can impact the feelings and thinking processes of patients who are dealing with breast cancer. With a correlation coefficient of 97.9%, the proposed method enhanced when it comes to mental health among those who have breast cancer and their likelihood of developing suicidal thoughts.

#### 4.4. Analysis of psychological impact

This paper showed that women who have beaten breast cancer could have more psychological issues, as shown in **Figure 9** than generally thought, as expressed in Equation (19). The main emotions identified in the data were fear, depression and ambiguity due to diagnosis and continuous treatments for this condition. Among the themes that emerged concerning self-awareness were body images, lifestyle changes and fears about meaninglessness associated with their experiences of illness. In the same way, social aspects depend on each other's spirituality, as shown by different patients. To ease pain caused by emotional outbursts amongst survivors while promoting quality of life, a better knowledge of the psychological effects of diseases and cancer should be attained. Therefore, Health workers should pay close attention as these victims tell their stories, infusing empathy into their lives and giving them strength. Thus, this investigation illustrates why holistic approaches to cancer care must include psycho-social support for female survivors of breast cancer. By taking the emotional route, the ratio of 98.7% can be improved in the proposed method.

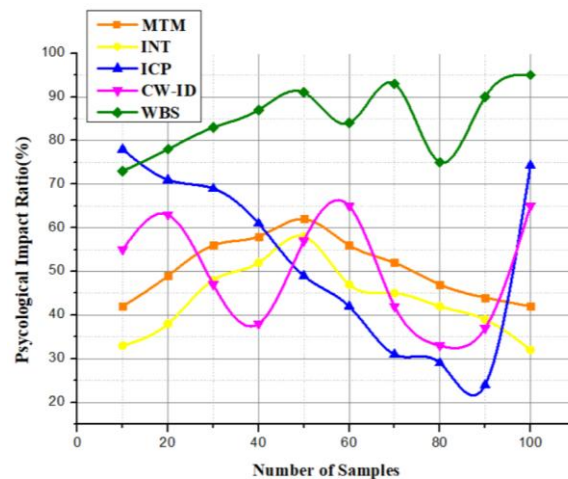


**Figure 9.** Psychological impact ratio.

#### 4.5. Analyzing the role of coping strategies

An examination of the interviews via the lens of theme analysis brought to light a variety of coping methods used by breast cancer patients, which is expressed in Equation (20). Adopting new health habits and using mental health services were some of the techniques included in this category, as shown in **Figure 10**. This included seeking social support and participating in spiritual activities. The efficiency of various strategies varied, suggesting that a tailored approach to coping mechanisms

can improve individual patients' results. Crucial in managing the emotional anguish connected with the disease were coping methods that focused on emotions, such as accepting the situation as it is, re-framing it, and finding meaning in it. The investigation highlighted adaptive coping, as survivors showed resilience and adaptability in hardship. How people face and overcome the psychological and social obstacles of breast cancer survival may be better understood by looking at the function of coping mechanisms. Healthcare providers may help cancer survivors deal with their emotional and practical challenges by learning what works for them and what doesn't and creating individualized support programs. The role of coping strategies is gained by 96% in the proposed methodology.

