



Use of Occupational Therapy Cognitive Retraining for Reducing Chemo Brain and its Impact on Quality of Life in a Breast Cancer Patient – A Case Study

Sanjutha P N - B.O.T, Raghuram P - M.O.T (Paed), Loganathan S - M.O.T (Neuro), T. Sundaresan - M.O.T (Rehab),

Sri Ramachandra Faculty of Occupational Therapy, Sri Ramachandra Institute of Higher Education and Research (DU)

(Received: 04 February 2024

Revised: 11 March 2024

Accepted: 08 April 2024)

KEYWORDS

Breast Cancer, Chemo brain, Occupational Therapy, Occupational Therapy Cognitive Retraining, Quality of Life.

ABSTRACT:

Introduction: The most common Cancer and the leading cause of death is Breast Cancer which has been exceeded Cervical cancer and Oral cavity cancer. Research suggests that 30-60% of having breast cancer will suffer from cognitive impairment or Chemo brain as an adverse effect of cancer treatment. Chemo brain has been defined as subtle, yet persistent mild mental dysfunctions often experienced following chemotherapy treatment for cancer. The mild cognitive deficits related to Chemo brain are trouble in memory, concentration and thinking, which are indistinct and difficult to measure and this impacts the individual's daily living, their health status, job performance and wellbeing.

Objectives: The Objective of the study are to find out the use of Occupational Therapy Cognitive Retraining for reducing Chemo brain and to analyse its impact on Quality of Life.

Methods: Out of 7 Breast cancer patients screened one patient was selected who met the inclusion criteria and participated in the study. Written informed consent was obtained from them. The pre-test and post-test were taken using the outcome measure. Participant underwent Occupational Therapy Cognitive Retraining for 12 sessions. The pre-test and post-test scores were compared for the results.

Results: Results shows that through Occupational Therapy Cognitive Retraining there was increase in the score of Functional Assessment of Cancer Therapy – Cognitive Function (FACT-Cog) which implies reduction in the level of Chemo brain symptoms and it has a positive impact on Quality of Life.

Conclusions: Occupational Therapy Cognitive Retraining was effective in reducing Chemo brain and it has a positive impact on Quality of Life.

1. Introduction

Cancer is a disease in which some of the body's cells grow uncontrollably and spread to other parts of the body [1]. Cancer is one of the leading causes of death worldwide [2]. According to the World Health Organization Cancer has been the most common cause of death before the age of 70 years in 112 of 183 countries [3]. The load of most cancers prevalence and mortality is unexpectedly developing worldwide; this displays both

aging and growth of the population in addition to modifications in the occurrence and distribution of risk factors for most cancers, some of which are related to socioeconomic development [4,5].

Typically, women are diagnosed with a cancer that is dominated by two cancers, which are breast cancer (159 countries) and cervical cancer (23 of the remaining 26). The leading cause of cancer deaths among women is



breast cancer and cervical cancer in 110 and 36 countries, respectively, followed by lung cancer in 25 countries [6].

Breast cancer is the leading malignancy in women worldwide. Over the past 30 years, that burden has grown. High morbidity and survival rates in developed countries than developing countries [7,8,9]. Breast cancer in women has surpassed lung cancer. The leading causes of cancer worldwide in 2020. Estimated to be 2.3 million new cases, accounting for 11.7% of the total cancer cases [6].

Chemo brain has been defined as subtle, yet persistent mild mental dysfunctions often experienced following chemotherapy treatment for cancer [10]. Research suggests that 30-60% of having breast cancer will suffer from cognitive impairment or Chemo brain as an adverse effect of cancer treatment [11].

The patient who has Chemo brain experiences the following symptoms such as memory that is forgetting things that they usually have no trouble remembering, trouble in concentrating, trouble remembering details like names, dates and sometimes larger events, trouble multitasking, trouble learning new things, disorganised, slower processing and thinking. Some of the people have these changes for shorter period and some for a longer period of time. Usually, the changes a patient notices are very minor, and others around them may not even notice any changes [12,13,14,15,16,17].

Variety of methods are there to measure, analyse and interpret cognitive functions. There are many self-reported measures which is used to evaluate Chemo brain. Many standard neuropsychological assessments do not detect subtle changes so self-report measures are recommended [18].

