RESEARCH ARTICLE

Low glycaemic index diet is effective in managing weight among obese postpartum women

Shahnai Basharat,[1] Syed Amir Gilani,[2] Amjad Iqbal Burq,[3] Shahid Bashir[4]

Abstract

Objective: To determine the effect of low glycaemic index diet on weight loss among obese post-partum women.

Methods: This randomised controlled trial study was conducted at the National Hospital and Medical Centre, and Services Hospital, Lahore, from April to June 2015, and comprised obese post-partum women. Subjects in the intervention group were assigned low glycaemic index diet for 12 weeks while the control group was advised to continue routine diet. SPSS 22 was used for data analysis.

Results: Of the 74 participants, 38(51.4%) were in the interventional group and 36(48.6%) in the control group. The low glycaemic index diet had a significant effect on weight reduction in the intervention group compared to the control group (83.6±0.75 vs. 89.1±2) (p=0.02). Low glycaemic diet also had a positive impact on body mass index (p=0.02), body fat percentage (p=0.03) and fat mass (p=0.02). Significant changes were found in the intervention group after 12 weeks in terms of body mass index, body fat percentage, and fat mass, fat-free mass and muscle mass. On the other hand, no changes were established in the control group after 12 weeks of the study period.

Conclusion: Low glycaemic index diet was effective for reducing weight among obese post-partum women.

Keywords: Low glycaemic index diet, Post-partum obesity, Weight loss, Body mass index. (JPMA 68: 548; 2018)

Introduction

Being overweight is a frequent health issue by which excess fat percentage increases to an extent that it could possess a negative impact on individual's health.[1] According to the latest survey conducted by the World Health Organisation (WHO) upon the obesity statistics in 2014, 13% of world population was obese at adult age and 39% was obese at the age of 18 years. More than 1.9 billion adults were overweight, of which 600 million people were suffering from obesity and 41 million children aged under five were obese. They also determined that obesity was increasing in middle and low socio-economic countries.[2] According to the Pakistan Demographic and Health Survey 2012-2013, 40% women of 15 to 49 years were overweight or obese (body mass index [BMI] $\geq$ 25.0). Moreover, increasing age reflects a significant impact on the weight of an individual. Only 7% women were obese at the age of 19 years. However, 51% women were obese at the age of 40-49 years.[3]

Pregnancy is a normal physiological phenomenon that relates to an increase in fat deposits and body weight in childbearing women.[4] During the last 20 years, overall prevalence of post-partum weight problem in the world has been elevated.[5] Available data suggests that over 64% of the post-partum women are overweight. Approximately four million females have a child every year and almost 50 percent gain abnormal weight.[6]

A well-structured diet plan is important for the prevention and management of obesity. Reducing glycaemic index and load may aid in the prevention or treatment of obesity.[7] Low glycaemic index (LGI) diet may regulate body weight by promoting satiety, minimising postprandial insulin secretion and by maintaining insulin sensitivity. This may also assist in the weight reduction via their ability to enhance satiety and subsequently reducing the food intake.[8] Nutritional researchers had used two commonly used tools, the glycaemic load, and glycaemic index to analyse the quality of carbohydrate (CHO) in food.[9]

The effects of two different types of diets have been studied, one from low glycaemic index food diet and the other was of high glycaemic index (HGI) food diet. The effect of these two diets was investigated by anthropometric measurements upon the adult obese participants. There were a significant weight loss and a greater decrease in body mass index among low glycaemic index diet group as compared to high glycaemic index diet group.[10] Low glycaemic index diet not only reduces the weight of body but also exerts influence on body composition and biochemical parameters.[11]

[1,4]University Institute of Diet & Nutritional Sciences, [2]Faculty of Allied Health Sciences, The University of Lahore, [3]Department of Community Medicine, Sharif Medical & Dental College, Lahore.

Correspondence: Amjad Iqbal Burq. Email: b15d@yahoo.com

Low glycaemic index diet takes a longer time to digest and keep the blood glucose level normal for long period of time as well by keeping low insulin level. Moreover, it also provides long satiety. So, a person on low glycaemic index diet can not feel hunger for a longer time and usually take a low meal quantity to fulfil hunger. All these effects can be used in weight reduction as well as in weight maintenance. The current study used the concept of LGI diet regimen for weight reduction in post-partum obese women who added weight during childbearing and retained it even after childbirth which is also called post-partum obesity.

Subjects and Methods

This randomised controlled interventional trial study was conducted at the National Hospital and Medical Centre, and Services Hospital, Lahore, from April to June 2015, and comprised obese post-partum women.

