EFFECTIVE COGNITIVE BEHAVIOR THERAPY APPLICATIONS IN CONTROLLING DEPRESSION AND GDS LEVEL OF DM PATIENTS

Fatmawati1,2, Stang3, Ridwan Amiruddin4, Muhammad Syafar5, Asri6
1Student of Doctoral Program, Faculty of Public Health, Hasanuddin University.
2,6STIKES Panrita Husada, Bulukumba, Indonesia.
3Department of Biostatistics, Faculty of Public Health, Hasanuddin University, Makassar, Indonesia.
4Department of Epidemiology, Faculty of Public Health, Hasanuddin University, Makassar, Indonesia.
5Department of Behavioral Science and Health Promotion, Faculty of Public Health, Hasanuddin University, Makassar, Indonesia.
nengfatma80@gmail.com

ABSTRACT

Purpose: This study aimed to determine the effectiveness of the application of Cognitive Behavior Therapy (CBT-DM) on controlling Depression and G.D.S. levels in patients with diabetes mellitus.

Methods: This study uses a proper experimental design with a pretest-posttest control group design. The treatment group was given an intervention using the CBT-DM application, and the control group was delivered relaxation therapy. Depressed D.M. patients were used as a sample of 50 people. The level of Depression was measured using the DASS 21 instrument, GDA levels were measured by a blood glucose meter. Data analysis using the Wilcoxon test.

Results: There is a significant difference in the level of Depression in D.M. patients before and after applying CBT-DM. The distribution shows a decrease in the level of Depression. G.D.S. levels also showed a significant difference pre and post-test.

Conclusion: CBT-DM application is effective in controlling Depression and reducing G.D.S. levels in D.M. patients.

Keywords: CBT-DM application, Depression, G.D.S., diabetes mellitus

I. INTRODUCTION

One of the problems for patients with diabetes is the occurrence of complications from diabetes, such as coronary artery and peripheral vascular disease, stroke, diabetic neuropathy, amputation, kidney failure, and blindness resulting in increased disability, reduced life expectancy, and enormous health costs for almost every patient. Every society. The most common psychological disorders experienced by adult D.M. patients are related to Diabetes-Related Depression (D.R.D.) and depressive disorders (Chew et al., 2016)

Data from studies conducted by WHO show that Depression is more common in diabetic patients than in the United States population. Studies in the United States (U.S.) that over 18 months, D.M. patients who had experienced major depressive disorder (M.D.D.) and D.R.D. were approximately 20% and 30%, respectively. Depression is a severe, common, and recurrent disorder associated with decreased function, quality of life, medical morbidity, and mortality. Depression is a disorder that causes low mood, low self-esteem, and altered cognitive abilities, reducing concentration and attention and increasing self-destructive and suicidal tendencies.

Major Depression is the only mental disorder included in the World Health Survey. Depression was the third leading cause of illness leading to disability worldwide in 2017 and is the disease with the most significant economic burden in high- and middle-income countries. It is projected to be the leading cause globally by 2030 (Organization, 2018)
The reported prevalence of Diabetes-Related Depression (D.R.D.) in Europe and the U.S. is between 15% and 20%. Depression experienced by D.M. patients is associated with poor glycemic control and reduced adherence to treatment programs. Depression has also been associated with an increased risk of diabetic complications, particularly cardiovascular disease and retinopathy. Reducing the incidence of Depression improves glycemic control and reduces the risk of complications. Pharmacotherapy for Depression may be poorly tolerated or may not be sufficient to produce a complete remission in as many as 50% of diabetic patients with significant Depression. However, currently, the benefits of non-pharmacological approaches to depression management, such as psychotherapy, have not been widely recognized (Chew et al., 2016).

Diabetes and Depression can coexist and have a two-way relationship (Pan et al., 2010). Subjects who are depressed have increased levels of stress hormones, such as cortisol which makes cells resistant to insulin action resulting in insulin resistance and hyperglycemia. At the same time, glycemic control The adverse effects on diabetes affect the hypothalamic-pituitary-adrenal (H.P.A.) axis activate the neurobiology of mood disorders that lead to Depression (Vogelzangs et al. 2007), the occurrence of depression and diabetes mellitus in one individual. Finally, this creates a negative reciprocal relationship. The existence of Depression in people with diabetes will eventually worsen the condition of diabetes suffered (Harista and Lisiswanti, 2015)

