Olfactory Sensory Stimulation Therapy on Anxiety among Patients with Cancer

Dr. Punitha P[1], Dr. Arun kumar Malayappan[2], Aravindu T[3]

Abstract

Background: Cancer is a disease characterized by uncontrolled proliferation of transformed cells that are subject to evolution through natural selection, not only physically deteriorating but also has profound psychological impacts, affecting patient's mental health causing anxiety and depression. Anxiety is a typical occurrence that is defined by feeling of fear or discomfort resulting from expectation of threat. Olfactory Sensory Stimulation Therapy has developed from the breathing in of essential oils, where basic inhalation aids in enhancing emotional wellness, calmness, relaxation, or rejuvenation of the human body from anxiety and depression. The objective of this quasi-experimental study is to assess the effectiveness of olfactory sensory stimulation therapy in alleviating anxiety among cancer patients. **Objectives:** The study aims to assess the impact of olfactory sensory stimulation therapy on anxiety among patients with cancer. **Methodology:** Participants in this study were cancer patients aged 35 years and older. They were screened using Hamilton Anxiety Rating Scale (HAM-A). There were 30 patients in total and they were divided into experimental group and control group, with 15 participants in each group. Participants in the experimental group received olfactory sensory stimulation therapy for 45 minutes each session (3 sessions per week) for approximately three months. They undergo training of about 36 sessions in total. Meanwhile, participants in control group received occupational therapy for same duration. The pre- and post-test results of the patients in both groups were assessed with the Beck Anxiety Inventory. **Conclusion**: The results of this study concluded that the therapeutic intervention by olfactory sensory stimulation therapy showed its effect in reducing anxiety in cancer patients.

Keywords: Cancer, anxiety, olfactory sensory stimulation therapy

Introduction

Cancer is a complex disease marked by the uncontrolled growth and spread of abnormal cells, disrupting normal bodily functions and leading to severe health complications. Cancer cells proliferate uncontrollably, invading healthy tissues,

consuming resources, and producing harmful byproducts that contribute to organ failure and pain[1]. Cancer not only physically deteriorates the body but also has profound psychological impacts, significantly affecting a patient's mental health and straining relationships with family and friends[2] . In 2020, 19. 3 million new cases and 10 million deaths were reported, with estimates increasing to 23. 8 million cases and 13 million deaths by 2030. Environmental factors such as pollution and processed foods increase the risk of developing cancer. Breast, lung, prostate and colon cancer are the most common types of cancer, especially in countries with high Human Development Index (HDI). Although advances in early detection and treatment have reduced mortality from cancers such as breast and prostate, other cancers such as liver, lung and pancreatic are still fatal. Global inequalities persist, with lower survival rates in low HDI countries due to lower access to health. Addressing modifiable risk factors, such as tobacco use and disease, and improving cancer registration and access to health care are key to future control efforts. The World Health Organization's goal is to reduce cancer deaths by 25% by 2025[3]. In the U. S., approximately 2 million new cancer cases and over 600,000 deaths are projected for 2024. India, too, faces a growing cancer burden, with more than 1. 46 million new cases reported in 2022[4].

Anxiety disorders involve symptoms like excessive worry, social fears, panic attacks (both spontaneous and triggered), anticipatory anxiety, and avoidance behaviours. Common types include generalized anxiety disorder (lifetime prevalence: 6. 2%), social anxiety disorder (13%), and panic disorder (5. 2%), sometimes with agoraphobia. These conditions are often seen in primary care and are associated with physical symptoms such as palpitations, shortness of breath, and dizziness. Anxiety disorders significantly impact daily functioning and quality of life, requiring proper diagnosis and management to alleviate both psychological and physical symptoms[5].

Anxiety is a common issue among cancer patients, often triggered by the uncertainties surrounding diagnosis, treatment, and prognosis. In the study *"Depression and Anxiety in Patients with Cancer: A Cross-Sectional Study,"* Abdallah Y. Naser, Anas Nawfal Hameed, Nour Mustafa, and Hassan Alwafi found a higher prevalence of anxiety and depressive symptoms in cancer patients, particularly in advanced stages of the disease and within inpatient settings. The study highlights that psychological distress is more pronounced among those undergoing more intense treatments or facing a poor prognosis[6].

Anxiety disorders are chronic but not necessarily lifelong. They often begin in childhood, adolescence, or early adulthood and peak in middle age before decreasing in older age. In a large study of 13- to 17-year-olds, anxiety disorders had a 12-month prevalence rate of 24. 9%, with specific phobias and social anxiety disorder being the most common. The median age of onset for anxiety disorders is 11 years, with specific phobias and separation anxiety starting as early as age 7. Generalized anxiety disorder (GAD) has a later onset at 31 years. Prevalence rates are highest in younger adults and

decrease significantly by the age of 65, indicating that anxiety disorders often diminish with age[7].

