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EFFECTIVENESS OF COGNITIVE BEHAVIOR THERAPY (CBT) FOR CANCER PATIENTS: A SYSTEMATIC REVIEW

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ABSTRACT

The objective of this systematic review is to assess the effectiveness of cognitive behavior therapy (CBT) on cancer patients. The systematic review was taken by screening last ten years (2010- 2021) of clinical trials conducted on cancer patients while applying CBT intervention. The compilation of n=20 inclusive clinical trials of last ten years shows positive effectiveness of CBT application on reducing depression, fatigue, PCI, HNFS and Insomnia related to cancer. It is concluded that there should be more researched conducted on different regions of the world to maximize the significance of psycho-oncological interventions.

Keywords: *CBT intervention, Cancer, Depression, Fatigue, Insomnia, meta-analysis, systematic review.*

INTRODUCTION

According to research, cardiovascular disease is the number one cause of death in the world and preceding it, cancer is the second most perpetuating factor leading towards death("Global cancer statistics 2020: Globocan estimates of incidence and mortality worldwide for 36 cancers in 185 countries," 2021). Ever rising statistical numbers makes cancer one of the riskiest and difficult process for those who suffer from this disease. It is predicted that the mortality rate of cancer is expected to rise bythe year 2030. Cancer patients, be it at any age, goes through extreme psychological distress(Helmondt et al., 2016). Studies show that they lose hope in life and suffer through severe depression which leads to insomnia(Johnson et al., 2016; Ma et al., 2021).

Poor psychological well-being in chronic cancer patients can lead to early death. Evidence also suggests that those patients who were able to fight back due to psychological well-being and resilience were cancer survivors(Mendoza et al., 2016). Any psychological illness be it depression or distress in a healthy person without any disease can lead to poor health conditions, poor immunity system, and overall quality of life(Qiu et al., 2013; Sheikhzadeh et al., 2021). It is highly imperative to understand the intervention to resolve psychological illness in cancer patients whose prevalence is undeniably exceeding throughout the world.

Depression is comorbid with any form of cancer trajectory, and it can lead to many exacerbated lifelong difficulties affecting relationships, finance, and physical health. Most often the patient is unaware of its negative influence on the mind and body(Qiu et al., 2013; Sheikhzadeh et al., 2021).There is multiple research that suggests that cancer patients must be given psychological support at the very early stages of cancer to improve the process of treatment and chances of survival in cancer patients(Teo et al., 2019; Sansom-Daly et al., 2012; Phianmongkhol et al., 2015; Getu et al., 2020).

Cancer patients suffer from acute psychological distress, anxiety, depression, and unhappiness with leads to intense insomnia and fatigue(Poort et al., 2020;Peersmann et al., 2021). Cancer patients' psychological problems are often overlooked while sustaining survival through medical interventions, but it is important to understand that implementation of the psychological interventions can slow down the negative impact of cancer in a body and mind and likewise, create a huge impact in the positive affirmation of the treatment process. Cancer patients suffer from insomnia which is often overlooked(Garland et al., 2015; Garland et al., 2017; Arico et al., 2016).

Likewise, perceived cognitive impairment (PCI) is another main issue that inhibits psychological deficit in cancer patients which affects their daily functioning such as returning to work, early retirement,etc(Larkin et al., 2014). Research suggests that there is a positive relationship between PCI and insomnia in cancer patients(Garland et al., 2021). Sleep disturbances rate in cancer patients is almost 30% to 50%(Duijts et al., 2012). Another prevailing yet very ignored psychological problem in cancer patients is cancer-related fatigue(Getu et al., 2021).The medical intervention and treatment process of cancer patients is very tiring, stressful, and demotivating. The prevalence of cancer-related fatigue occupies almost 59% to 98% of cancer patients(Getu et al., 2021).