According to two meta-analyses (Knol et al. 2006; Nouwen et al. 2010), diabetic subjects had a 24% increased risk of developing Depression and adults. Those with Depression had a 37% higher risk of developing diabetes, even higher with long-term antidepressants (Khullar et al., 2016). We found a nonlinear relationship between diabetes-specific emotional distress and HbA1c, diet, self-efficacy, and physical activity in two samples of people with type 2 diabetes, with a stronger association for lower levels of diabetes-specific emotional distress (Martin and Fisher, 2014). In addition, a high incidence of Diabetes-Related Depression (D.R.D.) was significantly associated with poor glycemic control, poor self-care, low diabetes self-efficacy, and poor quality of life, even after control for clinical Depression (Dagogo-Jack & Davidson, and 2011). A preliminary study was conducted on 47 people with D.M. who underwent a treatment program at RSUD H. Andi Sultan Daeng Radja Bulukumba in November - December 2019. Data showed that 61% of D.M. sufferers experienced depression which began with anxiety. Upon knowing that they suffered from D.M., they feel concerned that they cannot be cured and need to regulate the pattern and type of food eaten. The existence of complications such as wounds that are difficult to heal decreased vision and others.

As the number of people with depression increases, public health care continues to learn about the causes and treatments of Depression. In the past, Depression has been approached somatically, effectively, and cognitively. However, there has been an appreciation of human holism that has highlighted the need to holistically study, diagnose, and treat mental disorders such as Depression. With this recognition, there has been interested in approaching Depression spiritually (Westgate, 1996).

One form of non-pharmacological treatment in patients with Depression is Cognitive Behavior Therapy (C.B.T.) intervention. Cognitive-behavioral therapy appears to be very effective in the treatment of Depression. Being a global concern for health and wellness, the C.B.T. treatment technique for Depression shows effective results. It is very effective in changing the negative thinking and thinking patterns of a depressed person. More advanced courses in C.B.T. are needed to get more desirable results in the treatment process. The studies so far conducted on C.B.T. concerning the treatment of Depression are very positive. Several research databases are developing on Internet-guided and interventional interventions in treating common mental disorders, and several meta-analyses have now been published. This article provides a systematic meta-analysis review of the efficacy of self-help interventions, including internet-guided therapy, for depression and anxiety disorders (Kessler, 2012). Mobile apps have shown promise in supporting people with mental health issues to adopt healthy lifestyles using various persuasive strategies.

Digital technologies, such as mobile devices, smartphone applications, and wearable technologies, and remote sensors, can provide new opportunities to bridge significant gaps in meeting the mental and physical health needs of people with mental illness. For example, rates of mobile device ownership among people with mental illness, including schizophrenia or bipolar disorder, can be compared with the general population (Firth et al., 2016; Glick, Druss, Pina, Lally, & Conde, 2016; Naslund, Aschbrenner, & Bartels, 2016). Reviews also highlight the effectiveness of smartphone applications for reducing symptoms of depression or anxiety (Donker et al., 2013), supporting disease self-management and prevention of relapse among people with schizophrenia (Alvarez-Jimenez et al., 2014), and promoting medication adherence and retention in care among individuals receiving services through community mental health settings (Naslund et al., 2017).
Various applications for depression sufferers are available in the commercial market that can be downloaded for free or paid using Android or smartphones. Some of them use the Cognitive Behavior Therapy (C.B.T.) approach, but there has been no research that discusses the effectiveness of the application (Huguet et al., 2016). Based on this study, it is hoped that this study will form a Cognitive Behavior Therapy-Diabetes Mellitus (CBT-DM) application that D.M. patients can use to control depression and glucose levels and test the effectiveness of the CBT-DM application.

II. MATERIALS AND METHODS

Design and Sampling
The research design was an actual experiment with a pretest-posttest control group design by dividing the sample into two groups, namely the treatment group and the control group; pretest and post-test were carried out in both groups. The CBT-DM application intervention was given in the treatment group, while the control group was assigned relaxation therapy. This research was conducted in the working area of the Tanete Public Health Center, Bulukumba Regency. The study was carried out in January-June 2021. The sample in the study was 60 subjects with D.M. who experienced Depression (30 controls and 30 interventions). Sampling technique using simple random sampling.

Data Collection
Data were obtained directly from respondents who were collected through research questionnaires. For depression assessment, the research instrument used DASS 21 developed by Lovibond and Lovibond (1995) to measure Depression, with dysphoria, anhedonia, hopelessness, pessimistic outlook on life, and inertia indicators. There are four answer choices: never given a score of 0, sometimes given a 1, often given a 3, and always provided a 4. Statement items represent the assessment of Depression numbered 3, 5, 10, 13, 16, 17, 21. Blood sugar was measured using a blood glucose meter.

