Mindfulness Based Stress Reduction as an Adjunct Treatment to Diabetes

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Abstract

Background: Diabetes is a significant health problem currently and is linked to a variety of mental health issues. In order to adequately control this disease, patients must have good mental health status and methods of dealing with stress. Mindfulness-Based Stress Reduction (MBSR) is a technique people can use in all facets of their life for decreasing their level of mental stress. This review looks at the effects of using MBSR on glycemic control in diabetic patients.

Methods: An exhaustive search of available medical literature was performed using Medline-OVID, CINAHL, PsycInfo, and EBMR Multifile. Keywords used included: diabetes, diabetes mellitus type I, diabetes mellitus type II, diabetes mellitus, mindfulness, and meditation.

Results: 21 articles were reviewed for relevancy. Three studies were found, including 2 RCTs and one observational study. One of the three studies found a drop in HbA1C and all showed improvements in mental health of the participants. The overall quality of the studies was low and further study would need to be done to follow up with patients for a longer period of time.

Conclusion: MBSR cannot be used as a reliable method for glycemic control, but it is a safe and useful strategy to use with patients for stress management who are open to the therapy.

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AJ Sommers, PA-C

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Mindfulness-Based Stress Reduction as an Adjunct Treatment for Diabetes

Leslie Gustafson

A Clinical Graduate Project Submitted to the Faculty of the
School of Physician Assistant Studies
Pacific University
Hillsboro, OR
For the Masters of Science Degree, August 2014

Faculty Advisor: James Ferguson, PA-C, MPH
Clinical Graduate Project Coordinator: Annjanette Sommers, PA-C, MS
Biography

[Redacted for privacy]
Abstract

**Background:** Diabetes is a significant health problem currently and is linked to a variety of mental health issues. In order to adequately control this disease, patients must have good mental health status and methods of dealing with stress. Mindfulness-Based Stress Reduction (MBSR) is a technique people can use in all facets of their life for decreasing their level of mental stress. This review looks at the effects of using MBSR on glycemic control in diabetic patients.

**Methods:** An exhaustive search of available medical literature was performed using Medline-OVID, CINAHL, PsycInfo, and EBMR Multifile. Keywords used included: diabetes, diabetes mellitus type I, diabetes mellitus type II, diabetes mellitus, mindfulness, and meditation.

**Results:** 21 articles were reviewed for relevancy. Three studies were found, including 2 RCTs and one observational study. One of the three studies found a drop in HbA1C and all showed improvements in mental health of the participants. The overall quality of the studies was low and further study would need to be done to follow up with patients for a longer period of time.

**Conclusion:** MBSR cannot be used as a reliable method for glycemic control, but it is a safe and useful strategy to use with patients for stress management who are open to the therapy.

**Keywords:** diabetes, diabetes mellitus type I, diabetes mellitus type II, diabetes mellitus, mindfulness, MBSR
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List of Abbreviations

MBSR……………………………………………………Mindfulness Based Stress Reduction
MBCT…………………………………………………Mindfulness Based Cognitive Therapy
DM…………………………………………………………………………….Diabetes Mellitus
Mindfulness-Based Stress Reduction as an Adjunct Treatment for Diabetes

BACKGROUND

Diabetes is a significant health problem in the United States, affecting 25.8 million people and approximately 8.3 percent of the population in 2011, according to the National Diabetes Clearinghouse. It is a multifaceted disorder, affecting virtually every aspect of a person’s life including their physical health, mental health, and behavior. Helping patients to prevent and control this disease is a difficult problem that clinicians face and most of this load is usually carried by the primary care provider.

Most Americans live with at least some degree of stress in their lives, and being diagnosed with and attempting to control a chronic disease, such as diabetes, will undeniably add more stress to a person’s life. In fact, one meta-analysis found that diabetic patients are twice as likely to have depression. Another study found that about 41% of diabetic patients had mental health issues and that these issues are barriers to adequate control. According to a recent APA poll, 31% of people with a chronic illness think it is important to discuss stress management with their health care provider, but only 19% are doing so. While medications are an important part of diabetes management, it is obvious that both lifestyle and behavior change are vital to adequate control and improvement. Perhaps helping patients with their mental health and stress management could be a player in achieving these lifestyle changes.
Stress and anxiety can also lead to glycemic control problems on a physiological level. Cortisol and other hormones released by the body in response to stress lead to gluconeogenesis and elevated glucose levels in the blood. This is the body’s adaptive mechanism to provide cells with the energy they will need when dealing with a stressful situation, in a primitive sense, running from a predator. The stress that most people experience today is mental rather than physical, but the body’s response is the same. When this increased blood glucose is not utilized by the body’s cells, our pancreas must then produce excess insulin to decrease the blood glucose and keep our body in homeostasis. Therefore, stress can be even more detrimental to a diabetic patient and may cause increased difficulty with glucose control.

