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# ASSOCIATION BETWEEN DIET AND EXERCISE AND THEIR IMPACT ON OBESITY AND BODY WEIGHT OF SCHOOL TEACHERS

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## ABSTRACT

**Background:** Nutrients help our body in repairing. It can also help in preventing premature aging as well as onset of obesity. The poor eating patterns of the school teachers and zero exercise is closely related to unbalanced intake of energy that results in obesity leads to absenteeism from school including reduced productivity, chronic illness etc.

**Aims and Objectives:** To find association between diet and exercise and their impact on obesity and body weight of school teachers.

**Study Design:** A cross-sectional study was designed to find association between diet and exercise and their impact on obesity and body weight of school teachers.

**Research Tool:** A pre-planned questionnaire was used to collect data from the teachers.

**Methodology:** A total of 100 male and female school teachers were enrolled for the study from different government and private schools of district Charsadda. Data regarding socio demographic, anthropometric parameters, Physical activity and dietary intake were collected with the help of pre-planned questionnaire.

**Statistical Analysis:** Statistical package for Social Sciences (SPSS) Version-21 was used to analyze the data.

**Results:** The results showed that mean age of male was 38.2±9.2 (years) and that of female school teachers was 40.8±10.2 (years) with a non-significant ($p<0.05$) difference. The mean family size of male and female school teachers was 6.5±2.5 and 7.1±2.9 respectively. The monthly income of male (61.1%) and female (65.22%) was less than 50000 PKR per month. The female school teachers had a greater body mass index as compared to the male school teacher. Visceral fat was also recorded as high among female in relation to the male teachers. A total of 31.5% male and 54.3% female were physically active. Exercise on daily basis was observed for only 9.3% of the male and 23.9% of the female teachers. A total of 50.0% of males and 43.5% of females consumed milk products up to 3

days in a week however, 16.7% of males and 26.1% of females consumed beverages and juices on daily basis. The carbohydrate intake of male and female school teachers was 225.1±47.1 (g/day) and 240.4±44.7 (g/day) while protein intake was recorded as 49.8±19.9 (g/day) and 44.7±21.9 (g/day) respectively. A significant association ($p<0.05$) was recorded for the intake of carbohydrate, fats and energy in relation to body mass index and waist to hip ratio.

**Keywords:** Diet, Exercise, Obesity, Body Weight, School teachers.

## INTRODUCTION

In the eyes' of their students, the schools teachers are role models who "practice what they preach" (Skinner and Woodburn. 1986). In addition to the positive role modeling, school teachers can affect students' eating habits in other ways including through nutrition knowledge and avoidance of unhealt⁷hy classroom food practices (Rossiter et al., 2007), (Kubik et al., 2002) The teachers' nutritional behavior, dietary practices and eating habits at the school are usually well observed by students. On the long term, teachers' foods practices and nutritional behaviors during school day including their dietary pattern both in quality and quantity of foods consumed may transmit to their students (Rossiter et al., 2007). Food practices during the school day vary between nations and sometimes in the same nation depending on cultural, socio-economic and educational backgrounds (Skinner and Woodburn. 1986), (Rossiter et al., 2007), (Kubik et al., 2002). The identification of these food practices during the school day may help in designing future educational nutritional programs that support healthy food practices in the schools' environment particularly in countries that witness an epidemic of obesity related Type-2 diabetes mellitus.

The changes in prevalence rates of overweight, obesity and other related chronic metabolic diseases, particularly diabetes, were attributed to the major socio-cultural and lifestyle changes which accompanied an overall increase of per capita income and recent modernization of Middle Eastern oil countries (Alquahiz. 2010), (Musaiger. 1993), the promotion of unhealthy fast foods (Bakhotmah. 22011), the recent changes in Saudi diet both in quantity and quality (Bakhotmah. 2011), (Midhet et al., 2010) and increasing rates of physical inactivity which reached rates ranging between 43.3% - 99.5% [11].

