Journal of Nutrition & Food Sciences
ISSN: 2155-9600

Ashraf and Ali, J Nutr Food Sci 2018, 8:3
DOI: 10.4172/2155-9600.1000693

Research Article Open Access

Effect of Breakfast Skipping on Lipid Profile Parameters, Body Weight, and Metabolic Measures among University Going Adults

Shakeel Ashraf[1] and Zeshan Ali[2*]

[1]University of Veterinary and Animal Sciences, Lahore, Pakistan
[2]School of Food and Biological Engineering, Jiangsu University, Zhenjiang 212013, China

Abstract

The effect of skipping breakfast on health, specifically in adults, remains a debatable topic. The objective of this study was to evaluate the effects of breakfast skipping on lipid profile parameters, obesity and metabolic disorders. Two hundred subjects were divided into three different groups (regular, often and rare breakfast eaters). Three days' dietary intake over one weekend day and two weekdays were collected from each subject using a 24-hour recall and a 2-day daily record. Total cholesterol (TC), high density lipoproteins (HDL), low density lipoproteins (LDL), triglycerides (TG), body weight, body mass index, waist circumference and blood pressure were analyzed. This study supports the hypothesis that breakfast skipping has impact on selected metabolic measures, nutrient intakes and body weight in university going adults.

Keywords: Obesity; Breakfast skipping; Metabolic syndrome; Lipid profile

Introduction

Breakfast is the meal taken after overnight sleep, it usually taken before starting daily routines. Importance of breakfast is immense as body is deprived of most nutrients, glucose, vitamins, and minerals after overnight fasting. So, it is the most effective time for absorption of most important nutrients. People who start their daily routine with breakfast looks more focused, determined and fresh as compared to breakfast skippers [1]. Due to immense importance of breakfast many studies have been conducted to find relationship between different parameters like body mass index (BMI), metabolic syndrome, mental stress, diabetes etc. Results of various clinical trials recommend that breakfast is the most imperative meal of the day, with ingestion allied with a higher fiber and calcium consumption and, therefore, a lesser BMI [2]. Different studies revealed that breakfast skipping is interlinked with cardio metabolic disease [3] hypertension [4] obesity [5], insulin insensitivity [6], lower dietary quality scores [7], and mortality [8].

Metabolic syndrome can be defined as disorder of energy utilization and storage, its diagnosis can be done if three out of five medical conditions occurs at the same time that are abdominal obesity, increased blood sugar level, elevated blood pressure, high serum triglyceride and low HDL levels in serum [9]. These metabolic conditions increase the risk of developing cardiovascular disorders, diabetes and specially heart failure. Following are signs and symptoms of metabolic syndrome i.e. abdominal obesity, overweight with fat deposition mainly around waist and hip. Some other important signs are increased triglycerides, low HDL and impaired glucose fasting level [10].

Major subtypes of metabolic syndrome involve excess central obesity, dysfunctional lipid levels, hypertension, increased sugar levels, insulin resistance, pro-inflammatory state and thrombosis.

Obesity is one of most alarming risk factors for metabolic syndrome. It can be defined as excessive or abnormal deposition of fats that can disturbs the health of an individual [11]. Body mass index is simple criteria to categorize obesity and overweight in adults by height and weight index. BMI can be demarcated as a person's weight in kilograms and height in meter square (kg/m). According to WHO if BMI is equal to 25 then a person is considering as overweight and if a person having BMI equal to 30 is classified as obese. There can be many reasons for skipping breakfast. Some common reasons for skipping breakfast can be associated with various lifestyles and physical conditions like fatigue, disturbance in sleep, busy daily schedule, smoking, infrequent exercise, alcohol drinking, over working and even coronary heart disease. Another reason for skipping breakfast in due to late night dinner which can have complications like metabolic syndrome and protein urea. High energy food intake at dinner can lead risks like obesity and type 2 diabetes [12,13].