Mindfulness-Based Stress Reduction (MBSR) was a concept developed by Jon Kabat-Zinn, PhD, in 1979. Its goal is to help people better deal with stress and anxiety by allowing themselves to be truly present in the moment and conscious of their thought processes. This specific program is eight weekly 2.5-hour classes, as well as one 7-hour retreat that teach patients meditation, yoga, and communication and provides resources for use at home. By giving patients a valuable tool that they can use in all aspects of their lives, they will perhaps be able to achieve a better sense of well being and deal with stress.

One systematic review looking at the effects of MBSR found that overall it does help with the mental health and sense of well being of those who use it and can be complementary to medical management of disease. Another review concluded that MBSR can help depression, anxiety, and stress for those patients with chronic health conditions. While MBSR has shown to have a possible effect on the mental health of
patients, the next question for a clinician is whether the therapy can actually help a patient improve their physical condition, such as glycemic control for diabetes.

**METHODS**

An exhaustive search of the literature was performed using MedLine- OVID, CINAHL, PsycInfo, and EBMR Multifile. Keywords used included: diabetes, diabetes mellitus type I, diabetes mellitus type II, diabetes mellitus, mindfulness, and meditation. Studies were required to use mindfulness-based stress reduction as the cognitive therapy as opposed to other therapies. Bibliographies of studies and other relevant articles were searched for further sources. Articles were assessed for quality using the Grading of Recommendations, Assessment, Development, and Evaluation (GRADE).

**RESULTS**

A total of 21 articles were reviewed for relevancy. Three articles fit inclusion criteria, including two randomized controlled trials and one prospective observational study. One study was found that utilized a one day Acceptance and Commitment Therapy with mindfulness principles, but was excluded due to differences in therapy type. No additional articles were found by searching the references of the included studies.

**van Son et al**

This randomized control trial sought to look at the effects of a mindfulness-based cognitive therapy (MBCT), another form of MBSR, on the emotional state and HbA1C of diabetic patients (type I and II) with low levels of well being. Participants were recruited from several outpatient diabetes clinics using the WHO-5 well being
index. Patients were required to have a score of <13 on this index, indicating they have a low level of emotional well being. Patients were excluded who had severe psychopathology, drug abuse, severe comorbidities, or if they were in another psychological program. 139 participants were randomized into an MBCT group (n=70) and a usual care (TAU) group (n=69). Overall, the groups were balanced prognostically, but there was a slightly higher use of psychotropic medication in the MBCT group. The intervention was an MBSR/MBCT hybrid therapy and participants attended eight weekly, 2-hour sessions in groups of 4-10.

Randomization was done using a computerized system. The study was reported to be masked as much as possible, considering it is obvious to participants which group they are in once they begin. The statisticians and researchers were blinded to group allocation.

Primary outcomes included emotional distress, depressive symptoms, mood states and diabetes specific distress. Secondary outcomes were HbA1C and health-related quality of life. Patients’ level of emotional distress was measured using a variety of patient scales. All outcomes were measured at baseline, four, and eight weeks, while HbA1C was also measured 24 weeks after the intervention.

No effect was seen in HbA1C levels. However, there were statistically significant changes in depression, anxiety, and stress symptoms in the MBCT group over the control group. Participants were twice as likely to have decreased anxiety and three times as likely to have improvement in depression symptoms.
Limitations included a relatively high dropout rate in the MBCT group of about 26%. They also reported having some missing data for HbA1C values and the researchers did not control for changes in medication.\textsuperscript{11}

\textbf{Hartmann et al}

This was a randomized control trial\textsuperscript{12} looking at the 5-year outcome of an MBSR intervention. Participants were recruited from the Diabetes Outpatient Clinic at the University of Heidelberg in Germany. Inclusion criteria included between the ages of 30-70, Diabetes Mellitus (DM) Type II and albuminuria >20mg/l on two separate urines. Participants could not have other cardiovascular or renal comorbidities or psychiatric disorders. There were no significant differences in baseline characteristics of patients.\textsuperscript{12}

The study included a total of 110 participants randomized into an MBSR intervention (n=53) and control group (n=57) who received regular care at the diabetes outpatient clinic. The intervention used was an MBSR program adapted slightly to include diabetes-specific distress topics. Groups of 6-10 participants met weekly for eight weeks and then for a booster session at six months. All patients were seen at the outpatient clinic regularly for care.\textsuperscript{12}

The primary outcome of the study was microalbuminuria. Psychological distress, mortality, and other health status measures, including but not limited to HbA1c, were secondary endpoints. Outcome results were recorded immediately post-intervention as well as one year follow up and will continue yearly for five years. The one year follow up results showed little change in HbA1C and microalbuminuria, which are both important
markers for diabetes progression and control. Improved mental health status and lower levels of depression were found in the MBSR group at one year follow up.\textsuperscript{12}