Data Analysis
To see the effect of android-based CBT-DM application on depression control in the control group and the intervention group using the Wilcoxon test. For example, suppose you want to sense the impact of the android-based CBT-DM application on glucose levels in the control group using the Wilcoxon test. The effect of the android-based CBT-DM application on glucose levels in the intervention group, the paired sample t-test was used.

III. RESULT

Demographic data

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>Group</th>
<th>p=value*</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Control (30)</td>
<td>Intervention (30)</td>
</tr>
<tr>
<td>Age (mean ± SD)</td>
<td>58.70±8.55</td>
<td>53.40±8.15</td>
</tr>
<tr>
<td>sex</td>
<td>Man 7 (23.3%)</td>
<td>8 (26.7%)</td>
</tr>
<tr>
<td></td>
<td>Women 23 (76.7%)</td>
<td>22 (73.3%)</td>
</tr>
</tbody>
</table>

*Test Homogeneity of Variance

Table 1 shows that the variance of age and sex characteristics in the control and application groups is relatively the same (homogeneous). The average age is 50 years, and the majority are female.

Depresi Pre dan Post

<table>
<thead>
<tr>
<th>Depresi Pre-post</th>
<th>Control (30)</th>
<th>Intervention (30)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n</td>
<td>Mean Rank</td>
</tr>
</tbody>
</table>

Table 2 Difference between depression pre and post-test
Table 2 shows that there is no difference between pre and post-depression (p>α). The result is because all patients have a persistent depression score pre to post. However, in the intervention group, there was a significant difference in Depression before and after the application of CBT-DM (p<α), this was supported by 17 people whose depression scores decreased after the application was given. Therefore, it can be concluded that the administration of an android-based CBT-DM application affects controlling Depression in D.M. patients in Bulukumba Regency.

G.D.S. Pre dan Post

Table 3 Differences in pre and post-test glucose levels in the control group

<table>
<thead>
<tr>
<th>Glucose Level Pre-post</th>
<th>Control (30)</th>
<th>p-value*</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n</td>
<td>Mean Rank</td>
</tr>
<tr>
<td>Decrease</td>
<td>12</td>
<td>15.08</td>
</tr>
<tr>
<td>Increase</td>
<td>16</td>
<td>14.06</td>
</tr>
<tr>
<td>Stable</td>
<td>2</td>
<td></td>
</tr>
</tbody>
</table>

*Uji Wilcoxon

Table 3 shows a difference in pre and post glucose levels in the control group but not significant (p>α). This was because the number of patients whose glucose levels increased or decreased was relatively the same pre to post. Therefore, it can be concluded that giving deep breathing relaxation techniques does not affect glucose levels in D.M. patients in Bulukumba Regency.

Table 4 Differences in pre and post test glucose levels in the intervention group

<table>
<thead>
<tr>
<th>Glucose Level</th>
<th>Intervention (30)</th>
<th>p-value*</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean SD</td>
<td>Difference</td>
</tr>
<tr>
<td>Pre</td>
<td>329.03</td>
<td>117.845</td>
</tr>
</tbody>
</table>

paired sample t-test

Table 4 shows a significant difference in glucose levels in the intervention group before and after the application of CBT-DM (p<α). This was supported by the average decrease in glucose levels after the application with a 77.6 mg/dl difference. Therefore, it can be concluded that the administration of an android-based CBT-DM application affects the glucose levels of D.M. patients in Bulukumba Regency.

IV. DISCUSSION

The effect of the android-based CBT-DM application on controlling Depression in D.M. patients in Bulukumba Regency is: In this study, Depression is defined as a feeling of loss of joy or passion due to emotional disturbances experienced by D.M. sufferers in the form of mood disturbances, loss of interest, decreased activity, pessimism about the future. In addition, there are several indicators of Depression, namely dysphoria, anhedonia, hopelessness, pessimistic outlook on life, and inertia. Depression in D.M. patients was measured using the DASS-21 questionnaire, which consisted of 21 statements with four answer choices: never, sometimes, often, and always. If the patient often answers always, then the level of Depression is also declared to be getting worse.

The results showed that most people with diabetes mellitus in the control group experienced severe Depression, while those in the intervention group tended to experience mild depression. Test results explain that there is no difference in depression pre and post-treatment in the control group. This is because all patients have depression scores that persist from pre to post. However, the intervention group had a significant difference in Depression before and after the application of CBT-DM. A decrease in Depression scores supported this after the application. Therefore, it can be interpreted that the provision of an android-based CBT-DM application affects...
controlling Depression in D.M. patients in Bulukumba Regency. These results are in line with the concept proclaimed by the world mental health organization that cognitive-behavioral therapy (C.B.T.) and behavioral activation (B.A.) are now the first line of evidence-based treatment accepted by people with Depression (the U.K., 2010).