Skipping breakfast can have unhealthy effect on diet quality and increase in metabolic disease risks. Group of people who took breakfast rarely, have poor nutritive values throughout the day. They get most of their energy through unhealthy food source (fat containing foods) which can lead to different metabolic syndrome [14]. Every day diet quality greatly reflects the type of breakfast eaten. If breakfast comprises mostly of cereals can be associated with lower fats and higher concentration of carbohydrates, proteins and fibers. And if some skipped his all breakfast regularly showed J-shaped relationship with elevation in BMI. Skipping breakfast due to late night dinner can results in poorer diet quality and habitual skipping can lead to metabolic syndrome [15].

In cross-sectional analysis breakfast skipping has been related with increase in BMI in children [16] and adults [17] Various longitudinal studies revealed the effect of breakfast ingestion over time on weight eminence and utmost, however not all, recommend that skipping breakfast is interlinked with weight gain. Different clinical trials with follow-up ranging from three years to ten years suggested that breakfast skipping was linked with weight gain in adolescents, overweight girls, men and normal weighted children. Results of one study showed no

***Corresponding author:** Zeshan Ali, School of Food and Biological Engineering, Jiangsu University, Zhenjiang 212013, China, Tel: +86 511 8878 0011; E-mail: zeshan.ali4412@outlook.com

Received April 07, 2018; **Accepted** May 02, 2018; **Published** May 14, 2018

Citation: Ashraf S, Ali Z (2018) Effect of Breakfast Skipping on Lipid Profile Parameters, Body Weight, and Metabolic Measures among University Going Adults. J Nutr Food Sci 8: 693. doi: 10.4172/2155-9600.1000693

difference in weight loss among randomly assigned breakfast eating or no breakfaster eating obese women groups after a 12 weeks-controlled trial [18]. Present study was designed to evaluate the effects of skipping breakfast on age, height weight, BMI, cardiovascular and metabolic disorders. The purpose of this study was to find the association of skipping breakfast in Pakistani population on various metabolic measures as there is lot of difference in eating pattern and diet quality.

Methods

Study design and sample

Two hundred students of University of Veterinary and Animal Sciences Lahore Pakistan from different disciplines and their acquaintances were included in this study. The participants were between 20 and 25 years of age, were not taking any medicines recurrently and did not have any family history of hypertension, diabetes and heart attack Table 1. The data from subjects were collected through questionnaire and included in the final analyses. All subjects were provided informed consent before participation.

Assessment of dietary intake

Three 24 h dietary recalls on randomly selected days, including two weekdays and one weekend day, were used to evaluate dietary intake at each visit. To enhance the precision of the 24-hour recall, the participants were interviewed and tutored in three phases. From each participant one-day dietary intake was acquired through 24-hour recall method. Dietary interview were directed in three stages, (1) List of foods consumed throughout the preceding day, (2) meticulous info of all the foods consumed, (3) the concluding inquisitive for any items elapsed [19]. Amount of nutrients and energy consumed, and food group intake were measured for each participant according to Asian Nutrition and Health association and were used in the statistical analysis.

Breakfast definition and assessment

Breakfast was defined as the meal consumed in the morning, and any beverages or food taken in the morning were categorized as breakfast. Subjects were divided into 3 subgroups conferring to the frequency of breakfast skipping over the three-days dietary consumption data gathering period. Group one included participants who skipped breakfast on two or more of the three days were categorized as a 'rare breakfast eater' since breakfast was skipped on more than 50% of the days evaluated. Group 2 were comprising participants who skipped breakfast on one of the three days were in the 'often breakfast eater' group, and group 3 include those who did not skip breakfast on any of the three days of the trial and categorized in the 'regular breakfast eater' group. Similar studies have been conducted in some other researchers and provides base line for present research [19].

Biochemical, anthropometric and blood pressure measurements

Biochemical analysis, blood pressure and anthropometric measurements were conducted at University of Veterinary and Animal Sciences Lahore lab. Blood samples were collected after 8 hours fasting. A semi-automated biochemistry analyzer (Micro lab 300, Merck; Darmstadt, Germany) was used to analyze serum TG, LDL-C, HDL-C and serum fasting glucose. Sphygmomanometer was used to measure systolic and diastolic blood pressure. Height and height were analyzed by using extensometer. At the tapered portion of torso (i.e., a location amid the hipbone crest and lower rib) waist circumference was calculated twice. Measurement of body weight and height (nearest to 0.01 kg and 0.1 cm respectively) was done in fasting condition. Body weight was divided by height square to determine BMI.