The sample size was calculated by using the formula: sample size = 2SD2 (1.96+0.84)2/d2.[12] The subjects were divided into intervention and control groups. Primigravida obese post-partum women who were not breastfeeding their child were included. Women who did not meet the study criteria and those who did not agree to follow the study protocols were excluded. Participants who suffered from uncontrolled hypertension, diabetes mellitus, cardiovascular disease, endocrine disease and cancer before and at the time of screening were also excluded. Pre-pregnancy obese females were not considered. Subjects who used weight-loss medications at the baseline visit and smokers were excluded too. The control group used routine diet as before. However, the intervention group had specifically designed LGI diet protocol for 12 weeks. Data was collected with the help of relevant gynaecologist and clinical nutritionists at the two hospitals.

Institutional ethics review committee approved the study protocol and informed consent was taken from the participants. Post-partum weight retention comprised pre-pregnancy weight at the time of conception and gestational weight gain. Weight at delivery was estimated as the sum of these two weights. Weight loss from birth to baseline was estimated as weight at baseline minus weight at delivery.[13] Eligibility criteria included available weight data of pre-pregnancy, baseline BMI $\geq$30 kg/m^2, and women having given birth within the preceding six weeks.

Post-partum weight retention was then calculated as: six weeks post-partum= pre-pregnancy weight — weight at baseline.[14]

Participants had to discontinue all the dietary supplement and multivitamin therapies but advised to continue their normal physical activity.

The study included following clinical visits of both groups: 1) visit for screening — application of study inclusion or exclusion criteria; 2) visit for baseline measurement; 3) one visit after every four weeks for supervision during weight-loss treatment for 12 weeks of the intervention period; and 4) visit for post-study measurements. At the baseline screening visit, baseline data was collected within six weeks post-partum, including baseline anthropometry measurements (height, weight, BMI, muscle mass, fat mass, fat-free mass, percentage of fat), whereas dietary data included 24-hour dietary recall. Participants were asked to recall three different days' food intake including two weekdays and a weekend day and self-administered food frequency table per week. Both intervention and control groups were advised giving follow-up once in a month or after four weeks for 12 weeks. In each follow-up, anthropometry measurements and dietary data was collected. At the final visit, the same protocol of baseline visit was repeated.

Individual anthropometric measurements were scheduled at baseline visit once in a month for 12 weeks, and three months post-study for both groups. Body weight and height were measured by using calibrated scales (PCE-EP 150P1) and a Portable stadiometer (Seca 213) with subjects wearing light clothes and no shoes. Body weight and height was used for BMI calculation (weight in kilograms divided by square of height in metres). Body composition included muscle mass, fat mass and fat-free mass. The percentage of fat (fat %) was measured by analysing bioelectrical impedance using Tanitabody composition analyser (SC-331S).

Foods with a glycaemic index (GI) < 55 were considered LGI. Low glycaemic load (GL) was classified as a daily value <80. The clinical nutritionists of the selected hospitals remained the same for intervention and control groups during the entire study period of 12 weeks of intervention. With the help of these trained clinical nutritionists, the seven-day menu cycle was suggested to the intervention group. The diet was prescribed with the use of standardised household measures or kitchen utensils to quantify food portions in each meal. Intervention diet was designed as moderate energy low glycaemic index diet. The target macronutrient composition of the diet was 45% of energy from carbohydrate, emphasising low glycaemic index food sources, 30% from fat, and 25% of energy from protein during the entire 12 weeks of intervention. Glycaemic index values of each food were derived from the

international table of glycaemic index and glycaemic load, glucose as reference food scale,[15] glycaemic index and glycaemic load of Indian roti,[16] and food composition tables.[17] Total dietary glycaemic index was computed by multiplying the amount of available carbohydrate (g) of each food item by that food glycaemic index. Then the sum of these products was divided by total carbohydrate intake.[18] Statistical analysis was conducted using SPSS 22. Quantitative data was demonstrated as mean and standard deviation. Percentages were computed for the qualitative variables. The repeated measure analysis of variance was used to analyse the differences in parameters at baseline and post-study time between intervention and control group. P<0.05 was considered as statistically significant.

Results

Of the 179 women, 74(41.3%) were selected as 99(55.3%) were excluded and 6(3.4%) discontinued the study. Of the participants, 38(51.4%) were in the interventional group and 36(48.6%) in the control group (Figure-1). The overall mean age was 27±5 years (range: 22-32 years). The mean height was 160±1.2cm and mean weight was 89±3.4kg. The mean body mass was 90.45±3.0kg in controls and 88.03±2.2kg in cases (p=0.85), whereas BMI was 31.2±0.6 and 31.5±0.6kg/m^2 (p=0.95), body fat was 41.94±0.5 and 40.66±0.7% (p=0.83) and muscle mass was 58.7±0.5 and 56.8±1.2kg (p=0.42), respectively (Table-1).