Anthropometric measurements such as measuring height, weight, MUAC, waist circumference, hip circumference, WHR, and BMI and bio chemical tests such as Lipid profile are indicators use to describe the nutritional status of adult. For the measurement of under nutrition and over nutrition, the weight to height ratio in meter square is used (Woodruff and Duffield, 2000).

The school teachers are expected to play a major role in the war on the obesity-related type 2 diabetes mellitus through adopting healthier food practices while at schools and in their communities. To achieve this goal their knowledge, attitudes, and food behaviors during the school day should promote healthy dietary pattern and eating habits. Therefore, current study is designed to find association between diet and exercise and their impact on obesity and body weight of school teachers.

## II.REVIEW OF LITERATURE

Taiwo et al., (2020) conducted a cross-sectional survey in which 130 secondary school teachers aged 20 to 60 were recruited from four secondary schools in Sagamu, Ogun state, and south-west Nigeria. Students were not a part of the study groups so they were excluded from it. Blood samples were obtained following an overnight fast at baseline, 2 weeks, 4 weeks, 6 weeks, and 8 weeks to measure lipid profile levels using approved protocols. The LP calculated from the fasting liquid Profile was spectrophotometrically tested using standardised laboratory kits supplied by BIOLABO, France. A descriptive statistic and a repeated ANOVA with a significance level of $p<0.05$ were used to analyse the acquired data. The participants aged from 30 to 39 years are the highest group 62(47.7%). In this age group, there were 33 males (50.8%) and 29 females (40.0%). Female teachers had 256.21mg/dl ± 14.37 average total cholesterol, whereas the male teachers had 209.45±15.70 average total cholesterol ($p<0.05$). Male teachers had an HDL ratio of 4.02±0.30, while female teachers had a ratio of 3.84± 0.25. They came to the conclusion that difference in teacher's lipid profile are associated to

their gender. Males and females differ not just in their levels of sex hormones but gender also differ the effects of those sex hormones.

Velayutham et al., (2019) investigated and described population-based endocrine disorders in school teachers. Primary, secondary and high school teachers from 5 different schools are tested in terms of for overall and endocrine health. Detection of endocrine disorders, socioeconomic status, anthropometric measurements and biochemical tests were evaluated in the number of selected school teachers. Age, sex, height, weight, blood pressure, haemoglobin, lipid profile, fasting blood glucose, HbA1c, blood pressure, uric acid, urea, serum calcium, creatinine and TSH (thyroid hormone stimulant), FT4 (free T4) were all measured. According to US clinical data analysis, 16.93 percent of teachers were healthy and free of endocrine disorders, 30.31% had dyslipidaemia, 29.92 percent had thyroid disease, 16.14 percent had diabetes, and 5.12 percent He had other endocrine diseases like PCOS. Teachers aged 40 to 60 have higher levels of obesity/abnormal BMI. When comparing high school and high school teachers, significant differences were seen in triglyceride and HDL levels, and primary school teachers had much lower levels of thyroid, diabetes, dyslipidaemia, and other endocrine disorders. Higher secondary schoolteachers have obesity and many endocrine diseases. Evidence strongly supports that endocrine health screening among school teachers leads to significant improvements in teacher performance, job satisfaction and student achievement.

San et al., (2018) performed a cross sectional study to explore the relation between chronic low-grade inflammation (CLGI) and obesity in which dietary inflammation as a proxy indication between teachers who are obese and non-obese. They measured Index (DII). For this, they selected female teachers from 6 schools in Yogan city. The age of the teachers were between 25 to 60 years. The females were divided into 2 groups. First group including 128 members was non-obese and other group including 116 members that was obese. Time period was January to march in year of 2015. Dietary intake was analysed through a 24 hours dietary recall questionnaire and Semi-Quantitative food frequency questionnaires. They received that questionnaire from participants after 3 non-consecutive day. Adapted DII was measured with population based literature by standardized techniques derived dietary inflammatory weights of 31 food parameters. ELISA or a sandwich Enzyme Linked Immuno sorbent Assay approach was used to look at C-reactive protein (CRP). A comparison of non-obese and obese participants analysed with the help of independent t test Lower intakes of anti-inflammatory nutrients were found in Obese teachers (zinc, vitamin A and vitamin B-6)/food (onion) in contrast with teachers that were non-obese $p<0.05$. There was connection of Obesity with CRP and was significantly linked or their odd ratio or (OR) was 5.5, 95 %, confidence interval or CI was 1.2-24.1 and $p=0.02$. Obesity and DII were found to have no significant correlations (OR=1.4, 95 percent CI -0.8-2.3, $p=0.23$). Obesity and other obesity-related disorders/diseases should be prevented by eating anti-inflammatory foods.