Subjects	Male	Female
Rare breakfast eaters	22	10
Often breakfast eaters	23	27
Regular breakfast eaters	64	54

Table 1: Characteristics of participants according to breakfast intake.

Statistical analyses

The Statistical Package for the Social Sciences (SPSS) version 21.0.0 (SPSS Inc., IBM) was used to analyze the data. Variations in experimental and placebo groups were determined by the paired t-test. All statistical outcomes with a p value of less than 0.05 were deliberated as statistically significant. The values were demonstrated as Mean ± standard deviation.

Results

The odds ratios for risk of cardio metabolic factors across breakfast ingestion categories are shown in Table 2. Table showed that, "rare breakfast eaters" were found to have the enhanced peril of abdominal obesity from males as compared to females in all the models compared to the regular breakfast eater. Furthermore, in the model for sex and age, the risk of low HDL-C and increased LDL-C enhanced in the young ones who rarely take breakfast. In the multifactor model, those who rarely ate breakfast had an expressively greater risk of higher TG, abdominal obesity and metabolic syndrome.

Breakfast trend in males and females

Out of the 200 studied subjects 109 (51.9%) were male and most of them fall in the category of rare breakfast eaters (68%). Frequency of male in often (46%) and regular (54%) breakfast eaters were almost equal to women. It was also observed that young male are regular breakfast eaters as compared to another category. While, frequency of females was higher in the often (59%) breakfast eaters. Distribution of female in rare (11) and regular (30%) breakfast eaters was low as compared to the male. It was also concluded from the present study that adult females are regular breakfast eaters as compared to other age group Figure 1.

Average BMI of different breakfast frequency groups

Present study revealed that BMI of rare breakfast eaters were higher as compared to other groups of often breakfast eaters and regular breakfast eaters. So regularly breakfast eating proves to be helpful in maintaining healthier BMI levels Figure 2.

Subjects	Regular	Often	Rare
Elevated cholesterol	5.70	5.04	6.03
Low HDL	34.32	34.04	37.27
Elevated LDL	5.17	4.94	7.72
Elevated triglycerides	7.19	7.62	9.76
Elevated blood sugar	16.36	14.73	14.02
Elevated waist circumference	14.20	14.09	19.61
Elevated BP	6.05	6.86	4.89
Table showed that rare breakfast eater group is more prevalent in abdominal obesity, elevated triglyceride and LDL as compared to other two groups			

Table 2: Prevalence of cardio metabolic risk factors according to breakfast intake categories.

Average cholesterol levels of different breakfast frequency groups

Average cholesterol levels were higher in the group that used to eat breakfast rarely. As this trend started decreasing in the groups in which frequency of breakfast was increased Figure 3.

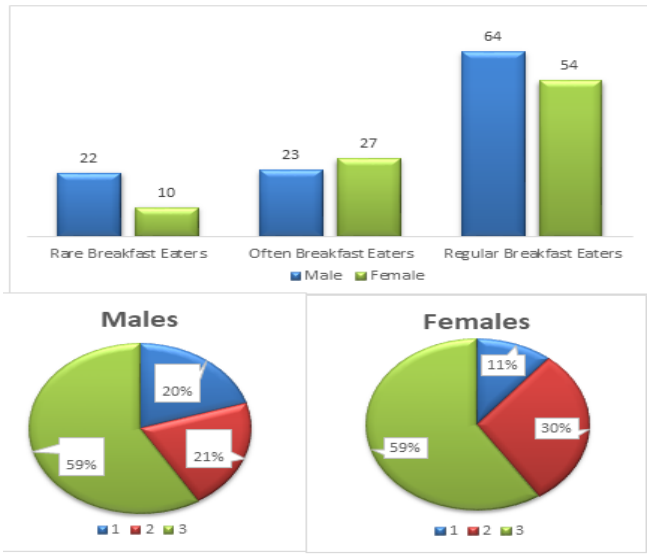

Figure 1: Males and females breakfast eating distribution and trends.