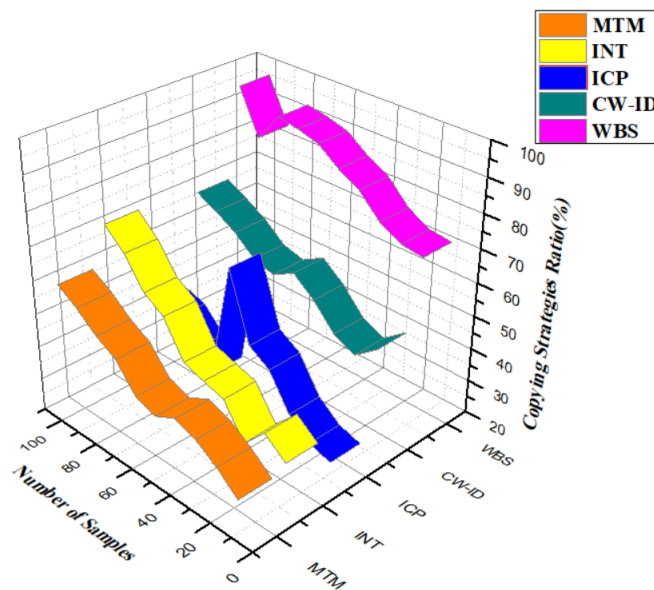


**Figure 10.** Role of coping strategies.

## 5. Discussion

In this research, 15 adults who had breast cancer surgery were interviewed individually using a web-based survey (WBS) within three months after the procedure. Foundational data (such as sociodemographics) was derived via quantitative surveys. This study used thematic analysis to examine each interview separately. Suicide ideation and mental health concept validation was the goal of the quantitative data analysis that made use of confirmatory factor analysis. Afterwards, this study isolated and scaled the significant relationships between mental health and suicidal thoughts for additional bivariate analysis. Interview transcripts and survey replies were subjected to a qualitative inductive theme analysis. This method allows for discovering patterns and themes that would otherwise go unnoticed by traditional qualitative analysis and gives a thorough understanding of the complex emotional terrain that comes with breast cancer. Sentiment analysis allows for the tracking of shifting emotional states, which provides real-time information on how survivors dealt with the trauma and how their mental health changed over time.

The experiences of individuals who have survived breast cancer by using several analytical perspectives. The thematic analysis sheds light on the emotional and practical aspects of cancer patients' coping mechanisms and the many difficulties they

experience during their journey. Moreover, the correlation analysis emphasizes the need for psychological assistance in cancer treatment by demonstrating the substantial influence of survivors' mental health on suicidal thoughts. Comprehensive support techniques are advocated by examining the psychological effect, highlighting the complex interaction between sickness, emotions, and social dynamics. The research adds to the knowledge of breast cancer survivorship by combining these findings, which may guide the creation of individualized psychosocial therapies to boost survivors' health and satisfaction. The experimental results demonstrated that the proposed WBS model increased the sentiment analysis ratio to 95.3%, the thematic analysis ratio to 96.5%, the correlation between mental health and suicidal thoughts prediction ratio to 97.9%, the psychological impact ratio by 98.7%, the role of coping strategies of 96% compared to other existing models. Further research is required to comprehend the cancer journey properly, the many obstacles encountered, and how to evaluate the effects of orientation. Cancer doctors and online content developers need to understand that knowledge can change a person's experience with cancer and that they must disseminate information ethically. Nursing interventions might potentially target this to female breast cancer patients who often exhibit emotional restraint and reluctance to communicate their emotions. Therefore, while offering treatments to female breast cancer patients from varied cultural backgrounds, healthcare providers should be more sensitive to cultural differences. As part of the regular nursing care routine, evaluating patients for distress symptoms at every stage of the diagnosis and treatment process in breast cancer is crucial. These results demonstrate that healthcare providers should investigate validated, reliable measures of emotional expression, body image, sexuality, and fertility. They support the availability of treatment to assist female patients with breast cancer to communicate their feelings through an emotional approach method.

## **6. Conclusion**

Deep insights into the psychological processes of breast cancer patients may be gained by examining the complex links between self-compassion, emotional resilience, emotion regulation, depression, and anxiety. Knowledge of the mediating functions of emotion regulation and resilience not only improves the knowledge but directs toward specific treatment approaches that can greatly improve mental health outcomes. Despite its insightfulness, the research has a few significant drawbacks that should be considered. Because of its WBS, which makes it impossible to prove conclusive causation, longitudinal studies are a preferable method for confirming the direction of correlations between depression, anxiety, emotional resilience, self-compassion, and cognitive emotion regulation. Self-report measures run the risk of introducing biases since participants may not always provide truthful or accurate answers, either due to social desirability or a lack of accuracy in their self-awareness of breast cancer patients. The experimental results demonstrated that the proposed WBS model increased the sentiment analysis ratio to 95.3%, the thematic analysis ratio to 96.5%, the correlation between mental health and suicidal thoughts prediction ratio to 97.9%, the psychological impact ratio by 98.7%, the role of coping strategies of 96% compared to other existing models.

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**Ethical approval:** Not applicable

**Informed consent statement:** Informed consent was obtained from all subjects involved in the study

**Availability of data and materials:**  
<https://www.kaggle.com/datasets/yasserh/breast-cancer-dataset>

**Conflict of interest:** The authors declare no conflict of interest.

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