(RESEARCH ARTICLE)

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Efficacy of digital cognitive behavior therapy intervention on adults enrolled in mental wellness care program on Mfine Application

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Abstract

The 2020 pandemic witnessed a surge in mental health cases in India which undoubtedly paved the way for mass adherence of digital health and digital mental health services. Traditional mental health services have issues of scalability, accessibility, stigma & cost effectiveness, and this can be resolved by digitizing these services. Since CBT is an evidence based therapeutic intervention validated by several research in the past, the current study aims to evaluate the efficacy of a Digital Cognitive Behavior Therapy (dCBT) intervention delivered via Mfine application, on adults, using Depression, Anxiety, Stress Scale (DASS21) before and after the intervention. For this purpose, a total of 150 adults who enrolled in the Mfine mental wellness program, from a time period of February 2021-September 2022 were selected. Data was collected via Mfine App. on video call by Rehabilitation Council of India certified clinical psychologists. 5 structured, 1-hour cognitive behavior therapy sessions were provided over a period of 2 months with an additional extension of 1 month for missed sessions, spaced between a gap of 10 days. Pre and post assessment scores were statistically analyzed using SPSS version 20 for all the completers in the program (N=95). The results proved that the dCBT intervention was significantly effective in improving mental health outcomes in adults (p=.000). Our study holds the potential to support the development of evidence-based digital mental health interventions and address the barriers of scalability and stigma in mental health services.

Keywords: Online therapy; e-CBT; Digital Mental Health; mHealth; Mental Health Apps; Mfine

1. Introduction

Mental health and well-being have become increasingly important matters of concern in today's world, especially post onset of the pandemic 2020 which led to a surge in common mental health disorders(1). Mental health issues affect millions of people worldwide, and access to timely and effective interventions is critical for positive outcomes. With the advancement of technology, digital interventions have emerged as a promising solution for addressing mental health and related concerns with greater accessibility(2). Just the way the healthcare ecosystem is incomplete without the inclusion of mental health care, similarly digital healthcare ecosystem is incomplete without the inclusion of technology.

The Mfine app is an AI driven, digital primary healthcare platform that provides comprehensive healthcare services through digital health interventions. Founded in 2017, Mfine offers professional health diagnostics, health check-up services and most importantly enhanced health outcomes by on demand access to healthcare professionals through its inbuilt App, across various super specialties. What makes Mfine application unique are the various health tools & trackers that empower its consumers to self-track their health vitals accurately, by simply accessing the inbuilt app features on their mobile phone. Mental wellness specialty is also one of the super specialties at Mfine that runs the mental wellness care program through Mfine application. Digital Cognitive Behaviour Therapy (dCBT) is one of the mental health services offered under the flagship of the mental wellness care program at Mfine.

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Cognitive Behavior Therapy (CBT) is one such evidence-based approach that has been effective in treating various mental health conditions besides pharmacological treatment(3). In recent years, dCBT interventions have gained popularity as a convenient and cost-effective alternative to traditional therapy. One particular study conducted a systematic review of digital and face-to-face cognitive behavioral therapy for depression and found that although the adherence rate was higher in face-to-face therapy sessions, however both approaches indicated similar effectiveness(4). The dCBT intervention provided through the Mfine app by mental health professionals, is designed to help individuals identify and modify negative thought patterns and behaviors that contribute to the exacerbation of their mental health symptoms.

The need for the current study emerges from the alarmingly existing mental health statistics. The WHO report 2001 stated the global count of mental health disorders as 450 million, which went up to an alarming 970 million in the year 2019, and the estimates show a 26% and 28% increase, respectively, for anxiety and major depressive disorders within a year of the onset of the pandemic(5). Furthermore, the national mental health survey of India stated that nearly 150 million Indians need mental health care services, however, less than 30 million are seeking care (6). Despite being home to one sixth of the world's population, India has a severe shortage of mental health professionals and facilities. As per the research statistics by department of Psychiatry, National Institute of Mental Health and Neurosciences (NIMHANS), Bengaluru, currently, there are 0.75 mental health experts per 100,000 population, whereas the required number is at least 3 experts per 100,000 population. The average cost of the treatment is between INR 1,500-2,000 per session in most cities, which may not be affordable for everyone(7). Mental health disorders are still widely stigmatized in India, and many people with mental health issues are reluctant to seek help due to the fear of being judged or discriminated against. This creates a barrier in people seeking treatment for mental health conditions (8). The burden of mental health disorders in India is also increasing, and it is estimated that by 2030, India will have the highest number of people with depression and anxiety in the world(9)(10). This is exactly where technology can come to the forefront & facilitate increased accessibility, convenience, confidentiality, and affordability of mental health interventions delivered digitally, making them a promising tool for addressing the growing need for mental health care on a large and wide scale. Since there are very few studies on the efficacy of cognitive behavior therapy delivered digitally, the current study has the potential to contribute to the emerging field of digital mental health interventions.

