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Effect of Fiber and Protein Supplementation on Weight Loss in Over-weight and Obese Individual

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Abstract

The study was conducted to assess the role of fiber and protein supplements in the reduction of weight in overweight and obese individuals. The interventional study was conducted in Euro Slim International, University Town Peshawar for two to three months in 2016. Total 80 over-weight and obese individuals were selected and divided into two groups (case and control). Each group had 40 individual, Case group (A) was receiving a sachet of 1.4 gm of plant fiber (Physillium husk) and protein (L-glutamine, L-Lysine and L-arginine) before every meal in a glass of water (250 ml) with a proper balance diet and the second group (B) was kept as control. The data was collected through follow up visits to the Centre at 0, 30th and 60th day, which in included anthropometric measurement, socio demographic and biochemical test for Data about dietary intake the food frequency questionnaire and 24 hour dietary recall method was used. Height and weight were measured and BMI (Body Mass Index) was calculated in both groups. Socio economic status was significantly higher in interventional group 40(100%) with satisfactory economic condition. Individual education was significantly higher in interventional group than non-interventional group. Exercise was significantly higher in interventional group 10(25%) than non-interventional group 2(5%). Weight was significantly reduced in interventional group from 85.88+13.6 to 77.06+12.45. Waist to hip ratio was decreased from 0.8612+0.068 to 0.8430+0.0664 while Non-interventional group remain constant. Fasting blood sugar level was significantly lower in interventional group 100.78+7.131 than non-interventional group 107.63+18.892. Total energy intake was significantly higher in interventional group 1858.79+888.99 than non-interventional group 1319.47+379.72.

Introduction

Overweight and obesity are inevitable diseases,a proper definition of obesity is given as excessive or abnormal fat growth which lead to the onset of disease (WHO, 2013). Obesity frequency is significantly increased in the past few years.[1] Because of high energy intake and less energy expenditure, leading from sedentary lifestyle and un proper diet misbalance of hormones like ghrelin and leptin. [2,3]

Obesity is one of the major global health challenges. Obesity incidence has been significantly increased globally between the years of 1980 to 2013, gender wise, in male adults from 28.8% to 36.9% in female adults 29.8% to 38.0%. [4] The incidence obesity in Pakistan between the years of 1990-1994 at the age of 25-44 was 9% males, 14% at the age of 25-44in rural areas and in urban areas 22% males and 37% females. The prevalence was greater at the age of 45-64, 19% females and 11% males in country areas and 40% females 23% males in city areas.

Obesity & Metabolic diseases like type II diabetes, CVD have a strong link and now it is considered to be the 5th leading cause of mortality at global level. It is stated in the national weight management guidelines that all individuals with increased body weight should reduce weight, 5%-10% reduction in the body weight have a positive impact on cardiac problems. [4] The primary step to overcome the consequences or problem related to obesity is to reduce weight but the results of programs associated with reduction are different. [5]

Nutrition have a main role in energy balance, energy intake and expenditure is associated with several factors (basal metabolic rate BMR, food thermogenic effects and physical activity.[6] Literature on weight loss assessment showed that variation in energy consumption have a direct effect on weight reduction. When intake is not according to the body need reduction in weight will be done. In obese individuals reduction in energy consumption up to 1000-1500 kcal is common. Recently it is indicated that dietary intervention of 2 years which contain low energy, nutrient-full meal replacements are safe, effective and viable to pharmacologic intervention. Patients who consume a balanced nutritional, prepack aged meals had a great benefits, nutritional completeness and have good compliance than who consume a self-selected plan. Weight loss is also connected with improved biomarker of problems and comorbidities related to obesity.

