Effects of mindfulness based stress reduction (MBSR) on stress, depression and mindfulness among Type 2 Diabetics - A randomized pilot study

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Received 12 September 2016, revised 11 May 2017

Diabetes mellitus is the chronic metabolic disorders that puts individual at greater risk of developing psychological problems such as stress, depression, disrupted family and personal relationship even suicide. Mindfulness Based Stress Reduction (MBSR) is a meditation therapy mainly designed to alleviate suffering associated with psychological problems. The present study aimed to evaluate the effects of Mindfulness Based Stress Reduction on stress, depression and mindfulness among type 2 diabetics residing at selected village, Bengaluru using evaluative approach with a true experimental pre-test post-test control group design. The study population included 40 type 2 diabetics selected by simple random sampling method and were randomly assigned into the control and experimental group with 20 in each group. Data was collected using demographic proforma, Perceived Stress Scale (PSS), Centre for Epidemiologic Studies Depression Scale (CES-D) and Mindfulness Attention Awareness Scale (MASS). The participants in the experimental group received 8 weeks MBSR therapy, whereas control group did not receive intervention. The study results revealed that MBSR was an effective intervention in reducing stress (p < 0.000), depression (p < 0.000), and increasing mindfulness awareness (p < 0.000) among participants in the experimental group.

Keywords: Mindfulness, Stress, Depression, Type 2 diabetics

IPC Int. Cl.: G05D 15/00, G01L 1/00, A01D 22/23, A01D 16/02

Diabetes mellitus is a group of heterogeneous disorders characterized by elevated levels of glucose in the blood, or hyperglycaemia. There are certain risk factors that are known to be associated with the development of type 2 diabetes. These include age, obesity and family history of diabetes. In worldwide the total number of people with type 2 diabetes was expected to increase from 171 million in 2000 to 366 million in 2030 and is found to be the leading cause of mortality. According to the International Diabetes Federation (IFD) by 2040 one adult in 10 that is 642 million will have diabetes. World Health Organization (WHO) also reports that diabetes is a major global health burden. In India more than 65.1 million people are suffered with diabetes, compared to 58.8 million in 2010. Diabetes and depression are highly prevalent conditions and have significant impact on health outcomes, health care costs, decreased quality of life and increased risk of death. Depression and diabetes are the two common public health problem affecting people all over the world. Globally 43 million diabetics have symptoms of stress and depression. Depression is more common in adults with type 2 diabetes mellitus as compared to those not having. Many Research studies indicate that co-morbid depression has been shown to be associated with poor adherence to diabetes medication and dietary regimen thus reduced the quality of life. The main goal of the treatment of diabetes is not only normalized insulin activity and blood glucose levels, but prompt action to be taken to reduce the symptoms of stress and depression as an avenue for health improvement associated with type 2 diabetes. For the promotion of a positive mind set and create a feeling of wellbeing; meditation, prayer and relaxation strategies are vital. Mindfulness is an effective health care intervention, alleviate suffering associated with stress and depression and improve people quality of life. Mindfulness is the awareness that emerges through paying attention on purpose in the present, non-judgemental to the unfolding of experience moment to moment. It is a simple way of relating to all experience that can reduce suffering and set the stage for positive personal information. MBSR is the one of the new treatments in the field of psychotherapy which is under

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category of meditation. This approach was introduced by Kabat-Zinn in the 1970s and since then, it was applied in many problems such as stress, chronic pain, headaches, high blood pressure, sleep disorders, depression, anxiety and other health related problems. MBSR constitutes of 2.5 h/week, 8-weeks course programme. So the present pilot study was done to assess the feasibility and to evaluate the effect of MBSR on stress, depression and mindfulness among type 2 diabetics.