The current study aims to evaluate the efficacy of a dCBT intervention provided through the Mfine app for adults enrolled in the Mfine mental wellness care program using the Depression, Anxiety, and Stress Scale (DASS21). It is a widely used self-report questionnaire designed to measure the severity of symptoms related to depression, anxiety, and stress. It consists of 21 items, each assessing different aspects of emotional distress, making it a valuable tool for assessing psychological well-being in both clinical and research settings. The objective is to study the effectiveness of dCBT on symptoms of stress, anxiety and depression. It is hypothesized that there will be no significant difference in the pre-assessment & post assessment scores on DASS21. The results of the study have the potential to inform the development and implementation of digital interventions for mental health care and contribute to the ongoing conversation on the use of technology in mental health care. Ultimately, our study aims to inform the development of effective and accessible digital mental health interventions that can reach individuals in any corner of the world, in need of mental health care.

2. Research methodology

A quantitative approach was used to address the study aims and objectives. Since this study is the first of its kind to assess the efficacy of digital cognitive behavior therapy intervention delivered through Mfine application, a pragmatic and simple approach was necessary based on research questions of interest. This study is the collateral outcome of the Mfine mental wellness program designed for Mfine clients, where pre-post assessment was conducted with the intention to gauge the progress made by clients & provide them with a report of the intervention at the end of the program and not primarily to conduct research. However, the positive results observed after the intervention led to the inception of the current study.

2.1. Study setting

A total of 150 adults who had enrolled for a paid mental wellness program on Mfine application were selected for the study in the chronological order of their enrolment, from the period of February 2021 to September 2022. The clients hailed from various geographical locations across India i.e 43 clients from North India, 7 from Central India, 22 from West India, 18 from east India, 2 from north-east India & 58 from South India. The Clients who completed all the 5 sessions and pre-post assessment were completers. The clients who did not complete all the 5 sessions and pre-post assessment were dropouts. Among 150 clients, 95 clients were completers, and 55 clients were dropouts. The result of the current study is derived from analyses of the data obtained from 95 completers (N=95).

2.2. Study Design & Sampling

The present study is a non-randomized interventional study with a single group before-after design, utilizing a convenient sampling technique. The study aims to evaluate the effectiveness of digital cognitive behavior therapy delivered through Mfine application on adults, using DASS21 scale before and after the intervention. All participants received the intervention and their outcomes on DASS21 were compared to their own baseline measures taken before the intervention, to assess any improvement or decline in the symptoms of depression, anxiety and stress, post intervention. The before-after design was used to evaluate changes in outcomes over time, providing insight into the intervention's effectiveness on the participants. The convenient sampling technique allows for a practical approach to recruiting participants, given the specific context and constraints of the study. This design provides a valuable contribution to the existing literature on the application of digital therapeutics to mental health and in providing insights that can guide future research and practice.

2.3. Inclusion criteria

The following were the inclusion criteria for the study:

- All adults (18-65yrs) enrolled in Mfine mental wellness program from the period of February 2021 to September 2022.
- Adults with formal education of 7yrs and with fluency in Hindi or English
- Adults with normal or corrected vision and hearing

2.4. Exclusion criteria

The following were the exclusion criteria for the study:

- Chronic psychiatric patients recommended for hospitalization.
- Patients with severe sensory deficits (visual, auditory, or motor) which would affect digital consultation.
- Geriatric patients.
- Adults with history of Mental Retardation

2.5. Study tool

For the present study, the Depression, Anxiety, Stress Scale (DASS21) was used as the study tool to assess the mental health outcomes of the study participants. The DASS21 (Cronbach's alpha =0.74: Test- retest= 0.99: split-half reliability=0.96) is a widely used self-report instrument that measures the severity of symptoms related to depression, anxiety, and stress in adults. The questionnaire consists of 21 items, divided into three subscales: depression, anxiety, and stress. Each subscale has 7 items which are rated on a 4-point Likert scale ranging from 0 (did not apply to me at all) to 1 (Applied to me to some degree, or some of the time), 2(Applied to me to a considerable degree or a good part of time) and 3 (Applied to me very much or most of the time). Each subscale provides the severity score of the respective symptoms ranging within 5 categories i.e. normal to mild, moderate, severe and extreme severe.