Many complementary and alternative treatments of mild forms of anxiety have gained popularity because of their alleged harmlessness. Examples of complementary treatment include acupuncture, herbal medicine, homeopathy, massage therapy, yoga, mindfulness, exercise practice, relaxation, etc. There are a wealth of treatments devoted to controlling the symptoms of anxiety, but nonconventional and newer psychotherapeutic treatments and pharmacological agents are propagated without an acceptable confirmation of benefit. So Olfactory sensory stimulation therapy is used as an intervention method in reducing anxiety[8].Olfactory sensory stimulation therapy works through the olfactory system, where volatile molecules from essential oils interact with nasal receptors, generating electrical signals to the brain that create the perception of smell. This process involves the limbic system, which regulates memory and emotion, leading to effects on mood, alertness, stress, arousal, and perceived health. Essential oils can be administered through passive diffusion, such as mist or heat diffusers and steam vaporization, or through direct inhalation methods like personal inhalers or steam inhalation. These methods allow the volatile molecules to reach the brain, where they may influence emotional and physiological responses, contributing to the therapeutic benefits commonly associated with aromatherapy[9].

Materials and Methods:

 The study was ethically approved by the Institution Scientific Review Board of Saveetha College of Occupational Therapy (SCOT/ ISRB/ 045/ 2023) and was conducted at the Saveetha Medical Hospital in Chennai, India. A quasi experimental quantitative study design was used and the study involved 30 participants with anxiety, aged above 35 years. Participants were divided into an experimental group and a control group, with 15 individuals in each group. The experimental group received home-based vocational skill training consisting of 45- minute sessions, held three times per week, over a period of approximately 3 months, totalling around 36 sessions. The control group received conventional occupational therapy for the same duration. Anxiety levels for both groups were measured using Beck anxiety inventory Scale through pre-test and post-test assessments.

Participants:

The selection criteria for the study are divided into inclusion and exclusion categories. For inclusion, the study focuses on patients diagnosed with stage 3 and stage 4 cancer, specifically targeting both male and female patients aged 35 years and older. Conversely, the exclusion criteria eliminate patients who have allergies to natural and essential oils or those who are currently taking anti-anxiety medications. The HAM-A is used as screening tool. To measure anxiety levels among participants, the Beck Anxiety

Inventory (BAI) is utilized. The BAI is a self-report tool specifically designed for adults, effectively assessing the presence and severity of anxiety symptoms. This structured approach ensures that the study examines the effects of interventions on a well-defined patient population while maintaining rigor in the assessment of anxiety.

Instrument:

The Beck Anxiety Inventory (BAI) is a self-report measure specifically designed to assess anxiety levels in adults. It consists of 21 items, each addressing different aspects of anxiety symptoms experienced by the respondent. Scoring is straightforward: participants rate their anxiety levels based on a four-point scale where 0 indicates "Not At All," 1 signifies "Mildly but it didn't bother me much," 2 represents "Moderately - it wasn't pleasant at times," and 3 denotes "Severely – it bothered me a lot. " The total score is calculated by summing the responses from all 21 items. Interpretation of the total score categorizes anxiety levels as follows: a score between 0 and 21 indicates low anxiety, a score ranging from 22 to 35 signifies moderate anxiety, and a score of 36 or above reflects potentially concerning levels of anxiety. This scoring system allows for an effective assessment of the severity of anxiety in adults[10].

Procedure:

The study involved thirty patients over the age of 35, all diagnosed with stage 3 and stage 4 cancer, who participated to help reduce their anxiety levels. First 30 members were screened and selected using Hamilton Anxiety Rating Scale (HAM-A) ,after explaining the procedure, participants willing to undergo therapy were selected using a convenient sampling method. Initially, all patients completed the Beck Anxiety Inventory as a pretest assessment. Following this assessment, participants were divided into two groups of 15: an experimental group and a control group. The experimental group received olfactory stimulation therapy, while the control group attended occupational therapy sessions over a total of 32 sessions. The experimental group engaged in olfactory stimulation therapy for 45 minutes per session, beginning with inhaling 2% lavender essential oil for 5 minutes, followed by various semi-structured art and craft activities infused with the same oil, thereby creating a modified environment throughout the session. Conversely, the control group participated in conventional occupational therapy designed to alleviate anxiety, involving recreational activities and group therapy, conducted three times a week over 12 weeks. After the interventions, posttest scores were assessed using the Beck Anxiety Inventory for both groups to evaluate the efficacy of olfactory sensory stimulation therapy in reducing anxiety among cancer patients.