Many studies have investigated the effects of Chemo brain on daily function and quality of life. Chemo brain is associated with diminished ability to return to work. Chemo brain is also associated with reduced productivity, functioning of social roles, and community involvement. Patients also report driving and reading difficulties that affect quality of life [19,20,21,22].

Many of the consequences from Chemo brain result in reduced independence. For example, many individuals report being less able to manage everyday

responsibilities such as paying bills or running errands [23,24,25].

The role of Occupational Therapy in oncology is to "facilitate and enable a patient to achieve maximum functional performance, both physical and psychological, in everyday life skills, regardless of age [26]. Occupational Therapy intervention is based on adapting and remediating functional impairment by providing many cognitive strategies. The Occupational Therapist typically uses adaptive strategies to the patient. This makes the patient to learn how to compensate for impaired memory or attention while performing particular tasks, or use restorative activities to improve cognition functioning while performing specific tasks [27].

The Chemo brain's impact on work performance and activities of daily living makes it an important area for Occupational Therapy to make new assessment tools and interventions to contribute towards return-to-work programmes, to enable self-management and to enhance quality of life [28]. For example, for a patient with memory and attention problems, an Occupational Therapist will help create system to set reminders for medication, schedule appointments, and manage similar tasks such as shopping, cooking and money management. Another example of interventions for cognitive impairment will be the use of paper maps and/or global positioning system devices to enhance independence in navigating the community [27].

2. Objectives

The Objective of the study are to find out the use of Occupational Therapy Cognitive Retraining for reducing Chemo brain and to analyse its impact on Quality of Life.

3. Methods

This Single Case Study was approved by the Ethics Committee for Students Proposals, Sri Ramachandra Institute of Higher Education and Research [Deemed to be University]. The subject was recruited from Department of Oncology, Sri Ramachandra Hospital, Porur, Chennai. Out of 7 Breast cancer patients screened one patient was selected who met the inclusion criteria and participated in the study. Written informed consent was obtained from them. Before the commencement of Intervention, pre-test was done using the Functional Assessment of Cancer Therapy – Cognitive Function



(FACT-Cog). The Participant underwent Occupational Therapy Cognitive Retraining for 12 sessions of each 45 minutes. Compensatory strategies, cognitive training activities, relaxation techniques have been taught during the intervention sessions. At the end of the 12th session, Post-test scores were assessed using the outcome measure. The Pre-test and Post-test scores of the outcome measure were analysed.

Inclusion criteria: Medically diagnosed female Breast Cancer patient within stages of I, II, III was included. Breast cancer patient from the age group of 35 to 70 years was included. Patients undergoing chemotherapy or after till 6 months were included. Patient with the score of ≤ 22 in RUDAS was included. Patient who knows English was included.

Exclusion criteria: Patient with any other Neurological disorder, any previously diagnosed Psychiatric conditions. Patient undergoing alternative treatments (Ayurveda, Siddha, Unani). Patients in Terminal or Hospice care were excluded.

4. Results

This study was intended to find out the use of Occupational Therapy Cognitive Retraining for reducing Chemo brain and its impact on Quality of Life in a Breast Cancer patient.

Table.1 shows the changes in FACT-Cog scores during the pre and post intervention phases which shows reduction in the Chemo brain symptoms. The pre intervention scores of the subscale domains are 31 in Perceived Cognitive Impairments, 6 in Comments from others 8 in Perceived cognitive abilities and 2 in Impairment of perceived cognitive impairments on Quality of Life. The post intervention scores of the subscale domains are 47 in Perceived Cognitive Impairments, 11 in Comments from others 15 in Perceived cognitive abilities and 10 in Impairment of perceived cognitive impairments on Quality of Life.

FACT-COG Components	Pre-test scores	Post-test scores
Perceived cognitive impairments (CogPCI)	31	47

Impairment of perceived cognitive impairments on Quality of Life (CogQOL)	2	10
Comments from others (CogOth)	6	11
Perceived cognitive abilities (CogPCA)	8	15

Table.1: Comparison of Pre-test and Post-test score for FACT-Cog subscale domains

Table.2 shows the impact on the Quality of Life during the pre and post intervention phases.