Likewise, there are other types of cancers in which the immune system of the human body heavily depends upon for example cervical cancer(Soetrisno et al., 2016). The number one cause of the expansion of cervical cancer is the weakness of immunity in the female population. Numerous reasons play important role in building immunity such as healthy lifestyle or food choice, but another main factor that contributes to weakening the immunity in the human body is psychological distress, as the research suggests(Soetrisno et al., 2016; Teo et al., 2019; Sansom-Daly et al., 2012; Phianmongkhol et al., 2015; Getu et al., 2020). Similarly, in the female population, breast cancer is one of the most rapidly fatal causes in the world. It is estimated that almost 9.6 million global incidences of cancer cases occurred only in the year 2018(Ma et al., 2021; Helmondt et al., 2016). Females who suffer from breast cancer go through multiple complications such as hormonal imbalance which creates hot flushes and night sweats known as HFNS. HFNS affects sleep quality, mood disturbances, and daily life functioning as well(Fenlon et al., 2018).

Additionally, another important type of cancer is pediatric cancer(Peersmann et al., 2021). Children who go through the intense treatment of chemotherapy show psychological deficit that prevails for a very long period(Zhang et al., 2019). Chemotherapy is known as a very painful and extremely difficult treatment, especially for a little child to go through. Research suggests that the effect of chemotherapy not only destroys the cognitive abilities in a child's developmental process but also affects the immune system(Woodford et al., 2018; Seitz et al., 2014). Multiple comorbid complications arise with the onset of pediatric cancer. At a very early period of life, children tend to develop personality conflicts that lead to more psychological disturbances in life.

Along with the medical intervention of the cancer disease, psychological treatment must be encouraged. Cognitive behavior therapy is the most effective form of psychotherapy that is empirically proven for depression, anxiety, fatigue, or even complex condition such as insomnia(Teo et al., 2019). Cognitive-behavioral Therapy as known as CBT has been widely accepted through its significant results on cancer patients (Soetrisno et al., 2016; Teo et al., 2019; Sansom-Daly et al., 2012; Phianmongkhol et al., 2015; Getu et al., 2020). Research support CBT as one of the most effective therapies for treating insomnia, depression, or fatigue in cancer patients be it their advanced stages, pediatric cancer, or cancer survivors. Multiple meta-analyses of the CBT on cancer patients shows that the effect is very therapeutic, and recovery is more rapid (Sansom-Daly et al., 2012; Soetrisno et al., 2016; Teo et al., 2019; Sansom-Daly et al., 2012; Phianmongkhol et al., 2015; Getu et al., 2020).Cognitive-behavioral therapy aims at eradicating the emotional distress and irrational beliefs attached to emotional suffering. It also aims at improving the cognitive process which can lead to hope and resilience in the client.

This study is a meta-analysis review of the clinical trials conducted in recent times to further

strengthen the positive effect of CBT application on cancer patients while they go through their painful trajectory of medical treatment. In this meta-analysis systematic review of the clinical trials of CBT on cancer patients, we will be able to see its effectiveness, focus, and the results of the randomized clinical trials.