Different types of dietary fibers with mean sources have advised, thorough which the aim of weight reduction or management can be gained. Effect of dietary fiber interventions on satiety, caloric intake, appetite and body weight enables an assessment of its effectiveness was stated in a systemic review for clinical trials. The positive physiological effects of dietary fibers include decrease in blood glucose or insulin and blood

cholesterol level, reduce in transit time or increased stool bulk and colon micro flora fermentation was developed.[7]

The ability of dietary fiber to reduce body size or weight or decrease weight gaining can be contributing to certain factors. Glucagon-like peptide (GLP-1) and peptide YY (PYY) is produced by the fermentation of soluble fiber in the large intestine which play important role in satiety. A significantly decrease energy intake might occur by fibers. Decreased intake of dietary fat by increased intake of dietary fiber in females. Reduction in metabolize energy may occur by dietary fiber which considered to be the gross caloric subtracted the energy gone in urine combustible gases and feces. Thus high intake of dietary fiber conclude reduction in metabolize energy. It means that increased dietary fiber reduce the digestibility of fat.[8]

Zone, Atkins, and Sugar Busters all these high protein diets have their important role and these are surly responsible for the reduction of weight in many cases. Effectiveness of high protein diets have been shown in many studies, when it comes weight loss it is considered to be more effective than high carbohydrate diets.[9] Short term high-protein consumption is directly proportional to protein-induce satiety. The factors which play role in increase protein induce satiety include high, metabolites like amino acids, transformed gluconeogenesis and high conc. of anorexigenic hormones. High protein diets can therefore favorably alter the energy balance equation, decrease food consumption is inversely proportional to satiety. And high thermic effects permits for great energy output.[10]

Keeping in view the high prevalence of obesity in Pakistan and the significant role of nutrition in inhibition of disease (overweight and obesity) through diet, the present study will be conducted at Euro Sliming Centre, University Town Peshawar, to determine the impact of diet on overweight and obese individuals.

Material and methods

Study design

An interventional study was conducted to know the effect of fiber and protein supplementation on weight loss in healthy over weight individuals.

Study location

This study was conducted at Euro Sliming Centre, University Town Peshawar where people having Body Mass Index (BMI) greater than 25 visited in order to reduce their excess weight.

Sample selection

A total of 80 individuals (40 cases and 40 control) undergoing overweight and obesity problem was randomly selected from both genders through consent letter.

Ethical approval

The study were approved from the Ethics board and Institutional Research Postgraduate Medical Institute Hayatabad Medical Complex Peshawar.

Inclusion criteria

Individuals with body mass index >25.0, indicated their willingness and to follow the program protocol was randomly assigned to the study groups.

Exclusion criteria

Individuals with a history or presence of significant disease including endocrine disorders, psychiatric diseases, and alcohol or drug abuse will be excluded. In addition, pregnant and lactating women were also excluded.

Study protocol

The selected 80 overweight individual was separated into two groups (case and control). Each group having 40 individual. Case group(A) was receiving a sachet of 1.4 gm of plant fiber (Physillium husk) and protein (L-glutamine, L-Lysine and L-arginine) before every meal in a glass of water (250 ml) with a proper balance diet and the second group (B) were kept as control. The data was collected through follow up visits to the Centre at 0, 30th and 60th day.

Data collection

Data regarding socioeconomic and demographic status, health status, anthropometric measurement and dietary intake of the patients was collected by interviewing and assessing the individuals.

Personal history

Personal history were taken from the individuals including name, gender, and nationality.

Medical history

Medical history including client family disease history, health history, problem duration, previous treatment for obesity and medicine used through designed questionnaire.

Socio-demographic assessment

Individual was interviewed regarding their socio-economic status such as family size, education, marital status and job description.

Anthropometric measurement

Weight measurement

Weight was determined through beam scale. The equipment was calibrated with reference weight. Individuals was asked to remove extra accessories like watch, sweater and shoes etc. The individual was standing with head straight and weight was taken to the nearest 0.01 kg. The reading were recorded as triplicate.

Measurement of height

Height was measured on a stretchable measuring tape and to stand individual with head straight and adjacent both knees with each other. Height was used taking to the nearest 0.01 cm.