Results and Statistical analysis:

The statistical analysis was done with the help of IBM SPSS version 23.0. Since the samples belonged to sample size (30), non-parametric method was used to test the statistical difference between pre-test and post-test scores of control group and experimental group. Wilcoxon signed-rank test and Mann Whitney U test were analyzed in finding the hypothesis being tested identifies whether there exists statistically significant difference in consideration of the treatment given. An alpha level of P = 0.05 was measured to be statistically significant.

Table 1: Statistical analysis of pre- test and post- test in control group

Test	Mean	SD	N	Z value	p value
Cntr1_Pre	17.3333	4.62395	15	-3.453	0.001*
Cntr1_Post	12.0667	4.19977	15		

*Significant at 5% alpha level

Data from Table 1 displays that Since the p value of 0.001 is lesser than 0.05, alternate hypothesis is accepted. Hence, there is statistically significant difference between pre-test and post test scores in the Control Group of the HAM-A. This suggests that the intervention received by the control group had significant improvement

Table 2: Statistical analysis of pre- test and post- test in experimental group

Test	Mean	SD	N	Z value	p value
Expt1_Pre	16.8667	3.96172	15	-3.448	0.001*
Expt1_Post	7.8667	3.15926	15		

* Significant at 5% alpha level

Data from table 2 and displays that in the Experimental group, since the p value of 0.001 is less than 0.05, alternate hypothesis is accepted. Hence, there is statistically significant difference in Experimental Group between pre-test and post test scores of HAM-A. This suggests that the intervention received by the experimental group had significant improvement.

Table 3: Statistical analysis of pre- test and post- test in experimental group

Test	Mean	SD	N	Z value	p value
Expt1_Pre	16.8667	3.96172	15	-3.448	0.001*
Expt1_Post	7.8667	3.15926	15		

* Significant at 5% alpha level

Data from table 3 and figure 3 displays that since the p value of 0.00 is lesser than 0.05, alternate hypothesis is accepted. Hence, there is statistically significant difference in post test scores between Experimental and Control Group of the HAM-A. This suggests

that the intervention received by the experimental group had more improvement when compared to the control group.

Discussion:

This study was conducted with the aim of investigating the effect of olfactory sensory stimulation therapy in reducing anxiety among cancer patients. A total of 30 cancer patients were divided into experimental and control groups according to the selection criteria described in the selection procedure and using the available sampling method. This study included both male and female patients. A screening test was performed with the HAM-A to identify patients with anxiety. The level of anxiety in the experimental and control groups was measured with the Beck Anxiety Inventory (BAI). The experimental group only participated in the olfactory stimulation treatment and occupational therapy interventions for three months, 3 sessions a week with the duration of each session lasting 40 minutes, while the control group did not participate to any specific intervention other than conventional occupational therapy. . After a three-month intervention period, a post-test assessment was conducted for both groups, and the scores were calculated and the results analyzed. The effect of the intervention was analyzed by comparing the pre- and post-test values of the experimental group. The results are shown in figure1 and no 1 (ie) Beck's Anxiety Inventory (BAI) comparison between pre-test and post-test scores were 17. 8 and 13 respectively with a 'Z' value of -3. 451 with a p-value equal to 0. 0001 in the control group is statistically different due to the intervention of occupational therapy. The concept of occupational therapy was discussed with a view to reducing anxiety in cancer patients. This result was consistent with the previous study conducted by Jhunilata Pradhan et al. 2020 This study concluded that progressive muscle relaxation therapy can be used as an alternative tool to reduce anxiety levels in cancer patients, suggesting that an occupational therapy intervention is effective in reducing anxiety in cancer patients. The results of 2 showed that the Beck Anxiety Inventory (BAI) comparison between the pre-test and post-test scores between the test group was 18. 13 and 8. 9 and the value of "Z" is -3. 436; The 'p' value is 0. 001. This shows a statistically significant difference to the control group due to the use of selected films and occupational therapy interventions. The opposite hypothesis is accepted. This result was similar to a previous study conducted by Selma Turan Kavaradim et al., 2021 concluded that aromatherapy reduces anxiety, systolic blood pressure, heart rate, and respiratory rate in patients with heart disease. This study provides researchers and health professionals with information on the effectiveness of aromatherapy in reducing anxiety and hemodynamic variables in cancer patients, suggesting that the therapeutic intervention of Stimulating the sense of smell is very effective in reducing anxiety in cancer patients. The results show the scores for the Beck anxiety questionnaire between the control group and the experimental group in the post-test. The mean value of the control group