Materials and Methods

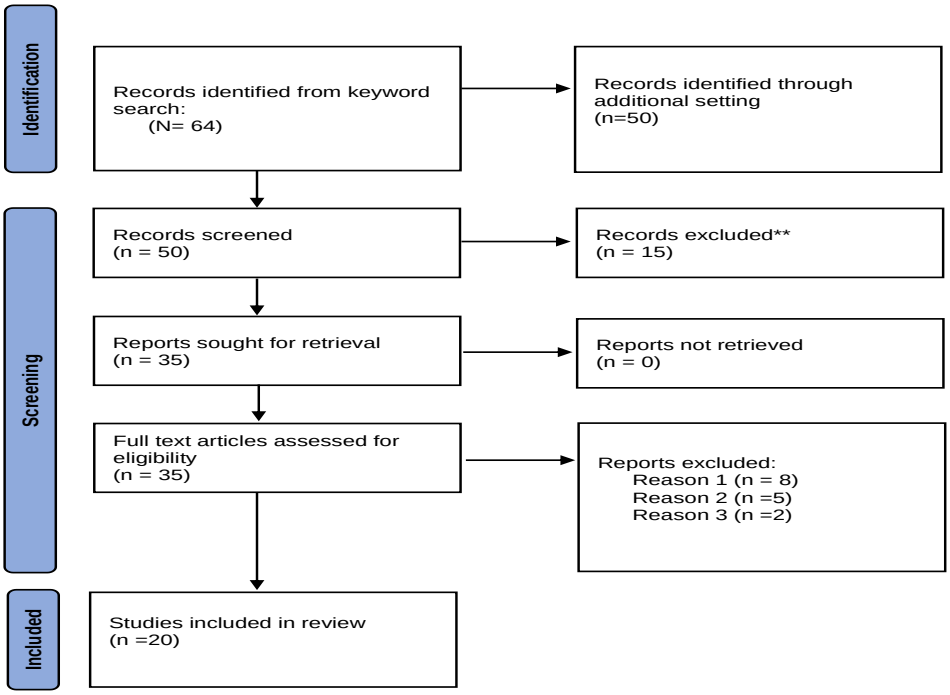
Literature Search Strategy

We undertook randomized clinical trials that focused on the effectiveness of cognitive behavior therapy on cancer patients. The type of cancer that is selected for this meta-analysis systematic review is collective. All types of cancers are included in the study, for example in women it is found that the prevalence of breast cancer and cervical cancer is more profound. General cancer and pediatric cancer clinical trials are also included in the systematic review. The method that was adopted to screen the clinical trials was based on the established guidelines for conducting systematic review research (Chalmers and Haynes, 1994; Wright et al., 2007; Pae, 2015).

Search Strategy

The research literature for the systematic review of randomized clinical trials articles was downloaded from the online database of peer-reviewed journals. The following databases narrowed down from the last 10 years(2010- 2021). Literature was searched to screen the randomized clinical trials of CBT on cancer patients from the following databases: Ebsco host, Scopus, Elsevier, PubMed, PsycARTICLES, and science direct. The search terms that were used to screen the clinical trial were: '*CBT on cancer patients*'; '*CBT clinical trials on cancer*. Other supporting literature was also found in a similar database to support the claim.

Figure 1. PRISMA Illustration of review data:



Inclusion Criteria

The inclusion criteria were specifically focused on screening the clinical trials for planning and implementing CBT on any type of cancer of any age or gender. The randomized clinical trials were focused on the last 10 years only (2010-2021). Only published randomized clinical trials were used as evidence to support the claim. Any study that focused on the cost analysis of the CBT on cancer patients or the meta-analysis of the CBT on general diseases were excluded. Other excluded studies also included the general application of CBT and its effectiveness on cancer patients. Only English language articles were included in this systematic review study. Only published articles were used as evidence. There was no unpublished form of literature used to support the claim.

Results

The included studies for the systematic meta-analysis were focused on the effect of CBT on cancer patients through randomized clinical trials. Table 1 of the PRISMA illustration shows the exclusion and inclusion criteria of the screening process. Initially, *n* = 60 were downloaded to be screened. The *n*=60 was downloaded based on the keyword search used to screen the data. Out of *n*=60 further *n*=40 was narrowed down specifically to screen out the clinical trials conducted on the cancer patients. The *n* =40 was further assessed to record only CBT-focused randomized clinical trials. From the inclusive clinical trials (*n*= 20) it is evident that CBT is an effective way to ease down the pain and psychological distress that cancer patients go through.

Efficacy of CBT to treat cancer patients

It is found that cognitive behavior therapy is highly effective and cost-effective for eradicating or subsidizing the mental pressure and fatigue cancer patients are going through. The clinical trials that were included to provide evidence in this regard, show positive results and declined severity of the mental pressure in the end. The studies *n*=20 also show a significant decline in depression, fatigue, and anxiety related to cancer. Females who suffer from breast cancer tend to develop a severe form of insomnia. Results from the clinical trials also show that there is a significant improvement in the sleep patterns in women who undergo CBT during the prognosis of breast cancer. Likewise, a female who experience HFNS (Hot flushes and Night weats) and male who experiences HFNS due to prostate cancer also experiences a decline in it due to the intervention of CBT.