Methodology
This study was a randomized pilot study, with a control group and featured pre-test, post-test and follow-up. The study was carried out in a selected village of Kannamangala taluk, Bengaluru. The study was conducted after getting the written approval from Institutional Ethics Committee of Saveetha University (008/01/2015/IEC/SU) and Vydehi Institute of Medical Sciences (VIEC/2015/APP/098). At first house to house survey was done by face to face interview using a brief questionnaire to assess the sample eligibility. A total of 82 type 2 diabetics were identified. Among these 61 individuals who met the inclusion criteria, i.e., those who willing to participate in the study, both male and female age of 30-65 yrs, diagnosed with type 2 diabetes for more than one year and taking oral hypoglycaemic agents, fasting blood glucose level is less than 275 mg/dL in last 3 months, stress score is ≥ 15 and depression score is ≤ 20 were included in the study. The samples of 40 type 2 diabetics were selected using lottery method of simple random sampling techniques and were randomly assigned to either the control group (n = 20) or the experimental group (n = 20) using computer generated random number. It is done by allocation of participants by randomization schedule and sealed envelope method. Informed consent was obtained from the participants and confidentiality was maintained. The tools used for the data collection of the present study have two parts. Part A includes demographic proforma and Part B includes Perceived Stress Scale (PSS), Centre for Epidemiologic Studies Depression Scale (CES-D) and Mindfulness Attention Awareness Scale (MAAS). Content validity, language validity and pretesting of the tool were obtained. The tool equivalency was 0.82 for PSS, 0.83 for CES-D and 0.88 for MAAS. The variables were measured at baseline; end of the intervention and at 1 month after the intervention. Experimental group was given 20-30 min MBSR practice for 5 days in a week and over the period of 8 weeks consisted of mindfulness breathing, mindfulness body scan, mindfulness sounds and mindfulness thoughts and feelings. Experimental group participants were comprised into two subgroups (10 + 10) and each group time slot was given for MBSR intervention. The MBSR was given by the investigator who had received training in mindfulness practice. Intervention was delivered at village under health training centre. The control group participants did not receive any intervention. However, MBSR session was conducted to the control group participants at the end of the study. Thirty eight participants were completed the study and two dropped out from the experimental group, i.e., only 18 participants in the experimental group and all 20 in the control group were included for final analysis. During intervention, two participants from the experimental group had missed more than three sessions of MBSR and they were discontinued from the study due to family issue.

Analysis of data
The results are presented in mean, standard deviation (SD), frequency and percentage. The repeated measures analysis of variance (RMANOVA) used to compare the means from the pre-test to follow up of the control and experimental groups. Bonferroni post hoc test was also computed to determine the difference between the time points. The p value ≤0.05 is being considered as significant. All the analysis is carried out by using Statistical Package for Social Sciences (SPSS) 16.0 version.

Results
In the study, there were no statistically significant difference between the groups at the age and gender. The control group and the experimental group were homogenous (p > 0.05, Table 1). The data presented in Table 1 shows that in the control group 6 out of 20 (30 %) and in experimental group 7 out of 18 (38.89 %) were in the age group of 45-49 yrs. In case of gender in the control group 12 (60 %) were female, 8 (40 %) were male, whereas in experimental group 11 (61.11 %) were female and 7 (38.89 %) were male.

With regards to religion majority of participants 10 (50 %) in the control group and 11 (61.11 %) in experimental group were Hindus. With regards to educational profile, majority of them in the control group, i.e., 10 (50 %) had primary education, in experimental group 11 (61.11 %) had primary
education. When concerned with occupation in the control group maximum of them, i.e., 55 % (11 out of 20) and in experimental group, 66.67 % (12 out of 18) were farmer and in both groups majority 16 were from nuclear family. With regard to dietary pattern most of them in the control group (80 %) and in experimental group (77.78 %) were consume mixed diet. In both groups all of them had habits of drinking coffee and tea (100 %). Regarding habits of addiction in the control group 12 (60 %), in experimental group 10 (55.56 %) were non-smoker and in the control group 14 (70 %), in experimental group 10 (55.56 %) were non-alcoholic. With regards to associated health problems, in the control group 11 out of 20 (55 %) and in experimental group 14 (70 %), in experimental group 10 (55.56 %) were non-alcoholic. With regards to associated health problems, in the control group half of the participants, i.e., 9 out of 18 (50 %) were diagnosed to have hypertension (Table 2). All of them in both the groups were taking anti-diabetic drugs with various dosage and frequency.