Similar results were observed using the Mood Gym application, namely the C.B.T. application aimed at Depression and developed in Australia (Farrer et al., 2011; Gilbody et al., 2015; Lintvedt et al., 2013; Phillips et al., 2014). In addition, it was found that treatment supported by a doctor and using the Mood Gym application resulted in a more significant reduction in Depression compared to treatments that did not use the Mood Gym application. The Deprexis application was developed in Germany and has been extensively studied and proven effective (Choi et al., 2012; Perini et al., 2009; Titov et al., 2010; Williams and Andrews, 2013). This application has been evaluated by comparing three groups of volunteers experiencing Depression. Group 1 received treatment from a doctor accompanied by an application, group 2 received support from the therapist with the application, and group 3 was the control group (without application) (Titov et al., 2010). It was found that the application of C.B.T. supported by doctors and therapists had a significant clinical effect compared to the control conditions, and no significant difference was found between the groups with the two types of support.

Another similar study was conducted by Gilbody et al. (2015), Glozier et al. (2013), and Proudfoot et al. (2004) about the application of Depression, namely Beating the Blues and found to be more effective than depression treatment with conventional methods. The Good Days Ahead application has also been directly compared with standard C.B.T. in two controlled trials involving patients with the major depressive disorder who were not taking antidepressant medications (Callan et al., 2021; Wright et al., 2019). It found that this application was as practical as an entire course of up to 20 conventional face-to-face C.B.T. sessions. Good Days Ahead has nine lessons covering basic concepts and methods of C.B.T., such as identifying and modifying automatic thoughts, scheduling activities, and revising maladaptive beliefs.

Four applications in English also offer C.B.T. therapy for the treatment of Depression. They have been studied by researchers and published in scientific papers, namely Behavioral Activation Scheduling (Both et al., 2010), the Get Happy Program (Watts et al., 2013), C.B.T. Mobilwork (Callan et al., 2021), and Mobilize (Burns et al., 2011). However, these four applications are not available for download by the public, intended for health practitioners only. The number of applications to help people cope with Depression is increasing rapidly, especially in the commercial market. Still, the development process, usefulness, feasibility, and efficacy of these applications developed in the retail market are rarely reported (Huguet et al., 2016).

A meta-analysis of 18 studies on app depression found a moderate effect size for mobile app use compared to control conditions not using apps (Firth et al., 2017). The IntelliCare application using C.B.T. principles has shown a significant reduction in depression measures after eight weeks of use (Mohr et al., 2017). The Virtual Hope Box app is not a depression-specific app. Still, it includes functions, such as breathing exercises, distraction, and relaxation training, which can help relieve symptoms of depression and be significantly better at improving skills for coping with unpleasant emotions and thoughts (Bush et al., 2017).

Huguet et al. (2016) also conducted a meta-analysis study of 117 commercially available applications using the C.B.T. method for Depression. Only 10% had content consistent with the C.B.T. method so that the usefulness of many applications for Depression was questioned, and privacy and security policies were questioned. Data are rarely noticed (Huguet et al., 2016). Commercial companies that distribute applications can store and transmit data via many hands and service providers with limited or no attention to protecting user privacy (Monteith and Glenn, 2016).

Patients' desire to use healthcare applications is relatively low (Marshall et al., 2020; Schueller et al., 2018). For example, about three-quarters of users stop using health apps after ten uses (Torous et al., 2018). In addition, one study reported that 60% of patients in a study of apps for Depression never downloaded an app (Arean et al., 2016). Low-involvement respondents were due to the application's lack of usefulness, user-centered design, concerns about privacy, lack of trust, and unhelpfulness in an emergency. Therefore, it is essential to evaluate the quality and efficacy of the application, including its ability to meet manufacturing objectives, before recommending it to patients or other providers. The American Psychiatric Association (A.P.A.) has developed an online evaluation framework for clinicians to use before prescribing applications to patients (A.P.A., 2019). The A.P.A. framework recommends gathering background information about the application developer and the reasons for developing the
application before evaluating the application's privacy and security, effectiveness, ease of use, and operation. Therefore, when assessing an application for clinical use, it is necessary to consider: application developer, motivation for application development, and cost; user-centered design methods; data security and privacy practices on how data is stored, used, and shared, including agreements with partners. Some patients discover apps through social media and word of mouth or decide which app to use based on ratings and reviews on app stores (Marshall et al., 2020). In addition, lower-priced mental health apps rank higher than more expensive paid apps (Krebs and Duncan, 2015). Thus price can drive patient choice.