Oh et al., (2016) conducted a research to determine the nutritional status and nutrition need as well as life style regarding their dietary intake among schools teachers. These investigations were find out through two phase stratified cluster sampling technique. They selected participants from 17 regions of country including 70 primary school, 41 middle schools and 40 high school and sample of 151 participants was chosen for analysis. Survey questionnaires included all characteristics regarding assessment including items, characteristics and education regarding dietary life. The T-test or Chi-square test was done for analysing data of groups of schools. In 65.7% of elementary schools nutritional education was implemented and in 51.9% was implemented in high and middle schools. Healthy dietary intake habits and table manners was the most important subject for nutritional education in school teachers, and this was significantly the same in school groups. School groups had significantly diverse reactions to adequate frequency, nutrition education methodologies, nutrition education materials, and nutrition education information sources. 'Securing time for implementing nutrition education by minimising work loads' and producing standard nutrition education materials in schools were discovered to be important responsibilities for activating nutrition education.

Amin et al., (2015) assessed the health and nutritional status of school teachers with the help of anthropometrics parameters, Clinical signs and symptoms as well as dietary pattern of school teachers at government school of Rawalpora, District Srinagar. Data was collected using a detailed

questionnaire that was designed to gather personal information, clinical assessments, anthropometric measures, and a dietary survey. All the data was brought together, the percentages were calculated, and the data was studied in form of master chart. According to the findings, the majority of the respondents were in good health and did not take any medications. According to their clinical assessment maximum had a normal weight and haemoglobin level. In general, the respondents' nutritional status was found to be satisfactory.

Chakraborty et al., (2009) investigated the relationship between BMI, MUAC, or mid-upper arm circumference, and self-reported disease in a cross-sectional study. They selected male teachers aged 18+ from Bengal and slum teachers from Kolkata, India, and evaluated the suitability of MUAC as a tool for nutritional health and general health. They analysed reported data on weight, height, MUAC, and disease rates of 474 school teachers. They used WHO guidelines to differentiate chronic energy deficiency (CED) and formulas to determine BMI. Results were mean (SD) age, weight, body weight index, median circumference and height of 37.5 (14.2), 161.5 (6.2), 53.0 (9.5), 20 (kg/m) and 25.0 cm. separately. It has been shown that the prevalence of CED is 32.3% in those with BMI < 18.5 kg/m2. There was a dramatic increase in CED from the group showing the lowest MUAC (3.0%) to the group showing the lowest MUAC (84.2%). The odds ratio (OR) is highest in the lowest category. The disease-free group or group 4 to 1 reported recent disease and group 2 reported previous disease, i.e. MUAC, showed a significant reduction. There was a significant increase in the prevalence of malnutrition from Group 4 to Group 1. They concluded that Bengali boys could use the MUAC as an effective tool to measure CED status among male school teachers.

Nube and Van den Boom, (2009) carried out a study to compare the frequency count of malnutrition in mature males and females of emergent nations on the basis of their BMI. They included different zones of under-developed countries in their study were, Sub-Saharan Africa, Latin America and South-East Asia. They gathered the data of about thirty-one countries all of them were selected from three major zones and the sample size which they selected was about 75 containing both males and females. They found that adult men and women have similar prevalence rates of malnutrition but having the regional differences. In sub-Saharan African communities, the average men has a few percent higher prevalence of low BMI than women but the results are opposite in South / Southeast Asia. Results showed a large gap in nutrition prevalence between men and women is in some societies. They made a conclusion that the data on the dietary deficiency of females can be regarded as a substitute for the dietary deficiencies of all mature individuals. They ended up with the results that the health and nourishment of the females of south-East Asia were comparable to that of males but the results of the Sub-Saharan region showed different results. However, it was observed that Sub-Saharan provides some help to the South / Southeast Asian females by in sighting their hardships and poverty.