The DASS21 has demonstrated good reliability and validity in numerous studies and has been translated into multiple languages. The use of DASS21 in this study allowed for a standardized and validated measure of mental health outcomes, providing valuable insights into the effects of the intervention on the study population.

2.6. Data collection

Data was collected through the Mfine application via video call during the CBT sessions and was delivered by RCI (Rehabilitation Council of India) certified and trained clinical psychologists who were onboard with Mfine as practicing clinical psychologists.

A common structure for the CBT sessions was developed to set one protocol for all clinical psychologists. A total of 5 CBT sessions, tailored to fit individual needs and symptoms, were provided to the clients which were spaced between a gap of 10 days and spread over a time of 2 months. If any client was not able to avail themselves of all the 5 sessions in 2 months, then an extension of one more month was given to avail themselves of the missed sessions. Care managers were assigned to each client who by qualification were counselling psychologists. Their primary role was to coordinate with the respective therapists and clients to get the sessions scheduled, pick up queries from clients in between the sessions and get them addressed and share self-help materials timely. The self-help materials consisted of relevant psychoeducational reading materials, videos, podcasts, and CBT worksheets.

The pre-assessment and the post assessment using DASS21 scale were done on the day of the first & last therapy sessions respectively. A pdf of the DASS21 questionnaire was shared on the respective chat window of the clients on Mfine application. The therapist would first brief the questionnaire to the client and then assist them to go through each question one by one and record their responses on a data sheet created specifically for the purpose. A similar process was followed for the post assessment as well. unlike the pre-assessment the responses were recorded at the end of the last therapy session. Session I revolved around introduction to the program, assessment, psychodiagnostics formulation and goal setting. Session II revolved around cognitive restructuring, identification of cognitive distortions and challenging negative automatic thoughts. Session III revolved around behavioral activation and setting achievable behavioral goals. Session IV revolved around monitoring progress, discussing underlying problems or new problems that emerged during the sessions and learning problem solving techniques. Session V revolved around relapse prevention and progress maintenance. It also included discussing termination of the program and schedule of follow up as required. The post assessment to gauge progress was also included in this session.

Reports were prepared and provided to the clients within a week of completion of the therapy sessions. Reports were prepared by the respective therapists where they were assisted by the case managers in scoring the responses collected on DASS21.

2.7. Data Analysis

In the present study data was analyzed by the author using SPSS software (version 20) to conduct quantitative analysis of the data collected. Paired t-test was used to compare the means of the preassessment scores and post assessment scores of all the participants, as the study aimed to evaluate the effectiveness of the digital CBT intervention delivered through Mfine application. Rates and ratios were also calculated to provide additional insights into the age and gender ratio of the participants. It also allowed for insights into the frequency of different categories of disorders. For this purpose, an excel sheet was created exclusively to enter the raw data i.e., the demographic details of the participants and raw scores obtained on each domain of the DASS21 scale, separately for both pre-assessment & post-assessment, into the columns under various relevant subheadings.

2.8. Research team and reflexivity

The research team consisted of the author, who undertook all aspects of this study, starting from data extraction and compilation till the completion of this study. The support from the practicing clinical psychologists on Mfine, the care managers and various stakeholders from Mfine has been acknowledged. The risk of personal bias which may be involved in the therapy sessions is also acknowledged. However, this was partly controlled to a certain extent as there was a common CBT structure of the sessions for all therapists to follow.