Measurement of waist circumference

Measurement of waist circumference were taken by asking the individual to stand with their feet close together, breath normally. The measuring scale was wrapped around the

abdomen midway between the lower rib margin and iliac crest. The measurements were taken to the nearest 0.1 cm

Measurement of hip circumference

The measuring tape for hip circumference the measuring tape was placed around the buttocks and the measurements was taken in centimeters to the nearest 0.1 cm.

Assessment of body mass index (BMI)

Weight profile were determined by Body mass index (BMI) it was calculated metrically as weight in (kg) divided by height in meter (m) squared as presented in following formula;

BMI = weight (kg)/ Ht (m2)

Classification of BMI will be done according to WHO classification for defining (WHO, 1995).

Underweight: (BMIL<18.5 kg/m2)

Overweight: (BMI=25 - 29.9 kg/m2)

Obese: (BMI > 30 kg/m2)

Clinical assessment

Disease sign and symptoms was observed and asked from the individual. Which include physical appearance of the patients, increased body size.

Bio-chemical assessment

A convenient blood sample were obtained from the individuals to measure the hemoglobin and blood glucose level. Hb level was determined by using hemoCue, while blood glucose level were determined by using glucometer at fasting.

Dietary assessment

Individuals were interviewed about their Diet consumption. Different foods consumed by patients was determined through food frequency questionnaire carbohydrates intake, fat, protein and total energy, was calculated through Pakistan food composition table.

Follow up

A special diet including protein and fiber were prescribed to the patients and a follow up chart is made which include their visits and measurement of the body.

Statistical analysis

For statistical analysis data was entered into the statistical package for social sciences (SPSS Inc., 2007). Percentage, Mean, standard deviation and frequency were obtained for quantitative and qualitative variables using descriptive analysis at 5% level of significance.

Results and discussion

A interventional study was conducted in a sliming center to know the side effects of fiber and protein supplementation on weight loss in healthy over weight and obese individuals. Total of 80 individuals undergoing overweight and obesity problem was randomly selected from both genders through consent letters. It was divided in two groups. 40 cases (Group 1) and 40 case control (Group 2). Fiber (physillium husk) and protein (L-glutamine, L-Lysine and L-arginine) supplements were given to the Group 1 while group 2 was kept control. Data of patients including personal profile, past medical history, Demographic and socio-economic condition, anthropometric assessment, bio-chemical tests and dietary intake was collected from patients. All data was statistically analyzed and given below in the following tables.

Personal profile of overweight and obese individuals.

Table 1 shows personal profile of overweight and obese individuals in which age was highly significant (0.005) in both interventional and non-interventional groups than gender.

Investigated between sex differences for the effect of dietary intervention impact on weight loss, which reported that men lost significantly more than women. Conducted study to check the effect of high-protein ketonic diet on hunger, appetite and weight loss in obese men feeding ad libitum. The result showed the hunger was lower significantly (p=0.014; SED 1.76) and weight loss was higher (p=0.006; SED 0.62) with the low carbohydrate diet (6.34 kg) than with medium carbohydrate diet (4.35kg).

Table 1: Personal profile of overweight and obese individuals.

Variables		Frequency(%)Mean+SD		p-value
		Interventional group	Non-interventional group	
Age		30.30+6.223	41.38+8.211	0.000
Gender	Male	9(22%)	12(30%)	0.611
	female	31(77%)	28(70%)	

%=percentage, SD=standard deviation, p-value=probability value.

Past medical history of overweight and obese individuals

Table 2 shows past medical history of overweight and obese individuals in which past medical history had showed a significantly higher (p<0.005) difference by non-interventional group than interventional group. Same as for not to take any treatment taken for obesity showed a higher significant (p<0.005) difference in non-interventional group 40(100%). 38(95%) patients of non-interventional group did not take any exercise. 16(40%) had constipation in interventional group and 24(60%) had constipation in non-interventional group. 24(60%) patients had showed that non-interventional group have 1 chronic family disease history and 17(42%) had 1 chronic disease family history in interventional group.