was 23. 1333 and the mean value of the experimental group was 30. 8667 with a Z value of -3. 007 and the p-value is equal to 0. 002. The fact that olfactory stimulation therapy and occupational therapy interventions lead to a higher level of improvement in reducing anxiety in cancer patients than conventional occupational therapy, is supported by Ezgi Karadag et al. 2017 This study concluded that lavender essential oil increased the quality of sleep and reduced anxiety levels in patients with cancer. The most important clinical findings in this study were that the participants were motivated and motivated to participate in olfactory sensory stimulation therapy, in addition, a significant improvement in anxiety reduction was observed in the experimental group when compared to the control group. Olfactory sensory stimulation therapy as a therapeutic technique to reduce anxiety appears to be the most promising among therapeutic modalities. However, this study has few limitations: it was conducted with a small sample size and over a relatively short duration. Future researches should address these limitations by employing a larger sample size and extending the duration of the study, and should consider investigating the phenomena in different contexts.

Conclusion:

As per results, obtained from this study showed a highly significant improvement in the experimental group, suggesting that olfactory sensory stimulation therapy can reduce anxiety among cancer patients.

Author Address:

[1]Department of Occupational Therapy, Associate professor of Saveetha College of Occupational therapy, Saveetha Institute of Medical and Technical Sciences, Saveetha Nagar Thandalam, Chennai, Tamil Nadu, India

[2]Department of Occupational Therapy, Principal of Saveetha College of Occupational therapy, Saveetha Institute of Medical and Technical Sciences, Saveetha Nagar Thandalam, Chennai, Tamil Nadu, India

[3]Department of Occupational Therapy, Occupational Therapist, Saveetha College of Occupational therapy, Saveetha Institute of Medical and Technical Sciences, Saveetha Nagar Thandalam, Chennai, Tamil Nadu, India

References:

1. Chowdhury RA, Brennan FP, Gardiner MD. Cancer rehabilitation and palliative care—exploring the synergies. Journal of pain and symptom management. 2020 Dec 1;60(6):1239-52.
2. Brown JS, Amend SR, Austin RH, Gatenby RA, Hammarlund EU, Pienta KJ. Updating the definition of cancer. Molecular Cancer Research [Internet]. 2023 Jul 6;21(11):1142–7.

3. Pina-Sanchez P, Chavez-Gonzalez A, Ruiz-Tachiquin M, Vadillo E, Monroy-Garcia A, Montesinos JJ, Grajales R, Gutierrez de la Barrera M, Mayani H. Cancer biology, epidemiology, and treatment in the 21st century: current status and future challenges from a biomedical perspective. Cancer Control. 2021 Sep 13

4. Siegel RL, Giaquinto AN, Jemal A. Cancer statistics, 2024. CA a Cancer Journal for Clinicians [Internet]. 2024 Jan 1;74(1):12–49.

5. Szuhany KL, Simon NM. Anxiety disorders: a review. Jama. 2022 Dec 27;328(24):2431-45.

6. Bandelow B, Michaelis S. Epidemiology of anxiety disorders in the 21st century. Dialogues in clinical neuroscience. 2015 Sep 30;17(3):327-35.

7. Naser AY, Hameed AN, Mustafa N, Alwafi H, Dahmash EZ, Alyami HS, Khalil H. Depression and anxiety in patients with cancer: a cross-sectional study. Frontiers in Psychology. 2021 Apr 15;12:585534.

8. Mangolini VI, Andrade LH, Lotufo-Neto F, Wang YP. Treatment of anxiety disorders in clinical practice: a critical overview of recent systematic evidence. Clinics [Internet]. 2019 Jan 1;74:e1316.

9. Brennan SE, McDonald S, Murano M, McKenzie JE. Effectiveness of aromatherapy for prevention or treatment of disease, medical or preclinical conditions, and injury: protocol for a systematic review and meta-analysis. Systematic Reviews [Internet]. 2022 Jul 26;11(1).

10. Toledano-Toledano F, Moral de la Rubia J, Domínguez-Guedea MT, Nabors LA, Barcelata-Eguiarte BE, Rocha-Pérez E, Luna D, Leyva-López A, Rivera-Rivera L. Validity and reliability of the Beck Anxiety Inventory (BAI) for family caregivers of children with cancer. International Journal of Environmental Research and Public Health. 2020 Nov;17(21):7765.