2.9. Ethical Consideration

Consent was obtained on the Mfine application as per the telemedicine guidelines released by government of India in the year 2020. The privacy policy of the Mfine application also mentioned "data would be used for research purpose". All the participants had voluntarily enrolled for the Mfine mental wellness program. Mfine maintains client confidentiality where the AI converts client names to a numeric code immediately when a case is created. Hence, except the consulting doctor and the doctor's team, no one else at Mfine or outside gets to know the name or details of the clients. All the guidelines of medical council of India have been strictly adhered to.
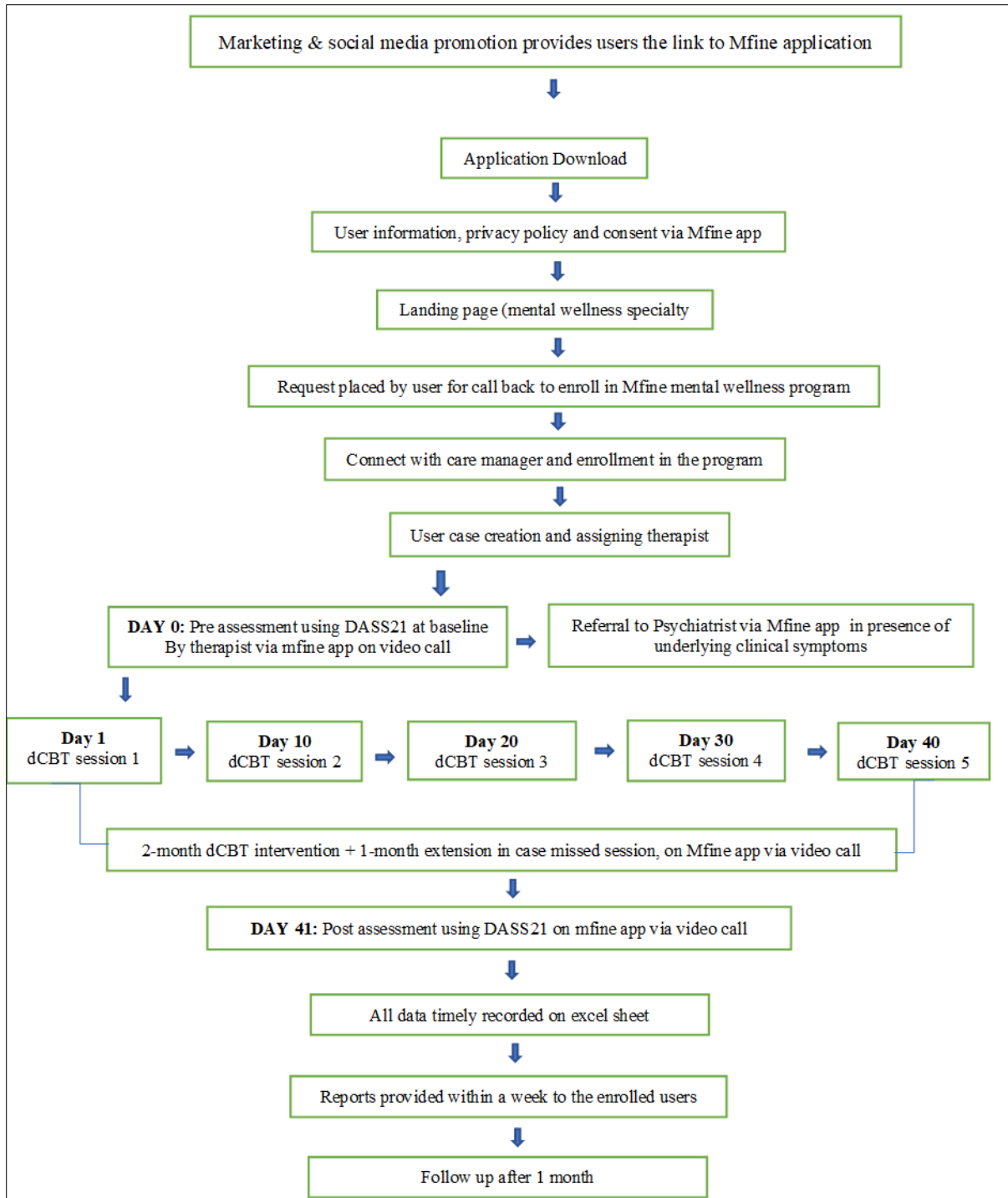
Figure 1 Flow and execution of the Mfine Mental Wellness Program

3. Results

Among 150 participants 95 clients were completers with a completion rate of 63.3 % and 55 clients were dropouts at various stages of the program indicating a dropout rate of 36.6%. Hence, the results of the current study have been analyzed on 95 participants (N=95) who have completed the pre-post assessment within a span of three months. The result tables have been illustrated below:

Table 1 Shows the distribution of the clients based on age. The Mean Age of the clients was found to be 31.08 years and the Range was from 18 – 56 years. The table also indicates that the highest number of the clients, i.e 43.3% were between the ages of 28-37 years. The least number of clients, i.e 5.3% were between the ages of 48-57 years.