Impairment of perceived cognitive impairments on Quality of Life (COGQOL)	Pre-test score	Post-test score
Impact in the Quality of Life	2	10

Table.2: Comparison of Pre-test and Post-test score of FACT-Cog subscale domain-(CogQOL) for Impact in Quality of Life

This result implies that the patient had reduction in the Chemo brain symptoms and it has impact on the Quality of Life.

5. Discussion

Chemo brain has been defined as subtle, yet persistent mild mental dysfunctions often experienced following chemotherapy treatment for cancer [10]. This has an impact on the individual's daily functioning, leading to changes in their health status, occupational performance and well-being even if they have mild Chemo brain symptoms. The key finding of this study is that Occupational Therapy Cognitive Retraining reduces the Chemo brain symptoms and brings improvement in their functional performance and well-being. The results show improvement in FACT-Cog in the subscale domains of Perceived cognitive impairments, Impairment of perceived cognitive impairments on Quality of Life, Comments from others, Perceived cognitive abilities.

Patients undergoing Chemotherapy or after 6 months of Chemotherapy reported high incidence of experiencing Chemo brain which has the following symptoms such as



forgetting things that they usually have no trouble remembering, trouble in concentrating, trouble remembering details like names, dates and sometimes larger events, trouble multitasking, trouble learning new things, disorganised, slower processing and thinking [12,13,14,15,16,17].

Mrs. V who has participated in this study had Chemo brain symptoms and mainly had problems in memory, concentration and thinking. These Chemo brain symptoms have been disrupting her occupational engagement and negatively affecting Quality of Life. After 12 sessions of Occupational Therapy Cognitive Retraining the participant had shown reduction in the Chemo brain symptoms and also it had a positive impact on Quality of Life. The participant underwent interventions such as cognitive training activities, relaxation techniques, compensatory strategies for 4 weeks and has shown reduction in the Chemo brain symptoms and positive impact in the Quality of life.

Compensatory strategies like maintaining a journal, to-do list, reminder notes, labelling contents have been helpful for the client and enable them to do their work without forgetting. Similarly, **Jin-Hee Park et al., (2017)** have conducted a study to determine the effect of compensatory strategies to improve the cognitive functions and found out that it helps in improving subjective and objective cognitive functioning. These compensatory strategies also help in improving the daily functioning and occupational performance.

The cognitive training activities improve their attention, memory and also processing speed which make the client to fulfil their daily needs. Maze puzzle solving, dot to dot connection, find the difference, copying picture were some of the cognitive training activities make the patient to concentrate and think. By performing these activities, the participant has shown improvement in attention, thinking, processing speed and memory. Consistent with this finding **Clare et al, (2004)** has proposed some set of cognitive training tasks which helps in improving the cognitive function.

Relaxation techniques like focus on breath and insight meditation helps in brain activation and concentration. Alternative deep breathing enables the patient to concentrate and breathe accordingly and also decreases

the distress of the patient. This technique was helpful in improving the perceived cognitive abilities of the participant. This was in accordance with the study done by **Katleen Van der Gucht et al., (2020)** who conducted a 2-arm randomized controlled trial to know the effectiveness of mindfulness-based intervention to improve cognitive functioning which resulted in reducing the subjective cognitive impairment and emotional distress.

Care giver education have a major role in the patient's life. Care giver education included the tips for the person who is taking care of the patient. Some of the tips given were knowledge about Chemo brain and its management, simplify activities, safety precautions, being supportive, sharing concerns, helping in maintaining roles and routines of patient. This alleviates the stress of the care giver and thus they can help the patient to cope with Chemo brain. Similarly, **Sheila K Hartje et al., (2003)** has proposed certain care giver education to the care giver of Dementia patient and helped managing the client's needs in their daily life.

Occupational Therapy Cognitive Retraining must be considered in relation to the patient's needs and priorities. The client-centered treatment was considered to be more effective and this enables the patient getting satisfied with the treatment.

Studies have proven that cognitive activities, relaxation techniques and compensatory strategies can improve cognition. The FACT-Cog scores have been increased which means there is improvement in cognitive functioning. This targeted intervention will reduce the Chemo brain symptoms in Cancer patients and Cancer survivors and also be helpful for the client to achieve their maximal functional capacity.