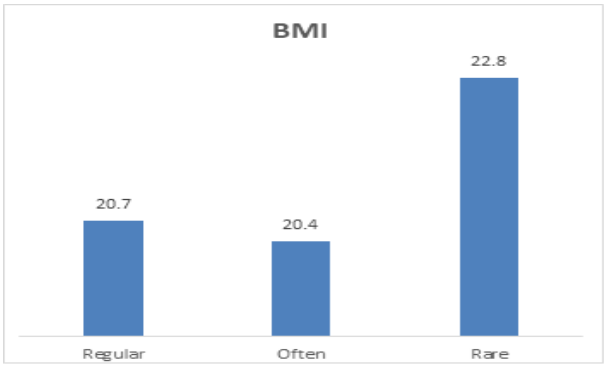

Figure 2: Average BMI of different breakfast frequency groups.

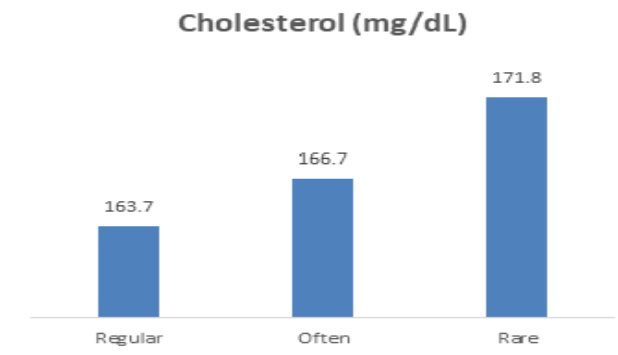

Figure 3: Average cholesterol of different breakfast frequency groups.

Average HDL levels of different breakfast frequency groups

HDL is considered as healthy cholesterol that reduce the risk of cardiovascular diseases. So according to this study it showed that HDL levels were significantly lower in the group who used to eat breakfast rare as compared to the other group who ate breakfast often and regularly Figure 4.

Average LDL levels of different breakfast frequency groups

LDL is considered as bad cholesterol that can increase the risk of cardio metabolic syndrome. So, trend showed that LDL levels were significantly low among regular breakfast eaters as compared to another groups Figure 5.

Average triglyceride levels of different breakfast frequency groups

This study revealed that triglyceride levels was significantly higher among the group that ate breakfast rare as compared to the group those ate breakfast regularly and often Figure 6.

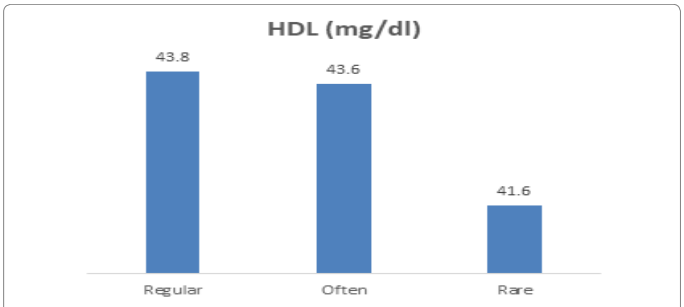

Figure 4: Average HDL of different breakfast frequency groups.

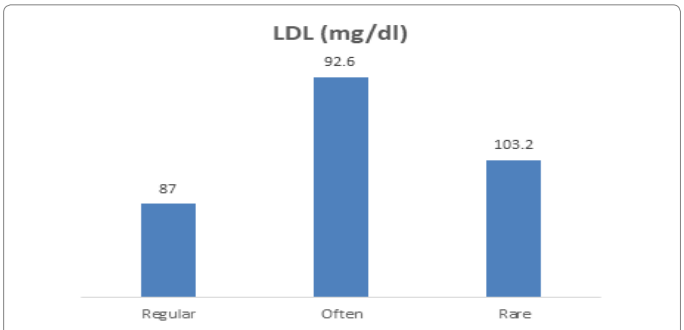

Figure 5: Average LDL of different breakfast frequency groups.