Table 1 Distribution of clients based on age (N=95)

Age	Frequency	%
18 to 27	35	36.8
28 to 37	41	43.2
38 to 47	14	14.7
48 to 57	5	5.3
Total	95	100

Table 2 Distribution of clients based on gender (N=95)

Gender	Frequency	Percentage
Male	39	41.1
Female	56	58.9
Total	95	100

Table 2 Shows the distribution of the clients based on gender. It clearly indicates that the percentage representation of female clients was more i.e 58.9% as compared to the male clients i.e 41.1 %.

Table 3 Distribution of clients based on disorders (N=95)

Diagnosis	Frequency	Percentage
F30-F39	19	20
F40-F48	63	66.3
F60-F69	4	4.2
F90-F98	1	1.1
Relationship counselling	8	8.4
Total	95	100

Table 4 Pre and Post comparison of the percentage improvement in participants at various levels of Stress on DASS21 (N=95)

Levels of Stress	No. of participants at Pre-stress assessment	%	No. of participants at post-stress assessment	%
Normal	23	24.2	73	76.8
Mild	16	16.8	11	11.6
Moderate	17	17.9	7	7.4
Severe	23	24.2	3	3.2
Extreme Severe	16	16.8	1	1.1
Total	95	100	95	100

Table 3 Shows the distribution of the clients based on disorders. The highest number, i.e 66.3% of the clients had a diagnosis of anxiety, dissociative, stress-related and somatoform disorders (F40-F48). The next highest representation

of the clients i.e 20%, were diagnosed with mood disorders (F30-F39) followed by relationship counselling i.e 8.4%, personality disorders (F60-F69) i.e 4.2% and Behavioral and emotional disorders with onset usually occurring in childhood and adolescence (F90-F98) i.e 1.1 %.

Table 4 Shows Pre and Post comparison of the percentage improvement in participants at various levels of Stress on DASS21. The scores obtained clearly indicate improvement in stress levels after the intervention, where 76.8% of clients went back to normal levels of stress after the intervention as compared to 23% of clients who were at normal levels of stress at baseline. Similarly, only 1.1% of clients remained at extreme severe levels of stress after the intervention as compared to 16.8% of clients at baseline. The rest of the levels of stress also show improvement.

Table 5 Pre and Post comparison of the percentage improvement in clients at various levels of Anxiety on DASS21 (N=95)

Levels of Anxiety	No. of participants at Pre-anxiety assessment	%	No. of participants at Post-anxiety assessment	%
Normal	12	12.6	55	57.9
Mild	9	9.5	12	12.6
Moderate	14	14.7	14	14.7
Severe	15	15.8	10	10.5
Extreme Severe	45	47.4	4	4.2
Total	95	100	95	100

Table 5 Shows Pre and Post comparison of the percentage improvement in clients at various levels of anxiety on DASS21. The scores obtained clearly indicate improvement in anxiety levels after the intervention, where 57.9% of clients went back to normal levels of anxiety after the intervention as compared to 12.6% of clients at baseline. Similarly, only 4.2% of clients remained at extreme severe levels of anxiety after the intervention as compared to 47.4% of clients at baseline. The rest of the levels of anxiety also showed improvement except for moderate level where there was no difference in the scores before and after the intervention. However, an increase in the mild levels of anxiety i.e in 12.6% of clients was observed after the intervention as compared to 9.5% of participants at baseline. It is assumed this could be due to the heightened awareness of one's fears and understanding of one's own thinking errors in the dCBT sessions that lead to the increase at this particular level of anxiety.