This single case study provides client-centered Cognitive Retraining and focused on the client's context. The results of this study prove the Alternate Hypothesis that Occupational Therapy Cognitive Retraining can reduce Chemo brain and shows its impact on Quality of Life.

References

1. <https://www.cancer.gov/about-cancer/understanding/what-is-cancer>



2. Bray F, Laversanne M, Weiderpass E, Soerjomataram I. The ever-increasing importance of cancer as a leading cause of premature death worldwide. *Cancer*. In press. <https://doi.org/10.1002/cncr.33587>
3. World Health Organization (WHO). Global Health Estimates 2020: Deaths by Cause, Age, Sex, by Country and by Region, 2000-2019. WHO; 2020. Accessed December 11, 2020. [who.int/data/gho/data/theme/mortality-and-global-health-estimates/global-health-estimates-leading-causes-of-death](https://www.who.int/data/gho/data/theme/mortality-and-global-health-estimates/global-health-estimates-leading-causes-of-death). https://www.researchgate.net/publication/360425996_Temporal_Clustering_of_the_Causes_of_Death_or_Mortality_Modelling
4. Omran AR. The epidemiologic transition. A theory of the epidemiology of population change. *Milbank Mem Fund Q*. 1971;49:509-538. <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2690264/>
5. Gersten O, Wilmoth JR. The cancer transition in Japan since 1951. *Demogr Res*. 2002;7:271-306. https://www.researchgate.net/publication/4747111_The_Cancer_Transition_in_Japan_since_1951
6. Sung H, Ferlay J, Siegel RL, Laversanne M, Soerjomataram I, Jemal A, Bray F. Global cancer statistics 2020: GLOBOCAN estimates of incidence and mortality worldwide for 36 cancers in 185 countries. *CA Cancer J Clin*. 2021; 71: 209- 249. <https://doi.org/10.3322/caac.21660>
7. Global Burden of Disease Cancer Collaboration (2019) Global, Regional, and National Cancer Incidence, Mortality, Years of Life Lost, Years Lived With Disability, and Disability-Adjusted Life Years for 29 Cancer Groups, 1990 to 2017: a systematic analysis for the global burden of disease study. *JAMA Oncol* 5(12):1749-1768. <https://jamanetwork.com/journals/jamaoncology/fullarticle/2752381>
8. Allemani C, Matsuda T, Di Carlo V et al (2018) Global surveillance of trends in cancer survival 2000–14 (CONCORD-3): analysis of individual records for 37 513 025 patients diagnosed with one of 18 cancers from 322 population-based registries in 71 countries. *Lancet* 391(10125):1023–1075. <https://pubmed.ncbi.nlm.nih.gov/29395269/>
9. Sharma R (2019) Breast cancer incidence, mortality and mortality-to-incidence ratio (MIR) are associated with human development, 1990–2016: evidence from Global Burden of Disease Study 2016. *Breast Cancer* 26(4):428–445. <https://pubmed.ncbi.nlm.nih.gov/30604398/>
10. Cheung, Y., Tan, E. & Chan, A. (2011). An evaluation on the neuropsychological tests used in the assessment of postchemotherapy cognitive changes in breast cancer survivors. *Supportive Care in Cancer*, 20, 1361–1375. <https://pubmed.ncbi.nlm.nih.gov/22476439/>
11. Vodermaier A. Breast cancer treatment and cognitive function: the current state of evidence, underlying mechanisms and potential treatments. *Womens Health (Lond)*. 2009;5(5):503-516. doi:10.2217/whe.09.36 <https://doi.org/10.2217/WHE.09.36>
12. AMERICAN CANCER SOCIETY (Brown PD, Butts AM, Parsons MW, Cerhan. Neurocognitive effects. In DeVita VT, Lawrence TS, Rosenberg SA, eds. *DeVita, Hellman, and Rosenberg's Cancer: Principles and Practice of Oncology*. 11th ed. Philadelphia, PA: Lippincott Williams & Wilkins; 2019:2175-2179.
13. Brant JM, Stringer LH. Cognitive impairment. In Brown CG, ed. *A Guide to Oncology Symptom Management*. 2nd ed. Pittsburgh, PA: Oncology Nursing Society; 2015:203-228.
14. National Cancer Institute (NIH). *Cognitive impairment in adults with non-central nervous system cancers* (PDQ®)- Patient Version. 2018. Accessed at <https://www.cancer.gov/about-cancer/treatment/side-effects/memory/cognitive-impairment-pdq> on August 5, 2019.
15. National Cancer Institute (NIH). *Memory or concentration problems and cancer*. 2015. Accessed at <https://www.cancer.gov/about-cancer/treatment/side-effects/memory> on August 5, 2019.
16. National Comprehensive Cancer Network (NCCN). *Survivorship*. Version 2.2019. Accessed at https://www.nccn.org/professionals/physician_gls/pdf/survivorship.pdf on August 5, 2019.
17. Yust-Katz S, Khagi S, Gilbert MR. Neurologic complications. In Niederhuber JE, Armitage JO,