At the end of 12 weeks, body mass changed from 88.03±2.2 to 83.6±0.75 kg in the intervention group, however, no changes in body weight were seen in the control group (Figure-2).

Table-1: Anthropometric measurements in control and intervention group at baseline.

	Control Group	Intervention Group	P-Value
Body Mass (kg)	90.45 ±3.0	88.03±2.2	0.85
BMI (kg/m^2)	31.2±0.6	31.5±0.6	0.95
Body fat (%)	41.94±0.5	40.66±0.7	0.83
Fat mass (Kg)	30.5±1.1	28.09±1.01	0.79
Fat free mass (Kg)	57.0±1.4	54.9±1.3	0.72
Muscle mass (Kg)	58.7±0.5	56.8±1.2	0.42

BMI: Body mass index.

Significant changes were found in the intervention group after 12 weeks in terms of BMI, body fat %, fat mass, fat-free mass and muscle mass. On the other hand, no changes were established in the control group after 12 weeks of the study period (Table-2).

Actual values of total energy, carbohydrate, protein, fat, glycaemic load and low glycaemic index were calculated from three-day, 24-hour recall completed during the intervention and post-study time in both groups. Target values for the intervention group were calculated from diet menus and for the control group was calculated by a usual diet of the participants at the baseline. The mean actual values for energy were1914.50±172.98 in controls

Table-2: Anthropometric measurements in control and intervention group at post study time.

	Control Group		Intervention Group		P-Value
	Baseline	Post Study	Baseline	Post Study	
Body Mass (kg)	90.45±3.0	89.1±2	88.03±2.2	83.6±0.75	0.02
BMI (kg/m^2)	31.2±0.6	30±0.2	31.5±0.6	29.4±.36	0.02
Body Fat (%)	41.94±0.5	40.5±0.3	40.66±0.7	36.9±0.9	0.03
Fat mass (kg)	30.5±1.1	29.3±0.2	28.09±1.01	26.4±0.28	0.02
Fat free mass (kg)	57.0±1.4	56.14±0.9	54.9±1.3	52.1±0.54	0.08
Muscle mass (kg)	58.7±0.5	56.9±0.9	56.8±1.2	57.5±1.2	0.09

BMI: Body mass index.

Table-3: 24-hour recall at baseline and at post-study time.

	Control Group		Intervention Group		P-Value
	Target	Actual	Target	Actual	
Energy (Kcal)	1992.05±119.56	1914.50±172.98	1645.06±0.02	1525.09±9.03	0.002
CHO (Energy %)	52.72±3.23	51.19±0.16	45±0.06	47.18±0.21	0.54
Protein (Energy %)	19.08±1.02	19.71±1.28	25±0.1	23.76±0.08	0.035
Fat (Energy %)	28.16±0.23	29.04±2.09	30±0.05	29.05±0.36	0.88
Glycaemic Index	65.96±1.79	64.23±46.34	44.56±0.08	42.95±0.88	0.004

CHO: Carbohydrates.

