

The Effects of Therapeutic Exercises on Physical Performance among Diabetic Older Individuals from Rural Population

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Abstract: *Background:* Type 2 diabetes mellitus is closely associated with both acquired and genetic risk factors. Sedentary lifestyle is an example of an acquired factor that is an independent predictor of poor quality of life, and should be considered as a modifiable risk factor in the rural population. The prevalence of type 2 diabetes in developing countries is rising due to the dietary change, increasing prevalence of obesity, and a decrease in physical activity. *Aim:* To find out the effectiveness of therapeutic exercises on older diabetic individuals from rural population. *Objectives:* 1. To find out the physical performance in diabetic older individuals. 2. To give the importance therapeutic exercises in diabetic older individuals. *Procedure:* This is interventional study. This study includes 100 participants. A physiotherapist was given one session on therapeutic exercise and its importance. The study duration was 3 months. *Data analysis:* Data analysis was conducted using t-test and ANOVA ($P < 0.05$). *Results:* The mean age of men was 71.5 and women 67.3 years. This study shows that physical performance in men and female were lower in before intervention and it was significantly increased after intervention of 12 weeks. *Conclusion:* Therapeutic Exercise is considered a critical cornerstone of treatment for people with DM due to its beneficial effects on physical performance, glycemic control, physical fitness, cardiovascular health and improvement in quality of life in older individuals.

Keywords: Older individuals, Physical performance, Diabetic, Therapeutic exercises, Rural population

1. Introduction

In Type 2 diabetes, clinical characteristics such as obesity and lack of physical activity are regarded as the most important risk factors, both independently associated with diabetes and diabetes related co-morbidities¹.

Type 2 diabetes mellitus is closely associated with both acquired and genetic risk factors. Sedentary lifestyle is an example of an acquired factor that is an independent predictor of poor quality of life, and should be considered as a modifiable risk factor in the general population².

Exercise is a planned, structured, and repetitive bodily movement performed to improve or maintain one or more components of physical fitness. In the present review, the terms "physical activity" and "exercise" will be used interchangeably. Physical fitness exercises include cardiorespiratory fitness, muscular fitness, and flexibility³.

2. Exercise prescription in Type 2 diabetes

Cardiorespiratory fitness (also known as **cardiorespiratory endurance** or **aerobic fitness**) is the ability of the circulatory and respiratory systems to supply oxygen during sustained physical activity. Aerobic exercise consists of rhythmic, repeated, and continuous movements of the same large muscle groups for at least 10 min at a time. Examples include walking, bicycling, jogging, continuous swimming, aerobics, and sports. This type of exercise increases cardiorespiratory fitness.

Intensity of aerobic exercise should be "moderate" when it is at 40–60% of VO₂max (50–70% of maximum heart rate)

and "vigorous" when it is at 60% of VO₂max (70% of maximum heart rate).

Muscular fitness is a strength and muscular endurance. Resistance exercise use muscular strength to move a weight or work against a resistive load. Examples include weight lifting and exercises using weight machines. Resistance exercise increases muscular fitness. Intensity of resistance exercise should "high" if the resistance is 75% of the maximum that can be lifted a single time (75% of 1-RM [repetition maximum]) and "moderate" if resistance is 50–74% of 1-RM.

Flexibility exercise: This is exercise (typically stretching) aimed at increasing or maintaining range of motion at joints. It includes stretching of the single muscle or group of muscles⁴.

This study is proposed to give importance of daily regular exercises in older diabetic people and to improve physical performance and quality of life by the therapeutic exercises.

3. Aim and Objectives

Aim: To find out the effectiveness of therapeutic exercises on physical performance in diabetic older individuals from rural population.

Objectives

- To assess the physical performance in diabetic older individuals.
- To give the importance therapeutic exercises in diabetic older individuals.

Hypothesis

Alternate Hypothesis:

The therapeutic exercises may increase the physical performance in diabetic older individuals from rural population.

Null-Hypothesis

The is no effect of therapeutic exercises on physical performance in diabetic older individuals from rural population.

4. Material and Methodology

- **Sample size:** 100
- **Study design:** Interventional study
- **Study duration:** 3 months
- **Sampling method:** Random sampling
- **Target Population:** older individuals with diabetic
- **Study setting:** Rural Area
- **Ethical considerations:** The study proposal approved for the ethical clearance from the institutional ethics committee of the DVVVPF's COPT, Ahmednagar. Prior to data collection and assessment informed consent was obtained from each subjects.

Eligibility Criteria

Inclusion criteria:

- Elderly individuals with diabetic mellitus
- Economically grade III, IV
- Elderly lives alone or in joint family
- Elderly who residing in rural area

Exclusion criteria:

- Any neurological disorders like stroke, Parkinson's disease etc.
- Any cardiovascular surgery patient
- Any recent fractures of joints
- Any cognitive impairment

Outcome measures

- Sociodemographic data
- Kuppaswamy scale
- Physical performance (30 Second Sit-to-stand test)

5. Study Procedure

This study started after taking the ethical clearance from the institutions then we started to recruit the patients according to inclusion criteria from rural area. Participants reported their sex, age, socio-economic-status and years since diabetes diagnosis. We recruited 100 participants randomly and 10 groups were made from which one group contains 10 participants and one senior citizen was selected from each group as instructor. The informed consent form was taken from every individual.

A detailed history was taken. All the data were self-reported. Before giving intervention to the participants we took the socioeconomic status and physical performance of participants. First session was given by the Physiotherapist to the total participants on therapeutic exercises and other diet counselling for diabetic individuals and its importance. Then senior citizen from each group was taken one session in a week of their own group and asked participants to do exercises at home for next 4 days. Physiotherapist was taken follow-up of patients on 4th, 8th, 12th week. The informed consent form was taken from every individual.