Study	Design	Setting	Sample size Sample and demographics	Intervention and Modification	Type of cancer	Results	Limitation	Conclusion
Factors that shape preference for acupuncture or cognitive behavioral therapy for the treatment of insomnia in cancer patients Garland.et al, (2018)	Pre-mid-post	Outpatients	N=31 Cancer patients (MNCR, n=32; CBT-I n=40)	Around N= 72 (MNCR, n=32; CBT-I n=40) were assessed at three different phases baseline, post-program, and 3 monthly follow-up	Cancer	Patients with both therapies showed significant improvement overtime. The changes in dysfunctional beliefs about sleep produced by the CBT-I group were more prevalent than produced by MBCR in the follow-up and post-program phase	Not mentioned	The study results support the use of CBT and MBCR to reduce the severity of insomnia. The study suggests that the development of mindfulness can reduce the dysfunctional beliefs of sleep in

								cancer patients.
Efficacy of Mindfulness-Based Cognitive Therapy and Cognitive Behavioral Therapy for Anxiety, Depression, and Fatigue in Cancer Patients: A Randomized Clinical Trial Sheikhzadeh.et.al, (2021)	Randomized clinical trial	Inpatients	N=60	The study was a randomized clinical of 60 patients diagnosed with cancer. These 60 patients were randomly divided into 3 groups CBT, MBCT, and WLG. 8 weekly sessions were given to the patients. These participants fulfilled the BAI(anxiety), BDI(depression), and CFS (fatigue) after and before the intervention.	Cancer	The results show a significant reduction in depression, anxiety, and fatigue scores in CBT and MBCT groups. There was no significant difference found among the groups of CBT and MBCT whereas, a significant amount of difference was found with the WLG group.	Not mentioned	MBCT and CBT performed very well in reducing depression and anxiety in cancer patients. these were considered to be more effective than other therapies. Similarly, these therapies can be considered as an effective and good addition pharmacological treatment in cancer patients.
A randomized controlled trial of a brief cognitive-behavioral intervention for men who have hot flushes following prostate cancer treatment (MANCAN)† Stefanopoulou1.etal, (2015)	Randomized clinical trial	Inpatients	N=	Patients with therapy-induced HFNS were randomly assigned to either CBT (n=33) or treatment as usual (n=35), with cancer type stratified. During 4 weeks, the CBT intervention included a booklet, CD, and telephone interaction. At baseline, 6 weeks, and 32 weeks after randomization, validated self-report questionnaires were completed. At 6 weeks after randomization, the primary outcome was the HFNS problem rating (felt the burden of HFNS). We looked at potential mediators and moderators. The data were analyzed using a	Prostate cancer	At 6 weeks, CBT significantly reduced HFNS problem rating (adjusted mean difference: 1.33, 95 percent confidence interval: 2.07 to 0.58; p=0.001) and HFNS frequency (12.12, 95 percent confidence interval: 22.39 to 1.84; p=0.02). Improvements were sustained after 32 weeks, however, there were no significant differences between groups. Following CBT, negative HFNS beliefs and behaviors decreased significantly, but mood and quality of life did not.	Not mentioned	Self-help with a guide Following prostate cancer therapy, CBT appears to be a safe and effective temporary treatment for men with troublesome HFNS. A multicenter trial could be used to examine the intervention's efficacy.

				modified intention-to-treat approach.				
Study Protocol of CBT-AP Trial: A Randomized Controlled Trial of Cognitive Behavioral Therapy Integrated with Activity Pacing for Fatigued Breast Cancer Patients Undergoing Chemotherapy. *Getu.et al, (2021)*	Randomized and control trial	Inpatients	N=58	58 patients with severe fatigue that will be randomized with a CBT group or usual care group. The intervention This intervention will be given to these groups for 6 sessions by oncology. Two constructs were measured that was fatigue, depression, and quality of life by using the SPIRIT guidelines that are one of the equator checklists.	Breast Cancer	The results of the study show that CBT is an effective therapy for reducing anxiety, fatigue, and depression. The breast cancer patients had an improve quality of life as compared to the control group.	The protocol has mentioned intervention and participants should not be blinded as it is not possible in the psychological treatment. Further studies are needed for further intervention and analysis	The effectiveness of CBT is evident from this experiment and the implementation of this therapy can play an integral part in the supportive care breast cancer patients taking chemotherapy.
OVPSYCH2: A randomized controlled trial of psychological support versus standard of care following chemotherapy for ovarian cancer Frangou.et.al, (2021)	Randomized control trial	Outpatients	N=182	Patients with primary or recurrent OC who had just completed chemotherapy were randomized 1:1 to Intervention (3 standardized CBT-based sessions in the 6–12 weeks following chemotherapy) or Control (standard of care). For the next two years, the PHQ-9, FOP-Q-SF, EORTC QLQ C30, and OV28 questionnaires were completed every three months. PHQ-9 change at three months was the primary outcome. Other scores at 3 months and all scores at later time points	Ovarian cancer	182 individuals were enrolled; 107 were randomized (54 to Intervention and 53 to Control); the average age was 59 years; 75 (70%) had undergone primary chemotherapy and 32 (30%) had completed relapsed OC, and 67 patients completed both baseline and 3-month surveys. At three months, all trial arms showed improvement in PHQ-9 when compared to baseline, however there was no significant difference in change between Intervention and Control. At 3 months, the Intervention arm's FOP-Q-SF scores improved significantly,	Not mentioned	After chemotherapy, CBT-based psychological assistance did not significantly modify the naturally increasing trajectory of depression scores at three months, but it did induce a significant improvement in FOP. Our findings suggest the use of FOP support for ovarian cancer

