

Original Article

The Effect of Swedish Massage on Glycohemoglobin in Children with Diabetes Mellitus

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Objectives: Diabetes mellitus (DM) is the most common endocrine disease in children. Massage therapy can improve glucose metabolism in DM. This study was conducted to determine the effect of Swedish massage on the Glycohemoglobin (HbA1c) in children with DM.

Methods: This study was an semi-experimental (clinical trial) conducted on thirty-six children, 6-12 years old with (DM), recruited from a clinic of the Qom City, Iran. They were randomly assigned to intervention and control groups (18 patients in each group). Swedish massage was performed for fifteen minutes, three times weekly, for three months in intervention group. The HbA1c was evaluated before and after intervention in the two groups.

Results: The average ages of children in the intervention and control groups were 9.05 (± 1.55) and 9.83 (± 2.03) years respectively. There was statistically no significant difference in Glycohemoglobin before intervention between two groups ($P = 0.491$), but the Glycohemoglobin was lower significantly in intervention group in comparison with control group after intervention ($P < 0.0001$).

Conclusion: Massage therapy can be an assisted treatment in children with DM; reducing the drug consumption by patients for the control of DM.

Key words: Diabetes Mellitus, Swedish massage, Glycohemoglobin (HbA1c), Children.

Introduction

Regarding changes in epidemiological trend of diseases in developing and developed countries and increase in life expectancy, stresses of modern urban life, less mobility and change in diet, the prevalence of Diabetes Mellitus (DM) has been increased (1). DM type I is rising in rate of 3% in children and adolescents and is being estimated that 700,000 of children under 15 are affected annually. Diabetes type II that is considered as adult disease, is also increasing in children and adolescents dramatically. Due to high prevalence of cardiovascular and ophthalmic complications in diabetic patients, the prevention, management and control in these patients is so important and necessary (2).

Nowadays in addition of medical and surgical treatments in DM, non-organic treatments such as weight control, tension reduction and change in lifestyle are also used (3). Sokolow & Cheitlin (1999) believe that general criteria such as diet, exercises, weight loss in overweight people, relaxation techniques, life equilibrium and consideration of other risk factors can not be ignored in diabetic patients' care (4).

Relaxation is one of the most efficient treatment modality in anxiety (5). Relaxation can decrease muscle tension (6) and increase parasympathetic nervous system activity via hypothalamus (7). According to Selye's stress theory, the limbic system links emotions and feelings with somatic and

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psychological behaviors and replace emotions like stress, anxiety, anger, depression with relaxation and good feelings and regulates somatic behaviours of feelings via neuroendocrine, autonomic nervous and ambulatory systems (8). Stress, anxiety, anger, depression and emotional distress often increase muscle tone. Relaxation and happy feelings decrease muscle tone in reverse. The limbic system effects on muscle tone via hypothalamus. Increased anterior hypothalamus activity raises sympathetic, ambulatory systems and cortex activity, while increasing posterior hypothalamus activity elevates parasympathetic system activity and decreases muscle tone (9). Massage as an enjoyable experience decreases anxiety and creates relaxation via muscle tone reduction (10).

Swedish massage is one of the prevalent methods in stress reduction and was used by Henrik ling in 1830 for the first time and spread in Europe gradually. This is a type of systematic massage that involves almost all muscles (11) and causes relaxation via hormones that is effective in raising insulin absorption and increases circulation that leads to decreased blood glucose level (10). It is the most common complementary therapies in nursing that the implementation is easy, safe, non invasive and relatively cheap (12). Nurses are usually qualified in massage (13) and have applied massage techniques for a long time (14).

Hence, we decided to evaluate the effectiveness of Swedish massage as a relaxing method on Glycohemoglobin (HbA_{1c}) level, as an important indicator of DM control.

Method and Materials

This was a semi-experimental study. Following ethical approval from the Ethics Committee of the University of Social Welfare and Rehabilitation Sciences (USWRS), a prospective, randomized, controlled trial study was conducted in 2009, at the Clinic of Kamkar-Arabnia Hospital, Qom City, Iran. Samples were 36 Iranian children (aged 6-12 years) with clinical diagnosis of diabetes (based on medical files). They were assigned into intervention and control groups randomly (18 patients in each group). Inclusion criteria were age between 6-12 years and, patients with DM type II. Exclusion criteria were unwillingness to cooperation, obvious movement disorder and complete bed rest order, skin disorder, skeletal disorder, history of spine malignancy, and any other drug consumption (except routine medications for DM) that affects on blood glucose level.