The data presented in Table 3 shows that the experimental group mean pre-test stress score (19.79) was higher than post-test stress score (13.78). The experimental group mean post-test stress score (13.78) was lower than the control group mean post-test stress score (19.35). A significant interaction effect between group and time (df = 2, 72; F = 78.09; p < 0.00) and time effect was observed between the groups. Significant difference in mean stress scores was observed between experimental and control group after intervention period. Post hoc test using the Bonferroni correction revealed that MBSR training was effective in significantly reduction in stress from pre training (19.78 ± 3.86), post training (13.78 ± 2.53) to follow-up (12.0 ± 1.82). The results of the RMANOVA showed that there was a significant reduction in the stress scores of the experimental group compared to the control group (Fig. 1).

In the experimental group mean pre-test depression score (19.11) was higher than post-test depression score (12.78). The experimental group mean post-test depression score (12.78) was lower than the control group mean post-test depression score (19.44). A significant interaction effect between group and time (df = 2, 72; F = 127.01; p < 0.00) and time effect was observed between the groups. Significant difference in mean depression scores was observed between experimental and control groups after intervention period. Post hoc test using the Bonferroni correction revealed that MBSR training was effective in significantly reduction in depression from pre training
EFFECTS OF MBSR ON STRESS, DEPRESSION & MINDFULNESS AMONG TYPE 2 DIABETICS

Table 3—Effects of MBSR on stress, depression and mindfulness (mean ± SD) N=38

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Groups</th>
<th>Pre-test M±SD</th>
<th>Post-test M±SD</th>
<th>follow-up M±SD</th>
<th>Variables</th>
<th>Significance (0.05 )</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stress</td>
<td>Exp.group</td>
<td>19.79±3.86</td>
<td>13.78±2.53</td>
<td>12±1.82</td>
<td>Group</td>
<td>1,36</td>
</tr>
<tr>
<td></td>
<td>Con.group</td>
<td>19.4±2.76</td>
<td>19.35±2.37</td>
<td>18.75±1.77</td>
<td>Time</td>
<td>2,72</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Group ×Time</td>
<td>2,72</td>
</tr>
<tr>
<td>Depression</td>
<td>Exp.group</td>
<td>19.11±1.84</td>
<td>12.78±2.49</td>
<td>11.11±1.32</td>
<td>Group</td>
<td>1,36</td>
</tr>
<tr>
<td></td>
<td>Con.group</td>
<td>19.61±1.86</td>
<td>19.44±1.98</td>
<td>19.44±1.35</td>
<td>Time</td>
<td>2,72</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Group ×Time</td>
<td>2,72</td>
</tr>
<tr>
<td>Mindfulness</td>
<td>Exp.group</td>
<td>47.33±6.63</td>
<td>61.39±5.3</td>
<td>64.61±3.65</td>
<td>Group</td>
<td>1,36</td>
</tr>
<tr>
<td></td>
<td>Con.group</td>
<td>45.67±5.73</td>
<td>43.89±5.78</td>
<td>44.5±5.04</td>
<td>Time</td>
<td>2,72</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Group ×Time</td>
<td>2,72</td>
</tr>
</tbody>
</table>

Fig. 1—Profile plot showing Repeated measures ANOVA for stress on MBSR
(19.11 ± 1.84), post training (12.78 ± 2.49) to follow-up (11.11 ± 1.32). The results of the RMANOVA showed that there was a significant reduction in the depression scores of the experimental group compared to the control group (Fig. 2).