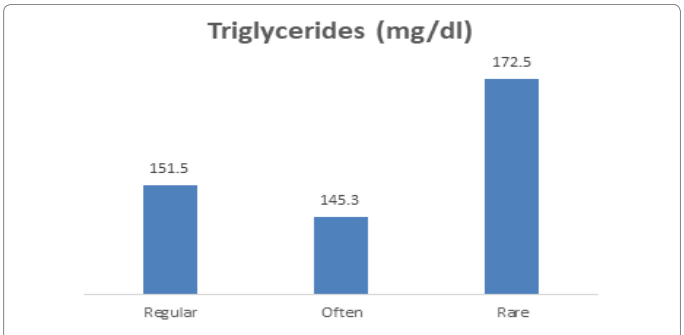

Figure 6: Average triglycerides of different breakfast frequency groups.

Average blood sugar levels of different breakfast frequency groups

This study revealed that no significant variation was seen among the three different groups. As blood glucose falls in normal range in all three groups Figure 7.

Average waist circumference of different breakfast frequency groups

Abdominal obesity is another risk factor that lead to cardio metabolic diseases. Results revealed that waist circumference was significantly higher in rare breakfast eaters as compared to regular and often breakfast eaters Figure 8.

Average systolic and diastolic pressure of different breakfast frequency groups

This study revealed that systolic and diastolic blood pressure was higher among often breakfast eaters, but no significant variation was seen among rare and regular breakfast eaters. Low blood pressure can be lethal and lead to metabolic syndrome Figure 9.

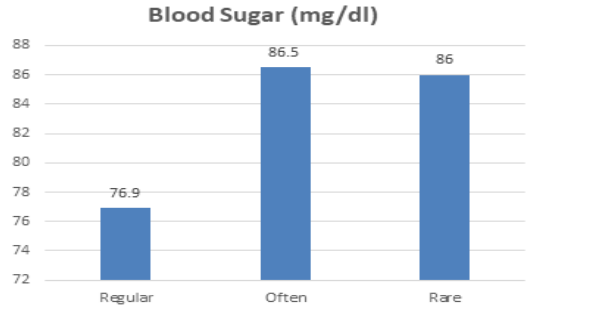

Figure 7: Average blood sugar of different breakfast frequency groups.

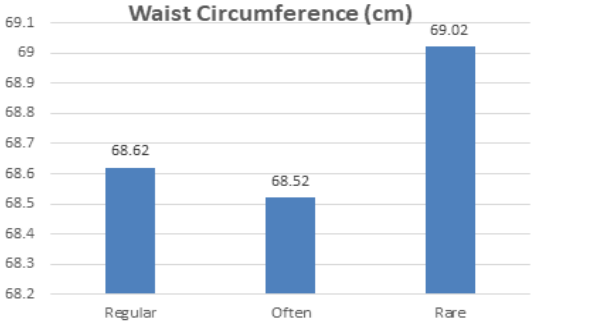

Figure 8: Average waist circumference of different breakfast frequency groups.

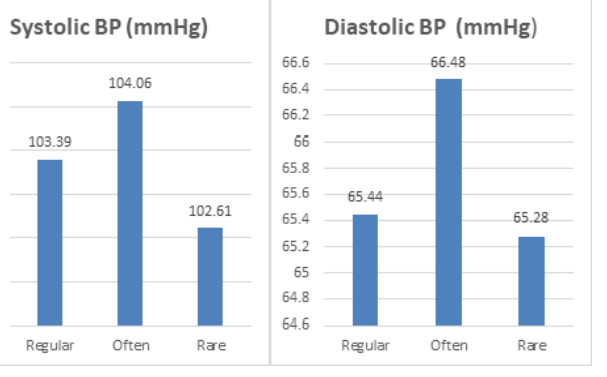

Figure 9: Average systolic and diastolic blood pressure of different breakfast frequency groups.

Discussion

Outcomes of this study showed that rare breakfast eaters were found to have the increased risk of abdominal obesity as compared to the regular breakfast eater. In addition, the risk of elevated LDL-C and low HDL-C increased in the young who rarely ate breakfast. Results also showed that those who rarely ate breakfast had a significantly higher risk of elevated TG, obesity and metabolic syndrome.