Kubik et al., (2000) conducted a study on the food practises for students eating behaviours of middle school teachers of upper mid-west of metropolitan city. They included 16 different schools in their study among which secondary level teachers of sixth to eighth class was selected as subjects in winter season. About 701 subjects were selected and 490 of them responded in positive way. The survey included questionnaires in which data on the teacher’s dietary patterns, classroom eating behaviour, environment of school and their health was gathered. Most of the teachers of the middle school do not follow the model of appropriate health. It was observed that most of teachers sells specific items in schools at a large scale. It was noticed that 35% of snacks and more than 60% of drinks were marketed by the teachers among which high sugar drinks and high fat diets were also included. High fat diets that causes bad health and less cooperation of school administration with teachers was a remarkable connection with teachers eating patterns. They ended up with the conclusion that the school and health authorities should develop policies and arrange programmes that chase and supports good health of teachers and students.

## METHODOLOGY

### Location of Study:

A quantitative community based cross-sectional study was performed in various government and private schools in district Charsadda.

**Ethical consideration:** Approval was sought from the ethical committee of the department of Human Nutrition, The University of Agriculture Peshawar.

### Data Collection:

Data regarding socio demographic and anthropometric parameters, physical activities and dietary intake was collected from the enrolled participants.

**1. Socio Demographic Parameters:**

Teachers were asked about their age, gender, family type, family size, income, and socioeconomic status to acquire socioeconomic and demographic data (Nwosu et al., 2021).

**2. Anthropometric Parameters:**

The anthropometric data of the selected participants was measured by using scientific equipment, including height, weight, BMI, waist circumference, hip circumference, and waist to hip ratio (Oliveira et al., 2015).

1. **Weight:** The weight was measured using a digital scale. While weighing the subjects, they were requested to remove their shoes (Paracha et al., 2016).
2. **Height:** The stadiometer was used to determine height. Subjects were requested to remove their shoes before having their height measured (Paracha et al., 2016).
3. **BMI:**The nutritional status of the study participants was assessed by using BMI. Underweight was defined as the BMI less than 18.5; normal was defined as the BMI range from 18.5 to 24.9; overweight was defined as the BMI range from 25.0 to 29.9; and obese was defined as the BMI 30.0 or greater (World Health Organization, 2003).

**4. Waist Circumference**

An inch tape was used to measure the waist circumference of the study participants by pointing four fingers above the bellybutton and placing the tape's tip there, then bringing the tape measure all the way around and taking the reading. The tape was not too firmly tightened (Paracha et al., 2016). Th e waistline of men should be under 83-98 cm and the waistline of women should be about 78-91cm (Molarius et al., 1999).

**5. Hip Circumference**

An inch tape was used to measure the hip circumference of the study participants by pointing four fingers below the bellybutton and placing the tape measure's tip there, then bringing the tape measure all the way around and getting the reading. The average hip circumference for men and women was 94-105cm and 97-108cm, respectively (Molarius et al., 1999).

**6. Waist to Hip Ratio**

By dividing the waist circumference by the hip circumference, the waist to hip ratio was calculated. According to the WHO, the normal range of WHR for men is less than 0.90, while for women it is less than 0.85. Values higher than these were considered dangerous (Molarius et al., 1999).

**3. Dietary Status:**

Dietary status was assessed using a questionnaire that included several questions to determine their eating status and patterns.

**1. 24 Dietary Recall**

A 24-hours dietary recall method was used to keep track of what they ate in the previous 24 hours (Jaceldo-Siegl et al., 2010).