				were used as secondary endpoints.		whereas the Control arm's FOP-Q-SF scores worsened (intervention effect = 4.4 (7.57,1.22), p-value = 0.008).		patients on a regular basis
Cognitive behavioral therapy or graded exercise therapy compared with usual care for severe fatigue in patients with advanced cancer during treatment: A randomized control trial H. Poort.et al, (2019)	Randomized control trail Longitudinal study (5 years)	Outpatients	N=134 Mean age= 63 and 77 were women	Randomized control trial was conducted for 5 years with the patients of advance cancer suffering from severe fatigue due to treatment. These patients were randomly assign to 12 weeks' trial of CBT or GET and usual care. whereas, in the second outcome fatigue was measured through the European organization for research and treatment of cancer quality of life questionnaire.	Advance stage Cancer patients	Among 134 participants randomized and the common diagnosis was breast colorectal and prostate cancer out of 137 only 12 patients has completed the intervention the results showed that in comparison to usual care CBT was more effective in reducing fatigue.	Smaller Sample size Revision of inclusion criteria made the sample size more heterogeneous.	Among the advanced stages of career patients suffering from severe fatigue during this treatment. The CBT intervention was more effective than usual cancer care given for reducing fatigue. The patients reported lower fatigue but due to smaller sample size results were not sufficient.
MENOS4 trial: a multicenter randomized controlled trial (RCT) of a breast care nurse delivered cognitive behavioral therapy (CBT) intervention to reduce the impact of hot flushes in women with breast cancer: Study Protocol Deborah.et al, (2018)	Randomized control trial	Outpatients	N=120-160	Controlled trial of CBT will be given to women suffering from primary breast cancer	Breast Cancer	Ongoing trail results not yet published	Not mentioned	Results are pending
The comparative Impact of mindfulness-based cancer recovery (MCBR) and Cognitive behavior therapy for insomnia (CBT-1) on sleep and	Secondary analysis of randomized controlled trial	Outpatients	N= 72	Patients (MBCR, n=32; CBT-n=40) were assessed into three phases baseline, post-program and 3 months follow up.	Cancer patients in recovery phase	Across both groups significant improvement was noted in the patient who were provided CBT. The improvement in CBT than MBCR.	The random division of participants in the MBCR did not improve the mindfulness	The study promotes the use of both CBT-1 and MBCR to reduce the severity of insomnia

mindfulness in Cancer patients Garland et.al, (2015)							to the extent it improved for all the member who entered by choice.	and development of mindfulness to deal with dysfunctional sleep
Does the guided online cognitive behavioral therapy for insomnia "i-Sleep youth" improve sleep of adolescents and young adults with insomnia after childhood cancer? (MICADO-study): study protocol of a randomized controlled trial Shosha.et al,(2021)	Randomized –control trial Longitudinal study (12 months)	Outpatients	N=70	Youth version of i-sleep was developed to evaluate the effectiveness of a randomized control clinical trial for comparison of CBT.	Childhood cancer patients	Results are still pending	Not mentioned	The study is not concluded yet.
Rationale and protocol for a randomized waitlist-controlled trial of videoconference delivered cognitive behaviour therapy for insomnia (CBT-I) to improve perceived cognitive impairment (PCI) among cancer survivors Garland, et al, (2021)	Randomized controlled trail	Outpatients	N= 124	These cancer survivors will be assessed through three different phases baseline, mid-treatment, and post treatment to evaluate the effectiveness of cbt on sleep disturbance and PCI	Cancer survivor	Trails are not completed, and results are yet to be decided	Not mentioned	Treatment for PCI in the cancer population is very limited. therefore, this study aims to evaluates if PCI can be improved through CBT-I.
Effects of cognitive behavioral therapy on psychological adjustment in Chinese pediatric cancer patients receiving chemotherapy Zhang.et.al,(2019)	Randomized controlled trail	Outpatients	N=104	Cancer patients were divided into two groups CBT and controlled groups randomly. Before and after the intervention Conner Davidson resilience scale (CD-RISC) and depression anxiety scale(DASS) were applied on the patients.	Cancer patients	Before the intervention no significant difference was found among the two groups but after the intervention significant differences were identified in the CBT group than in control group	Complexity of intervention, Decrease in validity due to biases.	CBT is an effective therapy that help the Chinese pediatric cancer patients to deal with the distorted cognition and create a positive attitude towards cancer and chemotherapy