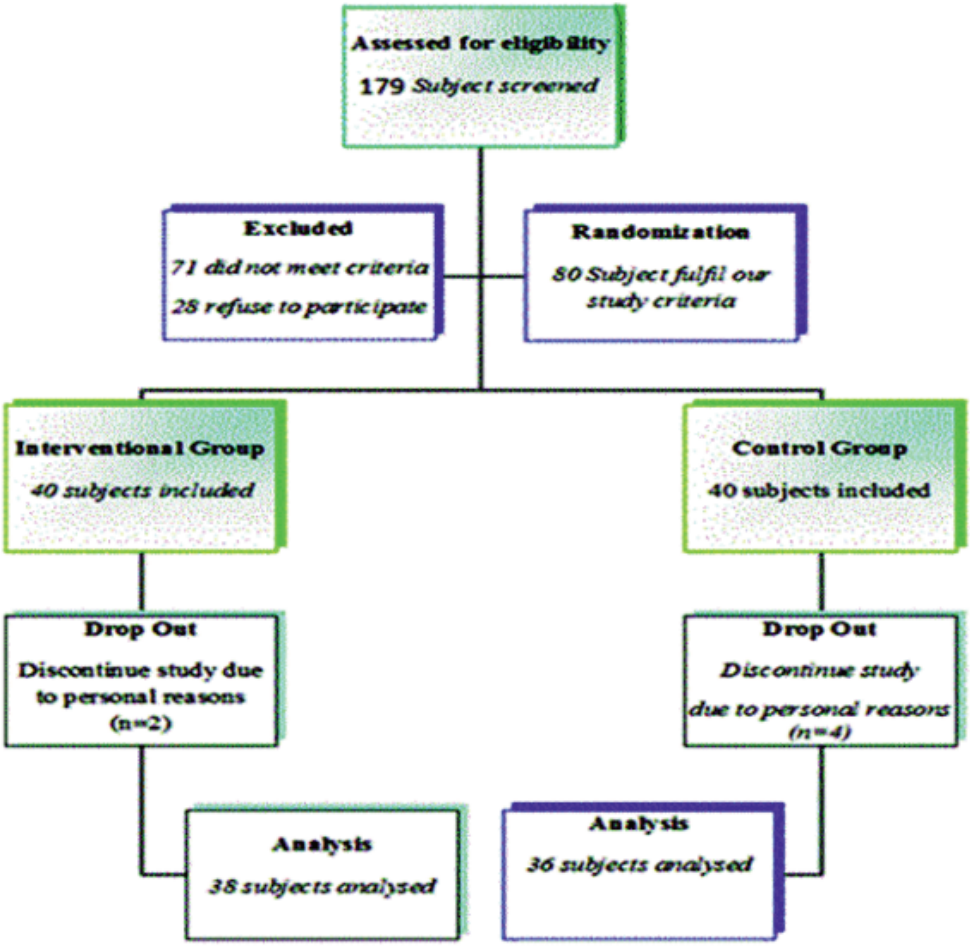

Figure-1: Study flowchart. A brief overview of participants' disposition.

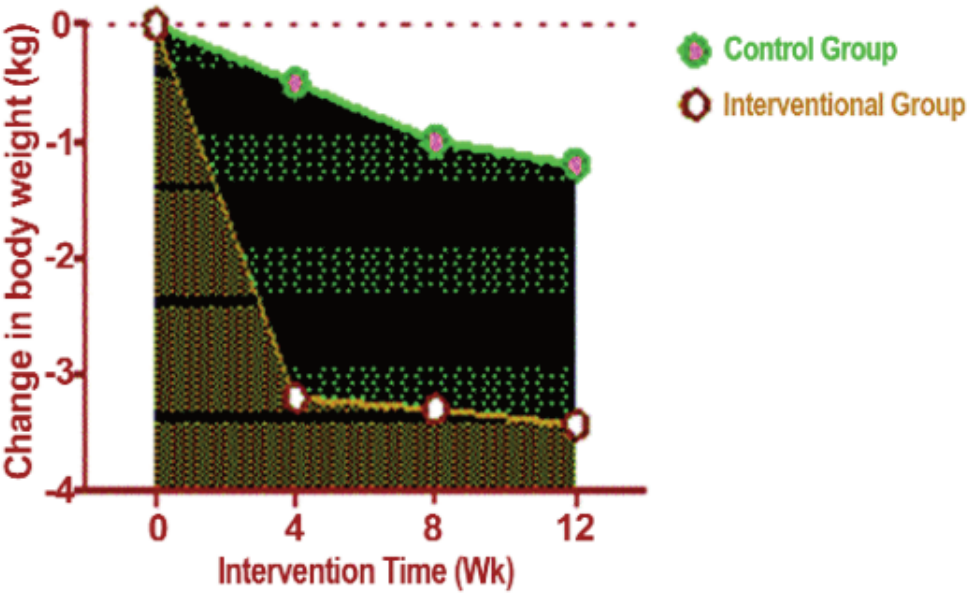

Figure-2: Change in body weight in Intervention and Control groups.

and 1525.09±9.03kcal in cases (p=0.002), that of protein were 19.71±1.28 and 23.76±0.08% (p=0.035) while that of 64.23±46.34 and 42.95±0.88 (p=0.004), respectively (Table-3).

Discussion

As per our knowledge, this is the prime research in Pakistan to examine the effect of LGI diet on anthropometry measurements among obese post-partum women. Post-partum obesity is the frequent issue facing in a healthcare setting around the globe. Diet is a considerable way to prevent and manage weight. Post-partum weight retention leads to long-term maternal obesity and promotes drastic health complications and risks like cardiovascular diseases, hypertension, preeclampsia, diabetes mellitus and even maternal mortality. For this reason, the purpose of the study was to provide the basis for effective diet for post-partum weight reduction in the initial stages of post-partum so that the long-term bad health effects could be prevented and also for planning nutritional education policies.