Conducted a study in which the effect of exercise or diet induced weight loss on cardio-metabolic risk among metabolically healthy obese and metabolically abnormally obese were examined 63 MHO and 43 MAO took part in this study of intervention. Body weight, waist circumference, and the total abdominal all these parameters showed reduction in all the individual with (p<0.050).

Table 2: Past medical history of overweight and obese individuals.

Variables		Frequency(%)Mean+SD		P-value
		Interventional group	Non-interventional group	
Medical history	NO	17(42%)	3(7%)	0.001
	YES	23(57%)	37(92%)	
Constipation	NO	19(47%)	16(40%)	0.652
	Yes	21(52%)	24(60%)	
Constipation category	Nil	19(47%)	16(40%)	0.247
	Mild	6(15%)	7(17%)	
	Moderate	12(30%)	8(20%)	
	Severe	3(7%)	9(22%)	
Medicine Using	YES	14(35%)	17(42%)	0.646
	No	26(65%)	23(57%)	
Treatment	YES	11(27%)	0(0%)	0.001
	NO	29(72%)	40(100%)	
Family disease history	1 chronic disease	17(42%)	24(60%)	0.180
	<1 chronic disease	23(57%)	16(40%)	
Exercise	Yes	10(25%)	2(5%)	0.028
	No	30(75%)	38(95%)	
Exercise frequency	Nil	30(75%)	38(95%)	0.022
	Daily	0(0%)	1(2.5%)	
	2-3 times per week	5(12%)	0(0%)	
	Weekly	5(12%)	1(2.5%)	

%=percentage, SD=standard deviation, p-value=probability value

Demographic and socio-economic status of over-weight and obese individuals

Table 3 shows demographic and socio-economic status of over-weight and obese individuals in which individuals education showed a highly significant (p<0.005) difference. In both groups interventional and non-interventional high number of individuals was married. 32(80%) of individuals in interventional group belonged to nuclear family type and in non-interventional group 21(52%) lived in nuclear family type. Socio-economic status showed a highly significant (p<0.005) difference.

Conducted a study which showed socio-demographic and dietary determinants of overweight and obese patients. They concluded with these results.[11] The largest proportion (41%) of the individuals had no formal education and were same in the lowest income group which is (33%). And the high percentage was engaged in government services (38.8%). 33% and 9% of the subjects were obese and overweight. Among the socio-demographic factors, age, occupation, monthly income, overweight/obesity history and physical activity showed a strong positive association (p<0.05) while marital status and formal education had no association with overweight/obesity (p>0.05).

Table 3: Demographic and socio-economic status of over-weight and obese individuals.

Variables		Frequency(%)Mean+SD		p-value
		Interventional group	Non-interventional group	
Marital status	Married	20(50%)	38(95%)	0.611
	Un married	20(50%0	2(5%)	
Family type	Joint	8(20%)	19(47%)	0.018
	Nuclear	32(80%)	21(52%)	
Individual occupation	Government job	5(12%)	11(27%)	0.221
	Private job	14(35%)	10(25%)	
	None	21(52%)	19(47%)	
Individual education	Illiterate	1(2.5%)	12(30%)	0.000
	<middle	0(0%)	1(2.5%)	
	SSC/HSSC	23(57%)	2(5%)	
	Graduate	16(40%)	25(62%)	
Socio-economic status	satisfactory	40(100%)	34(85%)	0.034
	Non-satisfactory	0(0%)	6(15%)	

%=percentage, SD=standard deviation, p-value=probability value.

Anthropometric measurement of overweight and obese individuals

Table 4 shows the anthropometric measurement of all the individuals, in which weight I and II shows no significant (p>0.05) difference between the intervention and non-interventional groups, while weight III shows high significant (p<0.05) difference with mean value 77.06+12.45 of case (interventional group) and 81.800+7.2 of control (non-interventional group). Height shows high significant (p<0.05) difference between the two groups. BMI I and II shows high significant (p<0.05) difference in the groups while BMI III shows no significant (p>0.05) difference. Waist circumference I shows no significance (p>0.05) difference, while waist circumference II and III shows high significant difference (p<0.05) between intervention and non-interventional group. Hip circumference I, II and III shows no significant (p>0.05) difference between the groups. The mean value of waist to hip ratio I for interventional group is 0.8612+0.068 and 0.883+0.042 for non-interventional group and it shows no significant (p>0.05) difference while to hip ratio II and III shows high significant (p<0.05) difference between interventional and non-interventional groups.

