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Original Article

Supervised group-exercise therapy versus home-based exercise therapy: Their effects on Quality of Life and cardiovascular risk factors in women with type 2 diabetes

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ABSTRACT

Objectives: Exercise is an integral part of diabetes care. In Iranian women with type II diabetes, we compared the effects of supervised group exercise therapy with the effects of home-based exercise therapy on health-related quality of life (HRQOL), anthropometric parameters, glycaemic control and lipid profile.

Materials and methods: One hundred and two diabetic women were randomised to supervised and home-based groups.

Methods: Over 12 weeks, participants received supervised group-exercise therapy or a home-based exercise-therapy program. During the intervention, they were assessed three times: at baseline, and at weeks 6 and 12. Generalized Estimating Equation models were used to examine the associations between the type of exercise-therapy program and changes over time in anthropometric and biochemical outcomes, and in HRQOL scales of SF36 questionnaire.

Results: Relative to home-based group, supervised group improved significantly regarding role-physical, general health, mean body weight and body mass index from baseline to week 12 ($p = 0.01$). Their reduction in mean body-fat mass from baseline to week 6 ($p = 0.04$) was greater. Similarly, their role-physical, general health and role-emotional improved significantly during the intervention ($p < 0.05$). From baseline to the twelfth week, the HbA1c level fell significantly ($p < 0.05$) in both groups.

Conclusions: Supervised group-exercise therapy was more effective than home-based exercise therapy in improving HRQOL and body composition in diabetic women.

However, home-based exercise therapy also produced significant improvements in glycaemic control, body composition and lipid profile. Whether in a supervised or home-based setting, the exercise intervention can therefore be effective in improving health outcomes in diabetic patients.

1. Introduction

In combination with dietary and pharmacological treatment, exercise is an integral part of diabetes care [1,2]. Although people with type II diabetes are generally recommended to exercise according to clinical guidelines, these guidelines contain no particular information on the types of exercise that will maximise clinical benefits [3]. The few studies to have compared the effects of supervised group exercise therapy with home-based programs on health-related quality of life (HRQOL) have published contradictory results. For example, while Vadstrup et al. found no significant differences between the two groups [4]. Nicolucci et al. found the supervised exercise program to improve quality of life more effectively than counselling alone [5].

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Patients with diabetes need the best possible exercise program, i.e., programs that are appropriate to the demographic, social, cultural and ethnic characteristics' of their population. Those programs should be designed on the basis of a number of studies with a specific focus on these variables in each country. Therefore, we compared the effects of supervised group-exercise therapy (SET) and home-based exercise therapy (HET) in Iranian women with type II diabetes over 12 weeks, focusing specifically on health-related quality of life (HRQOL), glycaemic control, lipid profile and anthropometric parameters.

2. Methods

This randomized clinical trial study was carried out for 12 weeks after approval by the Ethics Committee at Iran University of Medical Sciences. Iran registry of clinical trials number of this research is 201011044251N3. The study included 102 women with type 2 diabetes who had been referred to the following institutes between October 2011 and October 2012: the Endocrine Research Centre at Firouzgar Hospital, Endocrine and Metabolic clinics in the southern districts of Tehran, Imam Khomeini Hospital, and the Iranian Diabetes Society.

There were eight inclusion criteria: (1) women should be residents of Tehran; (2) they should be more than 30 years old; (3) they should not be receiving insulin; (4) they should have no clinical evidence of micro-vascular or macro- vascular complications of diabetes; (5) they should have an HBA1c $\leq$ 10; (6) they should have no orthopaedic problems restricting physical activity; (7) they should not have taken glucocorticoids during the past six months; (8) they should be able to speak and read Farsi. There were two exclusion criteria: (1) exercising two or more times a week for 20 min or longer per session over the previous six months, and (2) more than one weekly absence from supervised exercise therapy sessions in SET group.

Written informed consent was obtained from eligible patients, who were randomized into two groups: a SET group and a HET group.

Before starting on the interventions, eligible patients underwent the maximal treadmill exercise test (Bruce Ramp Protocol) at Firouzgar Hospital.

All participants were recommended to continue their previous medication. They were assessed three times during the intervention (baseline, week 6 and week 12). During the study, all patients were under the supervision of an endocrinology specialist who provided medical consultation as required.