The main outcome of the study was that the LGI diet had a significant impact on weight reduction in the intervention group in comparison to controls (p=0.02) and also a significant difference in BMI (p=0.02). Study outcomes showed that the intervention group had significantly greater weight loss, a decrease in BMI, the percentage of body fat and

fat mass during 12 weeks of intervention with comparison to control group. The study also found that there was no substantial difference in fat-free mass and muscle mass among the both groups (Table-2).

Similarly, results of another randomised controlled study were consistent with the recent research. The findings of the study suggested that there was improved weight reduction in the LGI diet group in comparison to control group ($p<0.05$).[11] Results were consistent with another eight-week randomised controlled trial study to investigate the effect of two diets comprising LGI food selection and HGI food selection. The findings of the study showed that an LGI diet composed of a specific deferential good selection had a significantly greater decrease in weight in cases as compared to controls ($p=0.032$) and BMI was significantly decreased in the LGI diet as compared to controls ($p=0.030$).[10] A randomised controlled trial assigned reduced glycaemic load (RGL) diet to 86 overweight and obese adults (mean BMI 32kg/m^2) during two phases, first phase for 12 weeks and the second phase for 24-36 weeks. Significantly greater weight loss was observed in cases than controls in the first phase ($p=0.002$) and a markable difference was also evaluated in body composition especially changes in fat mass ($p=0.016$).[19] A five-week randomised controlled trial investigated the LGI (46.5) and HGI (66.3) diet effects on adult overweight participants. Low glycaemic index diet group showed statistically significant mean decrease in body mass ($p=0.004$) and BMI ($p=0.005$), and there was also a significant decrease in body mass ($p=0.04$) and BMI ($p=0.03$) in cases as compared to controls.[20]

All of these studies showed a statistically significant difference in weight reduction among low glycaemic index/low glycaemic load diet group in comparison to control or other treatment groups.

The present study also found a significant difference in the percentage of body fat ($p=0.03$) and fat mass ($p=0.02$) between the intervention and control groups, respectively. A five-week study found a significant reduction in total fat mass among the LGI intervention group in comparison to the HGI intervention group ($p<0.05$).[21] Another study also found a remarkable reduction in body fat ($p<0.05$) among the intervention group as compared to the control group.[11] Obese female participants who were in the intervention group of having high-CHO/LGI diet showed a statistically considerable decrease in fat mass in comparison to high-CHO/HGI group participants.[22]

In contrary to present study's results, a randomised controlled trial was conducted among adult overweight and obese females with a mean BMI value of 33.1±1.1 kg/m^2 in order to investigate the effectiveness of reduced glycaemic index on appetite, energy intake, body weight and composition within two consecutive 12-week periods. Participants assigned to LGI diet (55.5) and HGI diet (63.9). There was no remarkable differentiation in energy intake, body mass and composition found between intervention treatments, therefore the study found no supportive material as an evidence for the effectiveness of reduced GI diet on appetite, energy intake and body weight.[23]

In the present study, dietary intake assessment showed an actual mean glycaemic index of the intervention group at42.95±0.88 and that of the control group at 64.23±46.34 ($p=0.004$). Similar to the present study, previous studies showed dietary intake assessment was conducted by using 24-hour recall method. Another randomised control trial study was conducted among bulky and obese pregnant females in order to investigate the low glycaemic load diet effects. For dietary assessment, the glycaemic index and glycaemic load of both groups were measured by using two 24-hour recalls and study groups were consuming approximately 1,600 kcal/day in which the macronutrients distribution was CHO 45% of energy, fat 35% and protein 20%of total energy. The study found improved cardiovascular risk factors.[24] Six 24-hour recalls (including four usual days and two holidays) for dietary intake assessment were studied and calculated the dietary glycaemic index in order to investigate the association between a dietary glycaemic index and blood lipids profile.[25]

Conclusion

Low glycaemic index diet was found to be an effective strategy in managing weight among obese post-partum women. Furthermore, low glycaemic index diet promoted decrease in BMI, percentage of body fat and fat mass. Thus, future studies should be focused on nutrition education in order to create awareness among obese post-partum women about the effectiveness of low glycaemic index diet in weight loss.

Disclaimer: None.

Conflict of Interest: The person who signed the ethical review statement is also a co-author of this article.

Source of Funding: None.

References

1. Laurent S, Boutouyrie P, Asmar R, Gautier I, Laloux B, Guize L, et al. Aortic stiffness is an independent predictor of all cause and cardiovascular mortality in hypertensive patients. Hypertension 2001; 37: 1236-41.