With regard to mindfulness the experimental group mean pre-test mindfulness score (47.33) was lower than post-test mindfulness score (61.39). The experimental group mean post-test mindfulness score (61.39) was higher than the control group mean post-test mindfulness score (43.89). A significant interaction effect between group and time (df = 2, 72; $F = 123.18$; $p < 0.00$) and time effect was observed between the groups. Significant difference in mean mindfulness scores was observed between experimental and control groups after intervention period. Post hoc test using the Bonferroni correction revealed that MBSR training was effective in significantly increase in mindfulness from pre training (47.33 ± 6.63), post training (61.39 ± 5.3) to follow-up (64.61 ± 3.65). The results of the RMANOVA showed that there was a significant improvement in the mindfulness scores of the experimental group compared to the control group (Fig. 3).

Discussion
Diabetes mellitus poses a major life stress which requires considerable physical, emotional and psychological accommodation and coping. People with diabetes are 20 % more likely to have an anxiety condition and about 25 % of adults with diabetes will experience depression at some point in their lifetime than those without diabetes. Mindfulness can help in adapting to the daily treatment needs and managing the psychosocial issues associated with diabetes that are
challenging and stressful. MBSR therapy has also been found to relieve stress in patients with diabetes mellitus (Lisa, 2015)\(^{18}\). The present pilot study findings reveals that MBSR was effective in reducing stress, depression and in improving mindfulness among type 2 diabetics. Similar findings were observed a study done by Hartmann \textit{et al.} (2012)\(^{19}\) reported that the MBSR group showed lower levels of depression (d = 0.71) and improved health status (d = 0.54) compared with the control group. MBSR intervention achieved a prolonged reduction in psychosocial distress. Van Son \textit{et al.} (2013)\(^{11}\) also reports that mindfulness based therapy was more effective in reducing stress (p = 0.001) depressive symptoms (p = 0.006) and anxiety (p = 0.019) compared with usual care in diabetic patients who had lower levels of emotional well-being. A meta-analysis was done by Grossman \textit{et al.} (2004)\(^{20}\), Klainin-Yobas \textit{et al.} (2012)\(^{21}\) and Bohlmeijer \textit{et al.} (2010)\(^{22}\) reported that MBSR may help individuals to cope with their clinical, nonclinical problems. Mindfulness-based interventions are efficacious for alleviating depressive symptoms in adults with mental disorders and improve the adult mental health with chronic medical disease. Fjorback \textit{et al.} (2011)\(^{23}\) and Teasdale \textit{et al.} (2000)\(^{24}\) conducted a randomized controlled trials reveals MBSR improves mental health and MBCT offers a promising cost-efficient psychological approach to prevent relapse/recurrence in recovered recurrently depressed patients. Limitation of the study was small number of participants, and setting was selected conveniently which limits generalization of findings. Since the present study was a pilot study. So the study was done with small number of samples, further research with large sample is essential to meet the generalization. The weakness of the present study includes two dropouts during the intervention programme.

**Conclusion**

The present study results suggested that MBSR therapy may be an effective intervention for reducing stress, depression and in addition to increasing mindfulness awareness of people with type 2 diabetes. The intervention is in-expensive, cost-effective and non-invasive that helps to treat variety of health related problems and provide quality care of people/patients with depression, stress due to various illness and disease conditions. The current health services have mainly placed emphasis on curative aspects but more comprehensive care is required to improve health of the people and increase their quality of life. MBSR is harmless and still effective to certain extent in improving health and the quality of life. Hence, it was concluded that MBSR may be an effective interventional therapy for reducing psychological disorders of individual with type 2 diabetes mellitus.

**Acknowledgement**

The authors thank to Dr R. Vijayaraghavan, Director Research, Saveetha University and ethical committee members, VIMS and RC for the support and guidance throughout the study.

**Conflict of interest**

None

**References**