**2. Food Frequency Questionnaire (FFQ):**

A food frequency questionnaire (FFQ) was used to enquire about the frequency of vegetables, fruits, meat, cereals, pulses, dairy products, and junk foods (Asif et al., 2016, Musaiger et al., 2011).

**4. Statistical Analysis:**

SPSS (statistical package for social science) version 21 was used for statistical analysis. For categorical data, descriptive statistics were used, whereas for continuous data, the t-test was used. The Chi-square test was used to examine the relationship between numerous variables.

## RESULTS AND DISCUSSION

The current cross-sectional study was performed in different government and private schools of district Charsadda to evaluate the dietary intake, physical activity and their impact on obesity and body weight of school teachers. Data regarding socio demographic, anthropometric parameters, lipid profile and dietary intake were collected with the help of pre-planned questionnaire. The study concluded with the following results.

**Table 1: Socio-demographic parameters of the subjects.**

| Variables | | Means±S.D/ N (%) | | | P-value |
|---|---|---|---|---|---|
| | | Total (n=100) | Male (n=54) | Female (n=46) | |
| **Age (years)** | | 39.7±9.7 | 38.8±9.2 | 40.8±10.2 | 0.317 |
| **Age categories** | **< 30 years** | 24 (24.0) | 14 (25.9) | 10 (21.7) | **0.028** |
| | **31 to 40 years** | 32 (32.0) | 18 (33.3) | 14 (30.4) | |
| | **41 to 50 years** | 23 (23.0) | 13 (24.1) | 10 (21.7) | |
| | **> 50 years** | 21 (21.0) | 9 (16.7) | 12 (26.1) | |
| **School** | **Government** | 50 (50.0) | 28 (51.9) | 22 (47.8) | 0.688 |
| | **Private** | 50 (50.0) | 26 (48.1) | 24 (52.2) | |
| **Education** | **B. A** | 38 (38.0) | 20 (38.4) | 18 (37.5) | 0.856 |
| | **B.ed** | 25 (25.0) | 11 (21.1) | 14 (29.1) | |
| | **M.ed** | 16 (16.0) | 12 (23.0) | 4 (8.3) | |
| | **BS** | 14 (14.0) | 7 (13.4) | 7 (14.5) | |
| | **MS** | 7 (7.0) | 2 (5.7) | 5 (10.4) | |
| **Family size** | | 6.8±2.7 | 6.5±2.5 | 7.1±2.9 | 0.238 |
| **Family type** | **Joint** | 39 (39.0) | 22 (40.7) | 17 (37.0) | 0.151 |
| | **Nuclear** | 61 (61.0) | 32 (59.3) | 29 (63.0) | |
| **Marital status** | **Single** | 26 (26.0) | 15 (27.8) | 11 (23.9) | 0.661 |
| | **Married** | 74 (74.0) | 39 (72.2) | 35 (76.1) | |
| **Family income (Rs.)** | **Less than 50000** | 63 (63.0) | 33 (61.1) | 30 (65.22) | 0.869 |
| | **More than 50000** | 37 (37.0) | 21 (38.9) | 16 (34.88) | |

Table 1 shows the socio-demographic parameters of the school teachers. A significant association ($P<0.05$) was recorded for age group in relation to difference in gender. The results showed that 54.0% were male subjects while 46.0% were female subjects. The mean age of the male was 38.8±9.2 (years) and that of female school teacher was 40.8±10.2 (years) with non-significant difference ($p>0.05$) whereas total mean age was 39.7±9.7. Majority of the male and female teachers falls in the age category of 31 to 40 (years) with significant difference ($p<0.05$). According to school distribution male (51.9%) and female (47.8%) were government school teachers. Majority of the male (38.4%)

