

Effects of structured exercise regime on lipid profile and renal function tests in gestational diabetes mellitus patients: A pilot study

Wardah Ajaz Qazi¹, Muhammad Naveed Babur², Arshad Nawaz Malik³, Nadia Ahmed Bokhari⁴, Mirza Shamim Baig⁵, Ruqia Begum⁶

Abstract

Objective: To determine the effects of structured exercise regime on biochemical markers of patients of gestational diabetes mellitus during the third trimester.

Methods: The two-arm pilot study was conducted at the Fauji Foundation Hospital, Rawalpindi, Pakistan, from March to July 2019, and comprised women aged 20-40 years with gestational age >20 weeks who were diagnosed with gestational diabetes mellitus and who were able to do 6min walk test under severity level on the 0-10 Borg scale. The subjects were randomized into two groups using the sealed envelope method. The intervention group received 5 weeks of structured exercise programme including aerobics, stabilisation and pelvic floor muscle training, while the control group only received postural education. Data was noted at baseline and after intervention, and was analysed using SPSS 20.

Results: Of the 16 subjects, there were 8(50%) in each of the two groups. The mean age was 31.5±4.17 years in the interventional group and it was 35.0±6.30 years in the control group. Serum low-density lipoprotein and serum creatinine showed significant differences between the groups ($p<0.05$), while the rest of markers were non-significant ($p>0.05$).

Conclusion: Structured exercise regime was found to have a positive effect in reducing serum low-density lipoprotein and serum creatinine levels in gestational diabetes mellitus during the third trimester.

Keywords: Gestational diabetes mellitus, Lipid profile, Renal function tests, Structured exercise regime, Third trimester.

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Introduction

Gestational diabetes mellitus (GDM) is diagnosed after 24th gestational week and persists only during pregnancy, resulting in complications for both the mother and the offspring even later in life.¹ The alarming increase in GDM prevalence has been reported by various systematic reviews as 16% globally, 13.2% in Germany up to 17.5% in China, 11.5% in Asia, and up to 21% in India.² Pakistan needs to figure out strategies for prevention and management of GDM. Exercise has been helpful in improving glucose homeostasis and supported by literature that difference has been observed in women doing exercise during pregnancy and those who are not following any antenatal exercise.³ It is suggested by the American Diabetes Association and the International Federation of Gynaecology and Obstetrics that lifestyle modification strategies, including physical activity, should be incorporated in GDM management.⁴ In Pakistan, observational studies have found positive association of physical activity and maternal obesity with GDM.⁵ Systematic review is available comparing GDM patients and non-GDM women,⁶ recommending more researches

for finding treatment options related to dyslipidaemia in GDM patients. Regarding lipid profile, a study in Pakistan has reported significantly higher values of total cholesterol (TC), low-density lipoprotein (LDL_ and triglycerides (TG) ($p<0.05$) in GDM patients.⁷ A study in India found higher levels of serum creatinine in GDM patients compared to non-GDM patients, while no significant difference in urea levels was reported.⁸

The current study was planned to identify the actual effects of structured exercise with specific type intensity and duration of exercise on biochemical markers.

Subjects and Methods

The pilot, two-arm randomised controlled trial (RCT) was conducted at the Fauji Foundation Hospital, Rawalpindi, Pakistan, from March to July 2019, and was registered with the United States (US) National Library of Medicine (Protocol ID: FUI/CTR/2019/1).

After approval from the ethics review committee of Foundation University, Islamabad, the sample was raised using non-probability purposive sampling technique. Those included were women aged 20-40 years with gestational age >20 weeks with diagnosed GDM who were able to do 6 min walk test and would lie under severity level on the 0-10 Borg scale of breathlessness.⁹ GDM patients diagnosed with neurological and cardiopulmonary problems were excluded.

^{1,6}Foundation University Institute of Rehabilitation Sciences, Foundation university, Islamabad, Pakistan; ^{2,5}Isra Institute of Rehabilitation Sciences, Isra University, Islamabad, Pakistan; ³Riphah college of Rehabilitation Sciences, Riphah International University, Lahore, Pakistan; ⁴Foundation University Medical College, Fauji Foundation Hospital, Islamabad, Pakistan.

Correspondence: Wardah Ajaz Qazi e-mail: warda.qazi@fui.edu.pk

After taking consent from the subjects, they were randomised into two groups using the sealed envelope method. The structured exercise regime (SER) group received medical and dietary interventions, like insulin, plus structured exercise regime consisting of aerobic exercise of moderate intensity by using stationary cycle (3-5 metabolic equivalent [MET]) 10 min and brisk walk for 10 min combined with stabilisation exercise 10 repetitions and pelvic floor muscle (PFM) training 20 repetitions. Lifestyle modification with postural guidance and back care was given to the participants. Exercise was done twice a week for 05 weeks while exercise duration was 45-50 min per session under the supervision of a physical therapist, and home plan of 10 min exercise daily. The control (CTL) group received no structured exercise regime. They were on medical and dietary interventions, like insulin, and were given postural education and back-care from physical therapists due to ethical concerns.