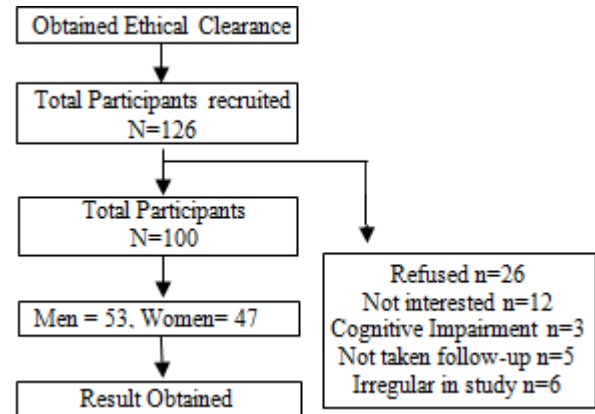


Figure: Flow chart of study procedure

6. Data Analysis

Data analysis was conducted using t-test and ANOVA ($P < 0.05$).

7. Result

The mean scores and SD of sociodemographic data are given in Table 1. The mean scores and SD of scores on physical performance for men and women are given in table 2. The „t“ values for significance of difference between the mean score of pre-intervention and 4th, 8th, 12th week follow-up suggest that these differences are statistically significant accepting the hypothesis set for the study. The post-intervention scores on 30 sec chair standtest were higher than the pre-intervention scores and individual differences in the scores were also reduced considerably during post-intervention both for male and female respondents. Men compared to women showed a higher score on physical performance during the pre-intervention. This study suggesting that the gain shown by men was more than the gain shown by women as indicated in the difference column.

Graph 1 shows the comparison of pre-intervention and follow-up score of 30 SCT in men and women. Men shows higher score of 30 SCT as compared to women in both pre-intervention and follow-up and score of 30 SCT in increased after the intervention in both and female and it shows positive significant difference in both male and female following intervention.

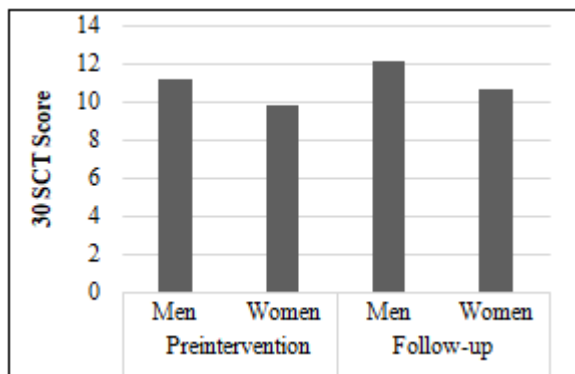
Table 1: Characteristics Sociodemographic data

Sr. No	Items	Total
1.	Total participants (n)	100
2.	Sex: Women	47
	Men	53
3.	Age: Women	71.5
	Men	67.3
4.	BMI: Women	22.1
	Men	21.3
5.	Economic status	IV
6.	Living status: Alone	34
	Family	66
7.	Since year DM: <10 yrs	56
	>10 yrs	44
8.	Addiction: Yes	47
	No	53
9.	Regular exercise: Yes	29
	No	71

Table 2: Difference between Pre-Intervention and Follow-up

Sr. No	Pre-intervention		Follow-up							
	Men	Women	Men				Women			
			4 th wk	8 th wk	12 th wk	SD	4 th wk	8 th wk	12 th wk	SD
30 SCT	11.2	9.8	11.5	11.8	13.1	0.85	10.2	10.5	11.2	0.51

Significant value <0.005



Graph 1: Pre-intervention and after follow-up score of 30 SCT in Men and Women

Many comorbidities of old age and about diabetes were also noticed among respondents. They were made to clear their doubts.

In the present study it was noticed that all the participants participated in the program with keen interest. They also expressed that the program was unique and such programs are the need of the hour. They were of the opinion that elderly were neglected in the society.

Diabetes mellitus presents a major area for intervention because it is a frequent condition and is amenable to control though both by non-pharmacological lifestyle factors and pharmacological treatment.

8. Discussion

In the present study knowledge was imported by organizing a therapeutic exercise program as an intervention for a group of older people with a module of exercise developed by the investigator. Various sessions were conducted by physiotherapist; display of various charts, posters at the designated areas and distribution of leaflets followed by small group discussion (10 participants).

In the First sessions we focused on other components like life style modification, diet counselling, stress management, health care, importance of meditation, physical exercise, yoga to improve their quality of life.

Thus the post intervention results showed a significant gain in scores in quality of life in the group of respondents suggesting the impact of therapeutic exercise program and its effectiveness is bringing about the desired change among respondents there by accepting the hypothesis set for the study.

The ADA (American Diabetic Association) states that ‘to improve control in glucose level, assist with weight maintenance, at least 150 min/week of moderate- intensity aerobic physical activity is recommended and/ or at least 90 min/week of vigorous aerobic exercise, at least 3 days/week. Since 2006, the ADA guidelines explicitly mention and recognize that ‘in the absence of contraindications, people with Type 2 diabetes should be encouraged to perform resistance exercise 3 times a week, targeting all major muscle groups, progressing to 3 sets of 8–10 repetitions⁵.

In this study of older people, we found that diabetes was strongly associated with decreased physical performance nearly 10 years later. We showed that physical performance was poorer among individuals with diabetes. There was a gradual decline in physical performance when transitioning to more severe disturbances in glucose level, with subjects previously diagnosed with diabetes having the poorest physical performance.

9. Conclusion

Therapeutic exercise is considered a critical cornerstone of treatment for people with DM due to its beneficial effects on physical performance, glucose level, physical fitness, cardiovascular health and improvement in quality of life in older individuals.

Disclosure of interest

The authors declare that they have no competing interest.

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