Efficacy of Cognitive Behavioral Therapy and Physical Exercise in Alleviating Treatment-Induced Menopausal Symptoms in Patients with Breast Cancer: Results of a Randomized, Controlled, Multicenter Trial Saskia.et.al, (2012)	Randomized control and multicenter Trail	Outpatient	N= 422	Breast cancer patients with treatment induced menopause symptoms were randomly assigned to the CBT and a control group. These subjects were assessed at baseline, after 12 weeks and 6 months of the intervention.	Breast cancer patient with menopausal symptoms	By the comparison of CBT and control groups a significant decrease in the levels of endocrine and urinary symptoms. As well as significant improvement was noted in their physical functioning.	Not mentioned	CBT and PE have significant impact on the endocrine symptoms and to a lesser degree on physical and sexual functioning of patients with breast cancer experiencing menopause due to the treatment
A pilot study of an exercise & cognitive behavioral therapy intervention for epithelial ovarian cancer patients Shalini.et.al, (2013)	Multi-phase trail	Inpatients	N= 32	Participants were recruited from the Gynecologic oncology clinic and were provided with CBT every other week and some home-based exercises.	Ovarian cancer	Out of 46 19 patients were eligible to be enrolled with 7 patients in the treatment group and 12 in the surveillance group There was a significant increase recorded from baseline to 6 months in the peak VO2	Not mentioned	The 6-month combined exercise of CBT intervention was associated with a significant increase in fitness of epithelial ovarian cancer patient
Efficacy of an internet-based cognitive-behavioral intervention for long-term survivors of pediatric cancer: a pilot study Diana.et al, (2013)	Pilot study	Outpatient	N=20	Pediatric cancer patients older than 15 years manifesting PTSS and anxiety. CBT consisting of Ten writing session and comprises of two different modules. The outcomes were assessed by the PTS diagnostic scale and hospital and depression scale.	Pediatric Cancer	20 participants completed the CBT intervention after which a significant decrease was identified in PTSS, anxiety and fear of progression. As well as significant decrease was noted in level of depression.	Single group is not enough to see the exact efficiency of the intervention	The result of the study shows that the CBT intervention is effective in reducing symptoms of PTS and anxiety.
Efficacy of cognitive behavioral therapy for insomnia in breast cancer: A meta-analysis	Randomized control trial and Meta-analysis	Inpatients	N= 14	Randomized controlled trial was conducted with the patients and survivors of breast cancer and cortand one self-report measure of sleep quality was included in the review. The subjects were assessed through baseline, mid-treatment and post intervention.	Breast cancer	From the above experimentation on implementing CBT intervention the study result showed that CBT plays an important role in reducing insomnia and improving sleep quality in breast cancer patients. The impact of CBT was evident after the intervention delivery.	The increase focus on specific population limits the study ability to generalize the other type of cancer population	The CBT intervention efficiently contributes in the reduction of insomnia in women taking treatment for breast cancer.