Table 6 Pre and Post comparison of the percentage improvement in clients at various levels of Depression on DASS21 (N=95)

Levels of Depression	No. of participants at Pre-depression assessment	%	No. of participants at Post-depression assessment	%
Normal	15	15.8	63	66.3
Mild	16	16.8	11	11.6
Moderate	31	32.6	15	15.8
Severe	13	13.7	4	4.2
Extreme Severe	20	21.1	2	2.1
Total	95	100	95	100

Table 6 Shows Pre and Post comparison of the percentage improvement in clients at various levels of depression on DASS21. The scores obtained clearly indicate improvement in depression levels after the intervention, where 66.3% of clients went back to normal levels of depression after the intervention as compared to 15.8% of clients at baseline. Similarly, only 2.1 % of clients remained at extreme severe levels of depression after the intervention as compared to 21.1% of clients at baseline. The rest of the levels of depression also show improvement.
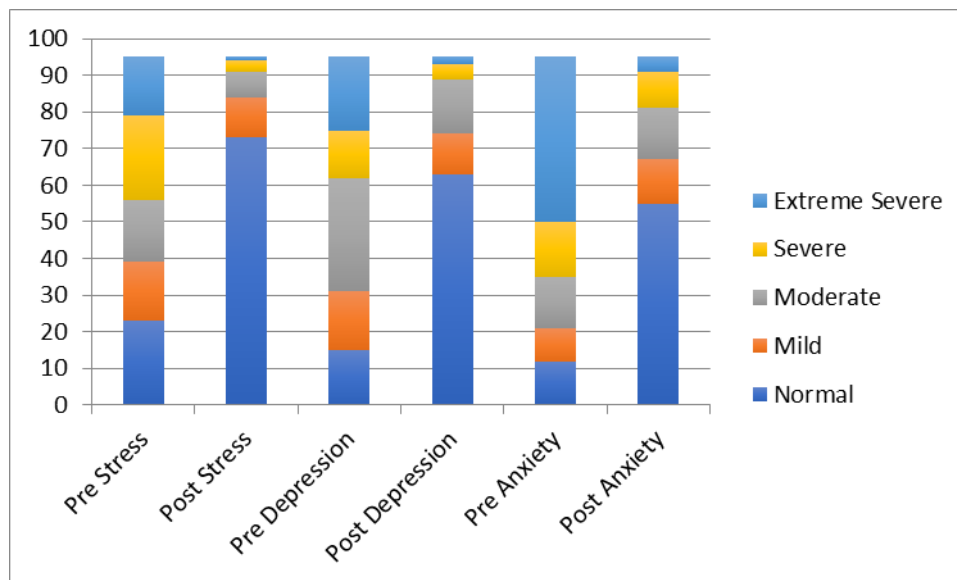
Figure 2 Graphical illustration of Pre and Post comparison of the percentage improvement in clients at various levels of Stress, Anxiety and Depression on DASS21 (N=95)

Table 7 Comparison between the means of pre and post assessment scores, the level of significance and effect size as measures of efficacy of dCBT (N=95)

		Mean	SD	Paired Differences					T	df	Sig. (2-tailed)	Cohen's d
				Mean difference	SD	Std. Error Mean	95% Confidence Interval of the Difference					
							Lower	Upper				
Pair 1	Pre-Stress	22.06	9.490	11.537	9.673	0.992	9.566	13.507	11.625	94	0	1.19
	Post-Stress	10.53	7.613									
Pair 2	Pre-Anxiety	18.52	9.584	10.905	9.18	0.942	9.035	12.775	11.578	94	0	1.18
	Post Anxiety	7.61	6.405									
Pair 3	Pre-Dep.	18.67	9.795	10.358	9.817	1.007	8.358	12.358	10.283	94	0	1.05
	Post-Dep.	8.32	7.073									

A paired sample t-test was conducted to evaluate the efficacy of the digital cognitive behaviour therapy intervention on the symptoms of stress, anxiety and depression in adults enrolled in the Mfine mental wellness program. Table 7 shows that the average scores at baseline on stress (*M*=22.06, *SD*=9.490), anxiety (*M*=18.52, *SD*=9.584) and depression (*M*=18.67, *SD*=9.795) is higher than the average scores on stress (*M*=10.53, *SD*=7.613), anxiety (*M*=7.6, *SD*=6.405) and depression (*M*=8.32, *SD*=7.073) after the intervention. This shows that the scores on stress, anxiety and depression have significantly reduced post intervention, *t*=11.625(94), 11.578(94), 10.283(94), *p*=.000 (two-tailed) and reduced scores on DASS21 indicate improvement in symptoms. The effect size is large (*Cohen's d*= 1.19, 1.18, 1,05) for all three

parameters i.e stress, anxiety and depression, indicating the large impact of the dCBT intervention on the symptoms of the program clients

4. Discussion

The present study investigated the efficacy of a digital cognitive behavior therapy (dCBT) intervention on adults enrolled in the mental wellness care program on the Mfine app. The intervention consisted of 5 structured CBT sessions that were delivered via the Mfine app. The program covered a range of CBT intervention techniques, including cognitive restructuring. Mindfulness & stress management techniques were also used. The clients were assessed at baseline and post-intervention using DASS21 scale.