Conducted an interventional study to check the high fiber and protein impact on weight in over weight and obese patients, 83 overweight and obese patients were given high protein and high fiber for 8 weeks.[12] Participants on both diets lost weight. High protein showed more reduction in weight, up to 95% individuals showed decrease in weight as compared to high fiber diet. Conducted a study to check the impact of high fiber, high fat and high protein diet on the insulin resistant obese women. 96 normoglycemic women, insulin resistant women were randomized to one of the three diet for 8 weeks. High protein diet showed greater significantly ($p<0.01$) greater reduction in several parameters, weight loss, waist circumference are triglyceride than the other two diets. conducted an interventional study to check the effect of total dietary fiber intake on weight of women, high dietary fiber intake decreases the risk of weight gain in women.[13] Each 1 g consumed decreases 0.25 kg($p=0.006$) and fat by 0.25 percentage point($p=0.0052$).

Table 4: Anthropometric measurement of over-weight and obese individuals.

Variables	Frequancy(%)Mean+SD		p-value
	Interventional group	Non interventional group	
Weight I	85.88±13.6	81.78 + 7.22	0.096
Weight II	80.20 + 12.71	81.80 + 7.21	0.491
Weight III	77.06 + 12.45	81.800 + 7.2	0.041
HEIGHT	160.07 + 10.244	166.33 + 2.9	0.000
BMI I	33.35 + 5.099	28.837 + 1.97	0.000
BMI II	31.18 + 4.779	28.86 + 2.00	0.006
BMI III	29.92 + 4.66	28.86 + 2.00	0.189
Waist circumference I	101.05 + 12.79	99.85 + 13.9	0.689
Waist circumference II	94.43 + 12.191	99.85 + 13.9	0.057
Waist circumference III	91.40 + 11.905	99.85 +13.9	0.005
Hip circumference I	116.78 + 9.713	112.55 +15.33	0.145
Hip circumference II	110.73 + 9.=54	112.55 +15.33	0.525
Hip circumference III	108.00 + 9.084	112.55 + 15.33	0.110
Waist to hip ratio I	0.8612 + 0.068	0.883 + 0.042	0.079
Waist to hip ratio II	0.8478 + 0.066	0.8838 + 0.042	0.005
Waist to hip ratio III	0.8430 + 0.0664	0.883 + 0.042	0.002

%=percentage, SD=standard deviation, p-value=probability value, BMI=body mass index.

Bio-chemical assessment of over-weight and obese individuals

Table 5 shows the bio-chemical reading of the patients in which fasting blood sugar level I and II shows no significant ($p>0.05$) difference between the intervention and non-intervention groups while fasting blood sugar level III shows high significant ($p<0.05$) difference between the group with mean value 100.78+7.131 for intervention and 107.63+18.892 for non-intervention group. Hb I, II and III showed high significant ($p<0.05$) difference between both the groups.

Conducted an interventional study to check the effect of dietary fiber of diabetes type 2, after 24 weeks of study, result showed that high fiber diets decreased both the daily blood glucose concentration ($p<0.001$) and HbA1c ($p<0.05$). Did the same study for type 2 diabetes, patients were given high fiber and low fiber diets.[14] After 6 weeks results showed that the plasma glucose concentration were 13 mg/dl lower during the high fiber diet than the low fiber. The high fiber also significantly decreased the 24 hour plasma glucose and insulin conc. up to10 % and 12% respectively. Showed that the fasting insulin was significantly 10% lower during the consumption of whole grain than during the intake of refined grain.[15] Stated that high insoluble dietary fiber consumption for 3 days significantly improved whole-body insulin sensitivity.