- Kastan MB, Doroshow JH, Tepper JE, eds. *Abeloff's Clinical Oncology*. 6th ed. Philadelphia, PA: Elsevier; 2020:688-705.)
18. Fornier, M.; D'Andrea, G.; et al. Cognitive function of older patients receiving adjuvant chemotherapy for breast cancer: A pilot prospective longitudinal study. *J. Am. Geriatr. Soc.* **2006**, 54, 925–931. <https://doi.org/10.1111/j.1532-5415.2006.00732.x>
19. Janelins MC, Kesler SR, Ahles TA, Morrow GR. Prevalence, mechanisms, and management of cancer-related cognitive impairment. *Int Rev Psychiatry*. 2014;26(1):102-113. doi:10.3109/09540261.2013.864260 <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4084673/>
20. Wefel JS, Lenzi R, Theriault RL, Davis RN, Meyers CA. The cognitive sequelae of standard-dose adjuvant chemotherapy in women with breast carcinoma: results of a prospective, randomized, longitudinal trial. *Cancer*. 2004;100(11):2292–2299. doi: 10.1002/cncr.20272. <https://doi.org/10.1002/cncr.20272>
21. Reid-Arndt SA, Yee A, Perry MC, Hsieh C. Cognitive and psychological factors associated with early posttreatment functional outcomes in breast cancer survivors. *J Psychosoc Oncol*. 2009;27(4):415–434. doi: 10.1080/07347330903183117 <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2760006/>
22. Myers JS. Chemotherapy-related cognitive impairment: the breast cancer experience. *Oncology nursing forum*. 2012;39(1):E31–40. doi: 10.1188/12.ONF.E31-E40. <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC9100963/>
23. Player L, Mackenzie L, Willis K, Loh SY. Women's experiences of cognitive changes or 'chemobrain' following treatment for breast cancer: a role for Occupational Therapy? *Am J Occupat Therapy* 2014;61:230–40. <https://doi.org/10.1111/1440-1630.12113>
24. Boykoff N, Moieni M, Subramanian S. Confronting chemobrain: an in-depth look at survivors' reports of impact on work, social networks, and health care response. *J Cancer Surviv* 2009;3:223–32. <https://pubmed.ncbi.nlm.nih.gov/19760150/>
25. Cheung YT, Shwe M, Tan YP, et al. Cognitive changes in multiethnic Asian breast cancer patients: a focus group study. *Ann Oncol* 2012;23:2547–52. <https://doi.org/10.1093/ANNONC%2FMDS029>
26. Penfold, S. (1996). The role of the Occupational Therapist in oncology. *Cancer Treatment Reviews*, 22, 75–81 <https://doi.org/10.1016/S0305-7372%2896%2990016-X>
27. Pergolotti M, Williams GR, Campbell C, Munoz LA, Muss HB. Occupational Therapy for Adults With Cancer: Why It Matters. *Oncologist*. 2016;21(3):314-319. doi:10.1634/theoncologist.2015-0335 <https://pubmed.ncbi.nlm.nih.gov/26865588/>
28. Player L, Mackenzie L, Willis K, Loh SY. Women's experiences of cognitive changes or 'chemobrain' following treatment for breast cancer: a role for Occupational Therapy ?. *Aust Occup Ther J*. 2014;61(4):230-240. doi:10.1111/1440-1630.12113 <https://doi.org/10.1111/1440-1630.12113>