Limitations of the study include a relatively small cohort and no mention of the level of blinding. Also, this study will continue for four more years after this report was published, so perhaps further findings will be discovered.\textsuperscript{12}

\textbf{Rosenzweig et al}

This was a prospective observational study\textsuperscript{13} of 14 adult participants with diabetes mellitus type I. It included adults between the ages of 30-75 with a HbA1C between 6.5 to 8.5 and fasting glucose <275mg/dL. Other criteria included no change in medication, diet, or exercise in the twelve weeks prior to enrollment in the study. Also, absence of severe psychopathology and no current meditation or mindfulness practice was required. Participants were recruited through an academic health center.\textsuperscript{13}

Intervention was a standard MBSR program based off of Kabat-Zinn’s method.\textsuperscript{5} Compliance with home mindfulness practice was assessed weekly. Outcomes were assessed at three intervals that included one week preceding intervention, at week eight, and one month after intervention. Outcomes included HbA1C, blood pressure, weight, and mental health using the Symptom Checklist 90-Revised.\textsuperscript{13,16}

Eleven subjects completed the study, due to one drop out and two patients with medication changes. No changes in diet or exercise regimen were reported and compliance with at home mindfulness practices was excellent. They found a statistically significant drop in HbA1C of 0.48\% (P=.03) and in mean arterial blood pressure at one month follow up. In addition, they reported a decrease in depression of 43\%, anxiety of
37%, and psychological distress of 35% based on the Symptom Checklist 90-Revised.\textsuperscript{16} No changes in weight were reported.\textsuperscript{13}

The authors state the limitations of this study to be a small study size and no control group.\textsuperscript{13}

**DISCUSSION**

Diabetes is a chronic condition that will undeniably add stress to a person’s life. Stress not only increases blood glucose through physiological mechanisms, but patients are less likely to be able to adequately control their diabetes when they have poor mental health and stressful lives.\textsuperscript{3} Mindfulness based stress reduction is a stress management practice that people can utilize in their everyday lives to decrease stress and has been shown to be effective for patients with chronic illnesses.\textsuperscript{8}

This systematic review was able to uncover three studies\textsuperscript{11,12,13} that look at the effect of a mindfulness-based stress reduction program on diabetic patients’ glycemic control. Only one study was able to show an effect on the HbA1C of patients using MBSR.\textsuperscript{13} In addition to these flaws, MBSR as a therapy itself raises many variables, as it is difficult to control for and quantify. The studies were evaluated using the GRADE method and results can be seen in Table 1.

The major limitations of these studies include blinding, cohort size, recruitment bias, and attrition bias. Blinding in these studies is overall difficult to do, as it becomes obvious to patients if they are receiving a psychological therapy versus no psychological therapy. Van Son et al\textsuperscript{11} reported blinding the data collectors and statisticians to group allocation, but Hartman et al\textsuperscript{12} made no mention as to the level of blinding. The
Rosenzweig et al\textsuperscript{13} study was limited because of its observational study design and it did not include a control group population, so blinding was not even possible.\textsuperscript{11,12,13}

Recruitment bias was probably present with all three studies as patients were given the option to participate and a patient who is open to the idea of the therapy will be more likely to join. In addition, Van Son et al\textsuperscript{11} reported a relatively large dropout of 26\%, which could be an indicator that the effectiveness of MBSR therapy is dependent on the patient’s openness and willingness to participate. A per-protocol analysis by Hartman et al\textsuperscript{12} demonstrated that with perfect compliance, depression rates would have dropped an even greater amount over time. This strengthens the idea that the therapy will only work for those who are willing to participate and follow through.

Rosenzweig et al\textsuperscript{13} was the only study that found a change in the HbA1C of participants. They did report controlling for variables such as medication, diet, and exercise changes. However, due to the small cohort and possible recruitment bias, the results cannot be generalized to all diabetic patients.\textsuperscript{13}

As has been shown with past research,\textsuperscript{8} all three of these studies demonstrated a positive effect on the mental health and level of stress of participants. Perhaps the possible physical benefit from MBSR takes a longer time to develop as the effects of stress are cumulative over time and short term improvements in mental health are unlikely to reverse the effects of years of stress. The Hartman et al\textsuperscript{12} study will continue for an additional 4 years, which may show additional results.