Measurements were scale, tape-measure and demographic questionnaire. Individuals' heights were measured by tape-measure and weights by standard scale. The heights were measured as the patients stood in front of a wall without shoes and their heel, shoulders and buttock touched the wall and the highest area of the head level was signed on the wall. All measurement instruments were assessed to reassure proper operation continuously.

Demographic questionnaire includes 13 questions about age, gender, height, weight, children and their parents' educations, the parents' job, duration of diabetes and diabetes medications (Insuline's type and dose), and family history of diabetes.

A nurse was trained Swedish massage by a physiotherapy professor at the University of Social Welfare and Rehabilitation Sciences. First she implemented Swedish massage on a mannequin then she had been trained on some patients in a clinic under supervision of the physiotherapist.

The parents of two groups were asked not to change their children's daily routines such as: exercise, diet and medications.

Next, massage was implemented in quiet rooms with appropriate temperature, light at 8 am; the time that children and their parents were comfort for cooperation. The child took off his clothes and was positioned in supine position. He/she was massaged from arms, neck and head and continued to the toes then in prone position on legs, hip and back [15]. The child received massage for 15 minutes in each session. Each child in intervention group received 36 sessions and totally 540 minutes massage during 3 months. The children in control group did not receive any intervention. HbA_{1c} were measured before and after massage in both groups.

Chi-square test was used to assess variables homogeneity in two groups, Kolmogorov-Smirnov to assess variable distribution normality, and independent t-test, Mann-Whitney tests, to compare mean and standard deviation of variables in two groups. Also Paired t-test was used to assess HbA_{1c}. Independent t-test was used to compare quantitative demographic variables in two groups. Chi-square and fisher's exact test were used to compare the categorical demographic variables in two groups. K-S test was used to assessing normality of variables. SPSS version 16 was used to statistical analysis of data. A p-value ≤ 0.05 was considered statistically significant.

Results

Background variables: A total of 36 children were enrolled in this study (n=18 in each group). There were 7 (38.9%) males and 11 (61.1%) females in control and intervention groups respectively ($p=0.182$).

Table 1 shows the demographic characteristics of two groups. There were no significant differences in age, weight, height, DM duration, medication duration, and insulin doses (NPH & regular) between two groups.

There were also no significant differences in jobs of mothers ($p=0.104$) and fathers ($p=0.97$), educations of mothers ($p=1$), fathers ($p=1$) and patients ($p=1$), and family history of DM ($p=1$) between 2 groups by fisher's exact test.

As it is shown in table 2, there was no significant difference in HbA_{1c} between before and after intervention in control group ($p=0.592$), but there was significant difference in HbA_{1c} between before and after intervention in intervention group ($p<0.0001$).

There was also no significant difference in HbA_{1c} before intervention between two groups ($p=0.491$), but there was significant difference in HbA_{1c} after intervention between two groups ($p<0.0001$).

Discussion

The results of this study demonstrated that Swedish massage is effective on HbA_{1c} reduction in diabetic children.

Hernandez, field *et al* (2000) assessed massage effect on blood pressure, stress hormones secreted from salivary glands and depression, demonstrated that massage reduces blood pressure ($p<0.05$), anxiety ($p<0.001$), depression ($p<0.01$) and stress hormones secreted from salivary glands ($p<0.05$). This research confirms that massage results in relaxation and stress hormones reduction (16).

Preliminary data were available from one small randomized trial comparing people with type II diabetes receiving 45-min, full-body massage three times a week for 12 weeks ($n=6$) to similar patients on a waiting list for massage ($n=2$). Researchers found that of the six patients receiving massage, HbA_{1c} decreased in three patients from a baseline of 7.9, 8.3, and 9.8% to 7.3, 8.1, and 8.6%, respectively. In the other three patients receiving massage, HbA_{1c} increased from a baseline of 7.4, 8.2, and 8.0% to 7.9%, 10.0%, and 8.5%, respectively. These patients, whose glycemic control deteriorated while receiving massage, were obese,

injecting insulin, or both. None of the group whose glycemic control improved with massage had either of these characteristics. In the waiting list control group, HbA_{1c} level also declined from 7.3 and 8.6% to 6.9 and 8.4%, respectively (15).