Present study revealed that rare breakfast eaters show general and abdominal obesity but other factors in association to this somewhat changed this phenomenon. Similarly, one previous study conducted by Cho and his colleagues reported that elevated BMI and reduced intake of total energy was observed in rare breakfast eaters [20]. Another study reported that regular breakfast eaters consumed large amount of energy fiber and decreased level of sugar and total fat [21]. Moreover, physical fitness is strongly allied with regular breakfast eater rather than breakfast skippers [22,23]. Those who regularly take breakfast also look much more physically energetic than breakfast skippers. Daily breakfast intake has the potential to improve energy balance along with insulin and glucose level and lead to enhanced satiety and lesser weight [24]. Skipping breakfast not merely results in a lesser daily energy ingestion, it also enhances, inactive lifestyle, eating snacks and peril of obesity [23]. While, eating breakfast is interlinked with enhanced eating regularity and this may in turn endorse fewer efficient energy exploitation by enhancing dietary-invoked thermogenesis, resulting to a lesser BMI [25]. An intricate interface of behavioral and environment factors is proposed as the fundamental roots of metabolic syndrome. Though, the influence of diet pattern on this health problematic is indecisive [26]. Outcomes of our trial revealed that breakfast skipping considerably enhanced the risk of having cardiovascular risk factors and metabolic syndrome. Our results are in line with the findings of a trial between children of Australia that exposed that breakfast skipping may have dogged the effects on their cardio metabolic healthiness [1]. Similarly, in another study, one researcher [27] found that women have higher level of TC and LDL-C after skipping breakfast compared to regular breakfast eaters. Another study exposed that weekly regularity of breakfast eating was negatively connected with TG and fasting glucose irrespective of other factors [1]. As showed in the present trial, the risk of low HDL-C and enhanced LDL-C and TG was considerably enhanced in adults who skipped breakfast. High prevalence of dyslipidemia was shown in various population-based studies conducted in Middle East regions [28]. This can be explicated by an ethnic inclination to metabolic syndrome in Pakistan and its neighboring nations. Additionally, the variations in lipid levels may be because of changes in dietary behaviors which have led to a significant imbalance in food intake, with lesser nutrient density portraying diets amongst more than a third of the family units [29]. While, one of the most imperative modifications in lifestyle is skipping meals, essentially breakfast. It has been testified to be related with unhealthy behaviors, such as physical dormancy and ingestion of a nutrient deprived diet that can enhance the risk of metabolic syndrome [30]. In the cure and prevention of metabolic disorder, we might benefit more from regular healthy meals than from meals skipping. Since common breakfast emanates from the staple food clusters, it is low in fat and nutritious meal [31]. Thus, for compensation later throughout the day, breakfast skippers have greater intakes of energy, fat, and lesser ingestions of fiber, minerals and vitamins than breakfast eaters [32]. Results of our

study revealed that the metabolic syndrome components that were more sturdily linked to breakfast skipping were TG, HDL and waist circumference, which are the renowned conjecturers of CVD risk, so accentuating the significance of breakfast eating as a conceivable behavioral pattern for cardio metabolic risk, specifically metabolic syndrome [30]. This study has some limitations. First, usage of the cross-sectional nature of the study, which does not permit a pivotal association between cardio metabolic risk factors and breakfast consumption to be established. Second, cardiovascular peril factors are dissimilar and other factors such as nutrition consumption, nature of breakfast and hereditary factors must be measured. We had measures of socioeconomic and lifestyle factors that we were able to include in our models to reduce possible confounding. To our information, this is the first study in Pakistan to observe the connection of breakfast consumption with cardiovascular risk factors and metabolic syndrome in young adults. Future research using a prospective design could assess these outcomes and evaluate possible mechanisms.

Conclusion

In conclusion, breakfast skipping is a general behavior between young adults, and relates to enhanced risk of metabolic disorder and other cardiovascular factors. Betterment of habits linked to the regularity of breakfast eating, in this age array, could be an important and useful implication to avert these risk factors.

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