Further study would need to be done on this topic in order to truly evaluate its effectiveness in improving glycemic control in diabetic patients. Because of the overall low quality of evidence of these studies, their results are not reliable. A larger,
randomized control trial, perhaps comparing different stress management therapies with a control could lead to better results. One RCT looking at a different type of mindfulness based therapy called acceptance and commitment therapy did show some promising results of improved glycemic control with only one session.16

**CONCLUSION**

The effects of MBSR on diabetes control are unclear. Due to the low quality of the current studies on this topic, not much can be gained. The studies did not show a benefit for glycemic control, but they did show improvements on emotional and mental health status. Further study would need to be done to obtain clearer results. However, due to the safety and possible benefits of the therapy, it is something that should be considered for patients who are open to it and are looking for a way to improve their stress management.
References


management through acceptance, mindfulness, and values: a randomized controlled

15. The WHO-Five Well-Being Index (WHO-5) [article online]. Available from
http://www.who-5.org/.


17. van Son J, Nyklicek I, Pop V, Pouwer F. Testing the effectiveness of a mindfulness-
based intervention to reduce emotional distress in outpatients with diabetes (DiaMind):
# Table I. Characteristics of Reviewed Studies

<table>
<thead>
<tr>
<th>Study</th>
<th>Design</th>
<th>Limitations</th>
<th>Indirectness</th>
<th>Imprecision</th>
<th>Inconsistency</th>
<th>Quality Assessment</th>
<th>Publication bias likely</th>
<th>Quality</th>
</tr>
</thead>
<tbody>
<tr>
<td>van Son et al.²</td>
<td>RCT</td>
<td>Not serious</td>
<td>Not serious</td>
<td>Not serious</td>
<td>Serious²</td>
<td>No</td>
<td>Moderate</td>
<td>Low</td>
</tr>
<tr>
<td>Hartman et al.²</td>
<td>RCT</td>
<td>Serious³</td>
<td>Not serious</td>
<td>Serious³</td>
<td>Not serious</td>
<td>No</td>
<td>Low</td>
<td>Low</td>
</tr>
<tr>
<td>Rozenzweig et al.²</td>
<td>Observational</td>
<td>Very serious⁴</td>
<td>Not serious</td>
<td>Serious⁴</td>
<td>Not serious</td>
<td>No</td>
<td>Very low</td>
<td>Very low</td>
</tr>
</tbody>
</table>

- no control group
- small sample size
- no mention of level of blinding of study
- attrition rate higher in treatment group
### Summary of Findings

**Table II. van Son et al**

<table>
<thead>
<tr>
<th>Outcome</th>
<th>MBCT (n=70)</th>
<th>TAU (n=69)</th>
<th>MBCT</th>
<th>TAU</th>
<th>P Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Quality of life, mental</td>
<td>33.9</td>
<td>32.5</td>
<td>42.9</td>
<td>35.7</td>
<td>&lt;0.01</td>
</tr>
<tr>
<td>HbA1C (%)</td>
<td>7.5 +/- 1.2</td>
<td>7.6 +/- 1.1</td>
<td>7.6 +/- 1.2</td>
<td>7.8 +/- 1.5</td>
<td>0.35</td>
</tr>
</tbody>
</table>

**Table III. Hartman et al**

<table>
<thead>
<tr>
<th>Outcome</th>
<th>Baseline</th>
<th>Intervention (n=53)</th>
<th>Control (n=57)</th>
<th>1 year follow-up</th>
</tr>
</thead>
<tbody>
<tr>
<td>Microalbuminuria (mg/24 h)</td>
<td>59.6</td>
<td>45.0</td>
<td>43.3</td>
<td>54.6</td>
</tr>
<tr>
<td>HbA1C (%)</td>
<td>7.26 +/- 1.08</td>
<td>7.27 +/- 1.06</td>
<td>7.2 +/- 0.14</td>
<td>7.5 +/- 0.16</td>
</tr>
<tr>
<td>SF-12 mental composite score</td>
<td>45.6 +/- 10.3</td>
<td>43.0 +/- 10.8</td>
<td>48.4 +/- 1.51</td>
<td>43.6 +/- 1.7</td>
</tr>
<tr>
<td>SF-12 Depression Score</td>
<td>6.4 +/- 4.9</td>
<td>5.7 +/- 4.3</td>
<td>5.3 +/- 0.48</td>
<td>7.3 +/- 0.56</td>
</tr>
</tbody>
</table>

**Table IV. Rosenzweig et al**

<table>
<thead>
<tr>
<th>Outcome</th>
<th>Baseline</th>
<th>Post-intervention (week 8)</th>
<th>Follow-up (Week 12)</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>HbA1C (%)</td>
<td>7.5 +/- 0.51</td>
<td>7.23 +/- 0.67</td>
<td>7.02 +/- 0.58</td>
<td>0.03</td>
</tr>
<tr>
<td>Weight (lbs)</td>
<td>236 +/- 48</td>
<td>238 +/- 50</td>
<td>240 +/- 46</td>
<td>0.10</td>
</tr>
<tr>
<td>Mean arterial pressure (mmHg)</td>
<td>100 +/- 12</td>
<td>97 +/- 10</td>
<td>94 +/- 13</td>
<td>0.009</td>
</tr>
</tbody>
</table>