Data was collected using self-structured questionnaire regarding demographics, family history, gravid, para and body mass index (BMI) while blood samples were taken for lipid profile and renal function tests at baseline and after 5 weeks in interventions for both groups. Data was analysed using SPSS 20. Demographics were reported as mean and standard deviation. Shapiro Wilk test found that LDL, high-density lipoprotein (HDL), TC, TG and urea data at baseline was not normally distributed, and, hence, for inter-group analysis, non-parametric Mann-Whitney U test was used. Serum creatinine at baseline showed normal distribution, and, hence, Independent t test was applied. $P < 0.05$ was considered significant.

Results

Of the 30 patients screened, 18(60%) were included, but 2(11%) of them declined to participate, and the study was completed by 16(89%) subjects; 8(50%) in each of the two groups. Overall 6(37.5%) patients reported positive family history of diabetes; 14(87.5%) were housewives; and 2(12.5%) were working women. The mean age was 31.5 ± 4.17 years in SER group and it was 35.0 ± 6.30 years in CTL group. Gravida and para status of the two groups was also noted (Table 1).

Serum LDL showed significant improvement ($p=0.01$), while the difference was not significant for HDL, TC, TG and urea ($p > 0.05$) (Table 2).

Table-1: Demographic Distribution between the groups.

Variables	SER Group Mean \pm SD	CTL Group Mean \pm SD
Age (years)	31.5 \pm 4.17	35.0 \pm 6.30
Gravida	3.25 \pm 1.38	05.0 \pm 2.44
Para	2.0 \pm 0.92	2.87 \pm 2.03

SER: Structured Exercise Regime; CTL: Control; SD: Standard Deviation.

Serum creatinine showed significant difference (Table 3).

Table-2: Inter-group analysis after 5 weeks (n=8).

Variables	Groups	Mann Whitney U test		p-value
		Mean Rank	IQR	
Serum LDL Cholesterol	SER	5.69	0.68	0.018
	CTL	11.31	2.23	
Serum HDL Cholesterol	SER	7.63	1.59	0.461
	CTL	9.38	0.53	
Serum Cholesterol Total	SER	6.50	0.65	0.093
	CTL	10.50	1.22	
Serum Triglycerides	SER	6.88	1.65	0.172
	CTL	10.13	2.33	
Urea	SER	7.25	1.43	0.292
	CTL	9.75	1.20	

LDL: Low Density Lipoproteins; HDL: High Density Lipoproteins ; SER: Structured Exercise Regime; CTL: Control; IQR: Interquartile range.

Table-3: Inter-group analysis after 5 weeks for serum creatinine.

Variables	Group	Mean \pm SD	Test	p-value
Serum creatinine	SER	57.25 \pm 7.32	Independent sample t test	0.006
	CTL	67.75 \pm 5.33		

SER: Structured Exercise Regime; CTL: Control; SD: Standard deviation.

Discussion

The current study was the first of its kind in Pakistan to evaluate biochemical markers along with exercise so that proper lifestyle strategies should be defined for GDM patients with evidence. Many studies have identified the role of exercise for GDM, but actual frequency, intensity and duration of exercise still need to be addressed.³ One RCT done on obese pregnant women found effects of exercise on overall aerobic fitness, but not on weight-gain and fat mass.¹⁰ One study identified the hike in levels of TC, LDL and TG during pregnancy and also their association with DGM development as significant difference was found between GDM and LDL levels during the third trimester, and TG levels >216 mg/dl during the third trimester could become the cause of GDM.¹¹ Similarly, in the current study, high levels of LDL and TH were observed in GDM patients during their third trimester. A meta-analysis done on assessing the role of exercise in prevention of GDM indicated significant decrease, but did not find its effects on glycaemic control in detail.¹² Another systematic review concluded better outcomes in exercise group compared to dietary interventions group in diagnosed GDM patients, but it also recommended further studies on biochemical markers.¹³ Although the current pilot study was done on diagnosed GDM patients and found significant results in lowering LDL through exercise, but the factor is needed to be studied on a large sample size. An RCT was done on 456 patients to evaluate the effects of aerobics exercise on maternal weight between intervention and control groups and revealed that the control group showed higher

prevalence of obesity compared to the intervention group which was following aerobics during pregnancy,¹⁴ which is in line with the current study. There is a need to conduct such experimental studies on a large scale to further evaluate the role of exercise on lipid profile and renal function tests. Moreover, inflammatory biomarkers should also be included.

Conclusion

Structured exercise regime had a positive effect in reducing serum LDL and serum creatinine levels in GDM patients during their third trimester. It should be added in the interdisciplinary management of GDM patients.

Disclaimer: The manuscript is a part of Ph.D thesis.

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