SF-36 Health Status Questionnaire: The self-administered SF-36 questionnaire is a 36-item scale that measures eight aspects of functional health. It measures the following scales: physical functioning, physical health, bodily pain, general health, vitality, role emotional, social functioning and mental health. To assess quality of life in diabetic women, we used the Iranian version of this questionnaire [6].

Biochemical tests: Fasting blood glucose (FBG), total cholesterol (TC), high-density lipoprotein cholesterol (HDL-c) and triglyceride (TG) were measured with enzymatic methods using the Pars Azmoon Kit (Town, Iran) by Liasys auto-analyser (Town, Italy). Low-density lipoprotein cholesterol (LDL-c) was calculated using the Friedewald equation. The ion-exchange chromatography method (DS5, Drew Company, UK) was used to measure HbA1c. The laboratory tests were carried out at Firouzgar Hospital.

Anthropometric parameters: We measured (1) the participants' height (in cm) using a mobile stadiometer rod with a sliding ruler; and (2) the participants' weight (in kg) with a digital device (Secca Digital, Town, Country).

Activity assessment: To record their step counts and the intensity of their daily walking, all patients were provided with a pedometer (Omron Walking Style X (HJ-304-E), China). For resistance training they received elastic bands (Thera-Band, LP, U.S.A); and to record their activities they received an activity log.

Interventions: Before starting the exercise-therapy program, all participants were instructed on diabetes for about 90 min receiving general information on diabetes, self-care, diet, and exercise as a treatment component. The latter consisted of explanations about the types, intensity and duration of exercises; and about the considerations that are necessary before, during and after it.

Supervised group exercise-therapy program (SET): Fifty-one diabetic women underwent the SET program. The SET sessions were supervised by an athletic trainer and observed by a sports-medicine registrar. The program was conducted in 24 sessions of supervised strength training including: in the first six weeks, those sessions involved three non-consecutive days per week and in the second six weeks, there was one session weekly. In addition, during the second six weeks, participants were provided by elastic bands to do two sessions of their weekly strength training at home.

The exercise prescription consisted of: (1) warm up: 10 min slow walking; (2) stretching exercises: 2 sets, 4–5 repetitions; (3) resistance exercises for the shoulder girdle, biceps, triceps, chest, abdomen, back, quadriceps, hamstring and calf muscles with an elastic band (Thera-Band): 2–3 sets, 10 repetitions increasing to 15 repetitions, from low intensity (red Thera-Band) to moderate intensity (green Thera-Band) to high intensity (blue Thera-Band); (4) cool down: slow walking and stretching for 10–15 min.

As well as the supervised sessions, aerobic activity was prescribed for all the women, who were recommended to walk with moderate intensity three to five days a week with a pedometer (from 2500 to 3000 steps per day, gradually increasing to 10,000–12,000). To determine the intensity of their activity, they were trained to use the 'talk test'. In addition, weekly sports medicine consultation by sports medicine registrar was held in a group in which participants experiences, realistic daily physical activity goals, and helpful strategies for increasing physical activity were discussed.

Home-based exercise-therapy program (HET): The 51 diabetic women assigned to this group only received an educational booklet on exercise training. Before entering the exercise programme, each woman had an individual 30-min session in which she received instruction and performed resistance and aerobic exercises. As in the SET group, pedometers, elastic bands and an activity log were provided. During the 12 weeks of the study, this group had no visits except for medical and exercise reassessment at the end of the sixth week. Once every two weeks during the first six weeks of the intervention, we also called this group for exercise counselling. After this, they received no counselling. The HET group was given contact numbers to call if any problems arose during the exercise training and if they needed advice.

2.1. Statistical analysis

To compare the groups' demographic and baseline characteristics, independent sample *t*-tests or non-parametric Mann–Whitney-*U* tests were used, wherever appropriate, for continuous variables. Pearson chi-square tests were used for nominal variables.

Generalized Estimating Equation [7] (GEE) models were used to examine the association between the type of exercise-therapy program and changes in health-related quality of life components and anthropometric and biochemical measures over time. GEE models included two main effects (group and time) and the interaction of these effects. Time points in the analyses included baseline and visits of weeks 6 and 12.

All tests applied were two-sided, and a significance level of 0.05 was considered significant. All statistical analyses were performed with statistical software SPSS 16.0.0. (SPSS Inc., Chicago, IL, USA).