Table 5: Bio-chemical assessment of over-weight and obese individuals.

Variables	Frequency(%)Mean+SD		P-value
	Interventional group	Non-interventional group	
Fasting blood sugar level I	103.10 + 8.277	107.05 + 21.619	0.284
Fasting blood sugar level II	100.58 + 6.348	106.48 + 20.182	0.082
Fasting blood sugar level III	100.78 + 7.131	107.63 + 18.892	0.035
Hb I	10.030 + 1.392	11.030 + 1.967	0.010
Hb II	9.987 + 1.3504	11.2575 + 1.833	0.001
Hb III	10.040 + 1.303	11.04 + 1.74	0.005

%=percentage, SD=standard deviation, p-value=probability value, Hb=hemoglobin

Dietary intake f over-weight and obese individuals

Table 6 shows the dietary intake of over-weight and obese individuals. Mean value of carbohydrates intake by intervention group was 191.66+74.04 and 200.1+85.88 for non-intervention group. Protein mean value for intervention group was 52.87+31.33 and 53.229+28.76 for non-intervention group, both the carbohydrate and protein showed no significant ($p>0.05$) difference between the groups. Fats and total Kcal showed high significant ($p<0.05$) difference between intervention and non-intervention group.

Conducted a study which showed the intake of under-weight, normal weight and obese individuals. [16] The results showed total KCAL for under-weight 1912+712, 1669+ 609 for normal weight and 1687+636 for obese patients, carbohydrates 258.4+90.1 for under-weight, 229.5+77.9 for normal weight and 231.6+80.2 for obese. And protien 76.3+39.8 for under-weight, 65.7+31.8 for normal, 67.8+34.5 for obese and fat intake 63.7+30.2 for under-weight, 59.4+25.9 for normal and 59.7+70.9 for obese individuals.

Table 6: Dietary intake of over-weight and obese individuals.

Variables	FREQUANCY(%)MEAN+SD		P-value
	Interventional group	Non-interventional group	
CARBOHYDRATES	191.66 +74.04	200.1 + 85.88	0.639
PROTIEN	52.87 + 31.33	53.229 + 28.76	0.958
FATS	112.539 + 84.980	34.97 + 25.266	0.000
TOTAL KCAL	1858.79 + 888.99	1319.47 +379.72	0.001

%=percentage, SD=standard deviation, p-value=probability value, KCAL=total caloric intake.

Food group consumption frequency of over-weight and obese individuals

Table 7 shows food group consumption of over-weight and obese patients. Out of 80 individuals 57(70.4%) consumed cereals (freshly prepared) 1-3 days/week, while 23(28.4%) took it 4-6 days/week. Cereals (commercial based) was consumed rarely/never by 30(37%) out of 80 individuals while the remaining 50(61.7%) consumed it for 1-3 days/week. Rice based cereals was taken never/rarely by 16(19.8%) and 1-3 days/week by 64(79.0%). Food pulses was consumed rarely/never by 58(71.6%) out of 80 individuals while the remaining 22(27.2%) took it for 1-3 days/week. 4(4.9%) consumed vegetables rarely/never and 76(93.8%) took 1-3 days /week. Starchy vegetables was consumed never/rarely by 61(75.3%) and the remaining 19(23.5%) took it for 1-3 days/week. Vegetables with other food items like meat, pulses etc. consumed by the individuals in which out of 80 patients 71(87.7%) rarely consumed it while the other 9(11.1%) had it for 1-3 days/week. Fruits category includes fruits only and fruit juices 19(23.5%) took fruits only rarely/never and the remaining 61(75.3%) took it 1-3 days/week. While fruit juices was taken rarely by 32(39.5%) ,45(55.6%) took it for 1-3 days /week and the left 3(3.7%) took for 4-6 days/week. Egg and egg included food was described as 27(33.3%) never/rarely, 49(60.5%) took it for 1-3days/week, 4(4.9%) took it for 4-6day/week. Meat only was consumed 57(70.4%) the remaining 23(28.4%) took it for 1-3 days/week. Meat with others like vegetables and pulses was taken 36(44%) for 1-3days/week. While the remaining 44(54.3%) rarely/never consumed it. Milk was consumed 4-6days/week by 27(23.3%), 19(23.5%) consumed it for 1-3 days/week, 11(13.6%) consumed it daily and 23(28.8%) never/rarely took it. Milk products was never/rarely consumed by 26(32.1%) while 54(66.7%) took it for 1-3 days/week. Others group includes junk food, fats, beverages etc. which was taken 1-3days/week by 76(93.8%), while the remaining 4(4.9%) never or rarely consumed it.