Yan.et al, (2020)								
A randomized controlled trial of group cognitive behavioral therapy for Chinese breast cancer patients with major depression Jianyin, et al, (2013)	Randomized control trial	Inpatients	N= 62 breast cancer patients	Breast and Self-Esteem Scale (SES). The intervention was a closed and treatment protocol-guided group intervention, in which patients met weekly for 10 two-hour sessions. One month following the end of the intervention, one booster session was provided.	Breast cancer patients	Patients in the GCBT group had a significant reduction in the 17-HAMD mean score of 9 points ($p<0.001$). It is more than any other reduction among patients in the group from baseline to beginning / Their GCBT and a significant 7 points ($p<0.001$) more than patients along with those who had undergone GCBT for better results during their follow-up 6 months after their initial therapy session.	Not mentioned	The Study results that the GCBT has significant effect on major depression. Moreover, it improves QoL and self-esteem in breast cancer patients
Online group-based cognitive-behavioral therapy for adolescents and young adults after cancer treatment: A multicenter randomized controlled trial of Recapture Life-AYA	randomized controlled trial	Outpatients	N= 90	Novel intervention, "Recapture LiFe" will be compared to a both a waitlist, and a peer-support group control and a phase II three-arm randomized controlled trial designed for adolescent and young adult cancer survivors	Cancer	A new program that uses an innovative videoconferencing delivery method can help protect and improve the lives of adolescents and young adults affected with cancer. It is expected that teaching AYAs coping skills as they resume their normal lives after cancer may have long-term	Not mentioned	This study proposes a new model of healthcare delivery, which will extend the reach of support to isolated populations worldwide. If this study demonstrates significant improvemen

Sansom et. al, (2012)						implications for their quality of life.		ts in quality of life, Recapture Life-AYA will be made available for clinical use with AYA cancer survivors across Australia.
Effect of Cognitive Behavior Therapy (CBT) Intervention on Serum Cortisol Level and Pain Score of Patients with Advanced Stage Cervical Cancer Sulistyowat.et.al (2016)	Multicenter randomized control trial	In-patients	N=454	A sample of 454 women taking treatment for breast cancer from eight different hospitals will recruited the participant will be randomly selected for the intervention and usual care And the cortisol-help intervention will be completed in baseline phase and then it will be monitored post-intervention and 24 month.	Breast cancer	The result of the study is still pending due to the ongoing trials but, the result will provide information on the possible benefits and strengths for the online self-help training for cancer patient	Not mentioned	The study is not finalized yet
No effect of CBT-based online self-help training to reduce fear of cancer recurrence: First results of the CAREST multicenter randomized controlled trial *Sanne.et al, (2019)*	Randomized control trail	Outpatients	N=262	The study was conducted on 262 breast cancer survivors and were randomly assigned to online self-help training or usual care. The patients completed the questionnaires at baseline,3 months and 9 months FCR was the primary outcome (Fear of Cancer Recurrence Inventory Severity subscale). Latent growth curve modelling (LGCM) was used to examine both effectiveness and predictors.	Breast cancer	LGCM showed no difference between the average latent slop in both the groups showing that the treatments did not differ in their change in FCR over time.	Not mentioned	In this study there was no effect of CBT based online self-help training of "less fear after cancer". Therefore, the study recommends a professional support to online intervention for FCR
Randomized controlled trial of the Valencia model of waking hypnosis plus CBT for pain, fatigue, and sleep management	Randomized control trial	Outpatients	N=44	The study was a randomized controlled crossover clinical trial that compared the VMWHCBT intervention to a control group of	Cancer	The participants were 89 percent female (N = 39), with a mean age of 61 years (SD = 12.2) and a mean age of 61 years (SD = 12.2). In all end measures, they	Not mentioned	This research backs up the VMWHCBT intervention's positive results when

in patients with cancer and cancer survivors Mendoza et al., (2017)				students. Participants (N = 44) were given four treatments in a counterbalanced order (n = 22 per order condition).		reported much higher improvement after receiving the active treatment compared to the control condition. At the three-month follow-up, the treatment benefits were still there.		compared to a control condition, as well as the fact that treatment improvements are stable. Although the findings need to be repeated in larger samples of cancer survivors, VMWHCBT –trained doctors should be available for addressing symptoms both during and after cancer treatment