The mobile app is strongly recommended to be used as part of a comprehensive and diverse treatment plan. Applications and other technology-based services should be conceptualized as part of the overall health delivery system rather than being treated as stand-alone products (Mehrotra and Tripathi, 2018; Mohr et al., 2017). The application of mobile applications, such as CBT-DM, will be practical if there is a therapeutic relationship with doctors or other health workers who conceptualize technological assistance as an adjunct to clinical care. This can encourage continued patient involvement if the healthcare provider: evaluates the application before suggesting the patient use it, supports the patient in the process of using the application, helps the patient determine whether the application is a reliable source of assistance, and uses the application as part of an integrated care system. 2. Effect of android-based C.B.T. – D.M. application on glucose levels of D.M. patients in Bulukumba Regency.

In this study, the glucose level is the glucose content in the blood of D.M. patients as measured by blood sugar levels when using a blood glucose meter with units of mg/dl glucose levels. The results showed that the glucose levels of people with diabetes were lower in the control group before being given treatment and increased after being given treatment. However, in the intervention group, the levels were higher before treatment and decreased after treatment.

In the control group, the difference in pre and post-glucose levels was not significant. This was because the number of patients whose glucose levels increased or decreased was relatively the same from pre to post. Therefore, the administration of deep breathing relaxation techniques did not affect glucose levels in D.M. patients in Bulukumba Regency. There was a significant difference in glucose levels in the intervention group before and after the administration of the CBT-DM application, with the mean glucose level decreasing after the application. Thus, the Android-based CBT-DM application administration affected the glucose levels of D.M. patients in Bulukumba Regency. These results are in line with the findings of Yang et al. (2020), showing that CBT-based interventions effectively improve glycemic control and depressive symptoms in adult patients with type 1 D.M. or type 2 D.M. with moderate to large effect sizes. In line with the research conducted by Snoek et al. (2008) also showed that C.B.T. could significantly and arise from poor self-care, poor adherence to medication, and comorbidities or psychological complications (Koro et al., 2004).

According to C.B.T. theory, behavioral and emotional problems are maintained by dysfunctional thoughts and automatic schemas. Thus, restructuring of cognition using cognitive and behavioral techniques can reduce dysfunctional behavior (Kahl et al., 2012). The meta-analysis findings have supported the benefits of implementing CBT-based interventions in the management of D.M. The results showed C.B.T. had an effect on HbA1c and had a moderate effect size on glycemic control. D.M. patients easily accept C.B.T., and better adherence is beneficial for glycemic control. Patient adherence to therapy has a significant influence on the therapeutic effect. CBT-based interventions with fewer sessions (<10) and shorter treatment (<6 weeks) had a better impact on glycemic control. This is because a shorter duration of treatment is more accessible for patients to accept. In contrast, long-term treatment will cause a decrease in inpatient medication adherence for several reasons (for example, time costs and physical discomfort), thus affecting the effect of treatment (Tolin, 2010).

Suppose C.B.T. combined with other therapies has a better effect on glycemic control. In that case, other treatments such as activating patient motivation, providing diabetes education, and practicing physical activity can increase the impact of C.B.T. In addition, the intervention given to a group of people with diabetes had a better effect on glycemic control than an individual intervention. Therefore, C.B.T. groups will emphasize the influence of social factors on individual behavior (Sochting, 2014).

Online C.B.T. (e.g., via mobile and internet) has been developed and found by several studies to be effective for glycemic control (Gregg et al., 2007; Kumar et al., 2017; Van Son et al., 2013). However, if analyzed by subgroup, it was found that face-to-face C.B.T. was much better than online C.B.T. This may be because most face-to-face therapy is administered in groups, and this type of treatment structure is more effective. The types of patients who
benefit more from CBT-based interventions have also been explored. It was found that CBT-based interventions are effective for patients with type 1 D.M. and type 2 D.M. C.B.T. can be widely used in the treatment of various types of D.M. Furthermore, Toyote et al. (2017) conducted a subgroup analysis. They showed that CBT-based interventions have a better effect for patients with type 1 D.M. patients who require lifelong insulin therapy are at high risk for various complications. Therefore, they may face more disease-related stress, which is an essential target of CBT-based interventions. C.B.T. specifically focused on diabetes can guide patients to accept and understand their disease and practice practical behavioral skills to control blood sugar better. People with D.M. have a high risk of experiencing symptoms of depression and anxiety.

V. CONCLUSION

The application of CBT-DM has a significant effect on controlling Depression and glucose levels in D.M. patients in Bulukumba district. In addition, the story of Depression in D.M. patients decreased after the application of CBT-DM.

REFERENCES