Conducted a study to check the effect of cereal fiber results showed, cereal fiber was inversely associated with risk of type 2 diabetes mellitus (T2DM=0.70,95%CL,0.51-0.96).[17] The combination of a high glycemic load and low cereal fiber intake increased the risk of T2DM(RR=2.17, 95%(1.04-4.54) compared with a low glycemic load and high cereal fiber. Concluded after assessing the effect of dietary fiber, that no significant changes in the weight reduction, only the dietary fiber reduced hunger feelings.[18]

Table 7: Food group consumption frequency of over-weight and obese patients.

Food items/ groups	Frequency (d/w) Mean (%)			
	Rarely/ never	1-3days/ week	4-6 days/ week	Daily
Cereals (Freshly prepared)	_	57(70.4%)	23(28.4%)	_
Cereals (commercial based)	30(37%)	50(61.7%)	_	_
Cereals (rice based)	16(19.8%)	64(79.0%)	_	_
Pulses only	58(71.6%)	22(27.2%)	_	_
Vegetables only	4(4.9%)	76(93.8%)	_	_
Starchy vegetables	61(75.3%)	19(23.5%)	_	_
Vegetables with others	71(87.7%)	9(11.1%)	_	_
Fruits only	19(23.5%)	61(75.3%)	_	_
Fruit juices	32(39.5%)	45(55.6%)	3(3.7%)	_
Egg and egg including food	27(33.3%)	49(60.5%)	4(4.9%)	_
Meat only	57(70.4%)	23(28.4%)	_	_
Meat with others	44(54.3%)	36(44%)	_	_
Milk only	23(28.8%)	19(23.5%)	27(33.3%)	11(13.6%)
Milk products	26(32.1%)	54(66.7%)	_	_
Others	4(4.9%)	76(93.8%)	_	_

%=percentage, SD=standard deviation, p-value=probability value.

Conclusion and recommendation

The following conclusions were drawn from the study.

Age was significantly higher in non-interventional group 41.38+8.211 than interventional group 30.30+6.223. There was

no significant difference in gender between the intervention and non-interventional group. Medical history was significantly higher in non-interventional group 37(92%) than interventional group 23(57%).[19,20,21] Constipation non-significantly lower in interventional group 21(52%) than non-interventional group 24(60%). Exercise was significantly higher in interventional group 10(25%) than non-interventional group 2(5%).[22,23,24] Exercise frequency was significantly higher in interventional group than non-interventional group. In which 5(12%) exercise weekly, 5(12%) 2-3 days/ week. Individual education was significantly higher in interventional group than non-interventional group. Weight III was significantly higher in non-interventional group 81.800+7.2 than interventional group 77.06+12.45. Height was significantly higher in non-interventional group than interventional group. The mean value of non-interventional group is 166.33+2.9 and 160.07+10.244 for interventional group. Waist circumference III was significantly lower in interventional group 91.40+11.905 than non-interventional group 99.85+13.9.[25,26,27] Waist to hip ratio was significantly lower in interventional group 0.8430+0.0664 than non-interventional group 0.883+0.042. Fasting blood sugar level was significantly lower in interventional group 100.78+7.131 than non-interventional group 107.63+18.892. Total energy intake was significantly higher in interventional group 1858.79+888.99 than non-interventional group 1319.47+379.72.

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