Modifications to CBT to treat Cancer patients

In the clinical trials *n*=20, some studies have directly applied only CBT as the intervention to treat depression or fatigue and some studies have modified CBT or applied other forms of therapy as well to accommodate and enhance the treatment of psychological problems in cancer patients. In one study by Deborah et al (2018), the breast care nurse was trained to deliver the CBT for HFNS on the female with breast cancer. Likewise, in the randomized clinical trial conducted by Saskia et al, (2012), the CBT was intervened along with physical exercise in boosting the treatment of the menopausal symptoms on breastcancer patients. Similarly, in a pilot study for ovarian cancer patients, CBT and exercise have been implemented together (Moonsammy, 2013). Mindfulness-based CBT has also been used in clinical trials to test the effectiveness of CBT on cancer patients (Garland, 2015; Sheikhzadeh, 2021). Waking hypnosisplus CBT has also been tested for patients with cancer and cancer survivors (Mendoza, 2016). All the above-mentioned clinical trials show positive enhancement in the results for treating cancer patients.

Discussion

Clinical significance of results

Findings from the review suggest that CBT is an effective therapy to treat the psychological problems related to cancer such as insomnia, fatigue, and especially depression(Duijts et al., 2012;Arico et al., 2016; Fenlon et al., 2018;Frangou et al., 2021). Even if the CBT is combined with other forms of therapy such as mindfulness, hypnosis, or physical exercise, its effectiveness remains the same(Garland et al., 2015; Getu et al., 2020; Garland et al., 2021). The trajectory of cancer is very painful for the patients who go through this process.

Research suggests that the psychological distress can double the amount of pain therefore, CBT has been proven as a form of medication for psychological distress (Sansom-Daly et al., 2012; Soetrisno et al., 2016; Teo et al., 2019; Sansom-Daly et al., 2012; Phianmongkhol et al., 2015; Getu et al., 2020). Most studies included in the review show positive results of the randomized and non-randomized clinical trials. The review also suggests that it can have a very positive impact on pediatric cancer, especially on children going through a painful treatment.

Effectiveness of CBT on Cancer patients

The review of these recently published clinical trials on cancer patients reveal that cognitive behavior therapy is a very effective process to reduce the mental health problems that arise with the onset of cancer in patients. The pain and difficulty that cancer patients go through is mentally disturbing for the patients due to which their severity enhances. Research states that if the mental health problems are controlled, the medical treatment for cancer is also enhanced. Therefore, the treatment plan for cancer patients must involve psychotherapy from the very first step. Cognitive Behavior therapy has proven to be effective in so many deleterious health diseases because it not only eases the pain but also enhance resilience in the patients to face their misery bravely. The review also reveals that any kind of cancer be it breast cancer or cervical cancer requires mental health stability. There is a aftermath of cancer disease that leaves an impact on the patient. At different stages of cancer, the severity level of stress, anxiety and depression increase which require intense mental health support.Even, when a patient gets fully treated post cancer disease, in some cases, PTSD has been reported because the impact of cancer was traumatic. Post-disease, CBT can also be very effective in treating PTSD.

Likewise, cancer patients' caretakers also go through equal pain and mental stress due to which they also require mental health and support. In some cases, partners and spouses of cancer patients have reported depression. Similarly, children whose parents have suffered from cancer has reported severe mental decline in so many areas such as education and social problems. CBT has been very effective to treat the trauma, stress and depression that cater along with such diseases.

Limitations

The limitation of this review included small samples. Caregivers and families must also be included in the testing as they equally suffer from psychological distress and fatigue. This kind of clinical trial must be conducted more often to prove the significance of the CBT effect on cancer patients. Limited clinical trials show that CBT is not practiced in the majority around the world to ease down the psychological distress in cancer patients.

The psycho-oncological interventions must be conducted in different regions of the world to maximize and strengthen the effectiveness of cognitive behavior therapy and other psychotherapies interventions on cancer patients. Cultural adaptation of the intervention must be encouraged.

Conclusion

This systematic review study targeted clinical trials of cognitive behavior therapy to treat the psychological problems that arise in cancer patients along with their difficult intervention trajectory. In this review, it has been noted that CBT is an effective and goal-oriented therapy that can reduce the severe level of insomnia, depression, fatigue, or anxiety in a cancer patient. It is effective on all ages and all genders as well. It is important to further assess CBT through clinical trials on cancer patients to improve the prognosis and its effectiveness.

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- Data Availability Statement (Required): all mentioned in method sections

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