The results of the study (table 1) indicated that the average age of the clients who enrolled for the program was 31.08 years, and most of the clients were between the age of 18-37 yrs., which clearly voices WHO's 2019 guideline recommending youth-centered digital health interventions(11) as the internet and digital tools are increasingly popular approach among the young adults. Similar findings have also been reported by Lupton and Pretorius(12) (13). The results of the study (table 2) indicated a greater representation of female clients as compared to male which support the already established fact the women in general are more prone to common mental health disorders as compared to men(14) and the results (table 3) indicates that 86.3 % of clients who sought the dCBT were diagnosed with common mental health disorders(15)indicating its high prevalence.

The study also highlighted that dCBT was effective in reducing symptoms of depression, anxiety, and stress of the clients who enrolled in the program (table 4, 5 & 6) where a greater number of clients have gone back to normal levels of symptoms as compared to other levels of severity at baseline on DASS21. These findings are consistent with the results of similar studies that have evaluated the efficacy of digital mental health interventions for mental health concerns(16) (17)(18,19).

The program clients also reported statistically significant lowered scores on DASS21 post the dCBT intervention establishing the efficacy of dCBT in alleviating the symptoms of stress, anxiety and depression in the program clients (table 7). Hence the Null hypothesis that there will be no significant difference in the pre-assessment & post assessment scores on DASS 21 was rejected and the research hypothesis has been accepted. The effect size was also statistically found to be large indicating large positive impact of dCBT on the overall symptoms of the clients enrolled in the program. These results of our study are consistent with previous meta-analyses conducted on digital mental health interventions, which have demonstrated their potential to improve mental health outcomes (20)(21)(22)(23,)(24)(25). digital interventions for mental health, such as those delivered through smartphone apps, are becoming increasingly popular due to their accessibility, convenience, and affordability (26). One of the strengths of our study is that it was conducted in a real-world setting, with participants from various parts of India, who were seeking mental health care through the Mfine app's mental wellness care program. This adds to the external validity of our findings, as it suggests that the digital CBT intervention is effective in a setting where individuals are seeking mental health care.

It is important to note that our study has some limitations like lack of a control group and further research on the percentage of dropouts. Future studies should aim to address these limitations and explore the effectiveness of dCBT interventions across a wider range of populations and contexts. Further research is needed to identify the efficacy of dCBT as compared to face-face in person therapy. It is also important to consider how these interventions can be integrated with other forms of mental health care, such as in-person therapy or medication and identifying which individuals are best suited for digital interventions, and how these interventions can be optimized to provide the most effective care. Future research should aim to replicate the findings of the present study in a larger, randomized controlled trial and examine the long-term effects of digital CBT interventions and the factors that contribute to treatment success.

Despite the above limitations, the findings of the present study have several implications for the delivery of mental health care. First, the results suggest that dCBT interventions can be an effective way to deliver evidence-based treatment for mental health problems. Second, the results suggest that dCBT interventions can be delivered in a scalable way, making them accessible to a wider range of people. Third, the results suggest that dCBT interventions can be delivered remotely, making them a viable option for people who live in rural areas or who have difficulty accessing traditional mental health care services. Fourth, our study also supports the potential of dCBT interventions as a complement to traditional in-person therapy.

5. Conclusion

In conclusion, the results of our study add to the growing body of literature demonstrating the efficacy of dCBT interventions in improving mental health outcomes. Digital interventions like the one offered on the Mfine app can provide a valuable resource to support mental health and well-being and our study suggests that this platform has the potential to improve mental health outcomes for those in need. We hope that our findings will contribute to the ongoing efforts to improve mental health care and support the development of evidence-based digital mental health interventions.

Compliance with ethical standards

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Disclosure of conflict of interest

The author has declared that no conflict of interests exists.

Statement of informed consent

Informed consent was obtained from all program clients before enrolling in the program.

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Authors short Biography

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