In other study, the effects of massage therapy had been determined on Vital Signs (blood pressure, heart rate, skin temperature, O₂ saturation), anxiety / depression; and Hemoglobin (HbA_{1c}), Cortisol, and Insulin. Effleurage (gliding/stroking), Petrissage (kneading) and Tapotement (cupping / hanking / pinching), and Vibration Friction of the neck, extremities, back/torso were used and hand pressure provided 20 minutes of massage. Immediate effects of massage were lower heart rate and skin temperature. Intermediate-long term effects appear to be higher resting heart rate and blood pressure, increased blood flow, higher cortisol and a trend toward improved wellbeing. HbA_{1c} increased 22%. They concluded that randomized controlled studies are needed to assess whether there are significant health benefits (17).

In another study by Surwit and his colleagues, patients with type II diabetes were randomized to undergo a five-session diabetes group education program with or without stress management training. They followed the patients for a year, testing their serum for HbA [sub]1c, a marker for long-term glycemic control, and evaluating psychological parameters with patient questionnaires. They reported stress management training was associated with a small (0.5%) but significant reduction in HbA [sub]1c. Therefore group oriented stress management training programs can produce small but significant improvements in long-term glycemic control in type II diabetics, but highly anxious patients with type II diabetes did not gain more benefits from stress management training than other, less anxious patients (18).

Any randomized trial should provide intervention for at least 3 months. This would permit changes to become evident in the HbA_{1c}. Trials measuring HbA_{1c} should also have a 2-month lead-in period during which values are measured but no intervention

is given in order to obtain valid baseline measures. Changes in HbA_{1c} may demonstrate whether massage may, in fact, be able to alter disease outcome. The sample size for a large, randomized controlled trial, therefore, should be calculated based on a clinically important change in HbA_{1c}. A 1% decrease in HbA_{1c} reflects a 30 mg/dl decrease in blood glucose (15).

Conclusion

Swedish massage as an alternative treatment accompanied with medication is an effective clinical intervention in reducing glycosylated hemoglobin as an important indicator of DM control in diabetic children. Therefore regarding cheapness, easiness and accessibility of this method, it is suggested that Swedish massage to be thought to parents and other caregivers.

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Table 1: Demographic characteristics (quantitative) in two groups*

| | Intervention (n = 18) | Control (n = 18) | P |
|-----------------------------|-----------------------|------------------|-------|
| Age (year) | 9.0 ± 1.5 | 9.8 ± 2.0 | 0.206 |
| Weight (kg) | 26.7 ± 5.3 | 30.7 ± 6.5 | 0.052 |
| Height (cm) | 129.7 ± 8.4 | 126.8 ± 33.0 | 0.342 |
| DM duration (month) | 21.6 ± 13.2 | 27.7 ± 19.6 | 0.278 |
| Medication duration (month) | 20.8 ± 12.2 | 27.6 ± 19.4 | 0.225 |
| NPH doses (IU) | 30.0 ± 5.8 | 32.8 ± 7.0 | 0.198 |
| Regular doses (IU) | 14.4 ± 3.2 | 16.0 ± 4.2 | 0.226 |

* values are expressed as mean ±SD

Table 2: Comparison of HbA_{1c} means between before and after intervention in 2 groups.

| Group | Intervention | HbA _{1c} Mean (SD) | T- Value | df | P- Value |
|---------------------|--------------|-----------------------------|----------|----|----------|
| Control (n=18) | Before | 7.93(0.554) | 0.546 | 17 | 0.592 |
| | After | 7.95(0.531) | | | |
| Intervention (n=18) | Before | 7.7(0.712) | 7.283 | 17 | <0.0001 |
| | After | 7.01(0.597) | | | |

Table 3: Comparison of HbA_{1c} means before and after intervention between 2 groups.

| | | Control (n=18) | Intervention (n=18) | P- Value |
|-----------------------------|--------|----------------|---------------------|-------------------|
| HbA _{1c} Mean (SD) | Before | 7.93 (0.554) | 7.7 (0.712) | 0.491 (K-S test) |
| | After | 7.95 (0.532) | 7.01 (0.596) | <0.0001 (T- test) |

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