and female (37.5%) were having education of B.A only. The mean family size of male and female school teachers was 6.5±2.5 and 7.1±2.9 respectively. Family type of majority of male and female were recorded as nuclear with the mean family size of 6.5±2.5 of male and 7.1±2.9 of female respectively . However, 72.2% of the male and 76.1% of the female school teachers were married. The monthly income of male (61.1%) and female (65.22%) was less than 50000 PKR per month.
According to the findings of current study the mean age of the male and female school teachers was 38.8±9.2 and 40.8±10.2 (years). The results also showed that 54.0% were male subjects while 46.0% were female subjects. Oliviera et al., (2015) reported that the mean age of enrolled teachers was 43.2 ± 10.2 years. Another similar study has been conducted by Shreta and Shrestha, (2016) whose findings are also similar to our results, according to that the mean age of the participants was 42.0 (years) and 47% were men and 53% were women teachers. Bandpei et al., (2016) reported that 33.6% male and 66.4% female teachers were enrolled in the study.

**Table 2: Anthropometric measurement of the subjects.**

| **Variables** | | **Means±SD/ N (%)** | | | **P-value** |
|---|---|---|---|---|---|
| | | **Total (n=100)** | **Male (n=54)** | **Female (n=46)** | |
| **Weight (kg)** | | 77.3±8.6 | 75.2±8.5 | 79.5±8.7 | 0.202 |
| **Height (cm)** | | 159.5±8.8 | 167.7±11.2 | 148.2±13.2 | **<0.001** |
| **Body mass index** | | 27.0±4.8 | 24.1±4.4 | 30.0.±5.3 | **<0.001** |
| **BMI Categories** | 6 (6.0) | 6 (6.0) | 4 (7.4) | 2 (4.3) | **<0.001** |
| | 33 (33.0) | 33 (33.0) | 28 (51.9) | 5 (10.9) | |
| | 30 (30.0) | 30 (30.0) | 16 (29.6) | 14 (30.4) | |
| | 31 (31.0) | 31 (31.0) | 6 (11.1) | 25 (54.3) | |
| **Waist circumference (cm)** | | 87.9±4.4 | 83.1±4.2 | 92.8±4.7 | **<0.001** |
| **Hip circumference (cm)** | | 98.3±4.1 | 93.6±4.8 | 103.1±3.5 | **<0.001** |
| **Waist to hip ratio** | | 0.88±0.01 | 0.88±0.02 | 0.89±0.02 | 0.051 |
| **Waist to hip ratio categories** | **Normal** | 45 (45.0) | 25 (46.3) | 20 (43.5) | 0.750 |
| | **At risk** | 55 (55.0) | 29 (53.7) | 26 (56.5) | |

Table 2 shows the anthropometric measurement and body fat composition of the enrolled subjects. The mean weight of the male school teacher was 75.2±8.5 (kg) and female school teacher was 79.5±8.7 (kg) with non-significant difference ($p>0.05$), while the mean height of the male and female school teachers was 167.7±11.2 (cm) and 148.2±13.2 (cm) with significant difference ($p<0.05$).The mean total weight and height was 77.3±8.6 kg and 159.5±8.8 cm. The mean body mass index of the male was 24.1±4.4 and female was 30.0±5.3 with significant difference ($p<0.05$). The mean waist circumference of the male was 83.1±4.2 (cm) and female was 92.8±4.7 (cm) with significant difference ($p<0.05$). The mean of hip circumference male was 93.6±4.8 (cm) and female was 103.1±3.5 (cm) with significant difference ($p<0.05$). The result of current research study revealed that the weight, body mass index and waist to hip ratio of male school teachers was low as compared to the female school teacher. According to BMI categories, Male with normal weight was 51.9% while the female was 10.9%, for male teachers, (7.4%) were underweight, (29.6%) were overweight and (11.1%) were Obese whereas for female teachers 4.3% were underweight, 30.4% were overweight and (54.3%) were Obese. The mean body fat percentage of the male and female school teachers was 28.8±4.0.
According to this study findings the total mean weight of the male and female school teacher was 77.3±8.6 kg and the total mean height of the male and female school teachers was 159.5±8.8 (cm) which is similar to those of Saraiva et al., (2019) who reported that mean weight of the teachers was 70.2 ±15.3 kg and their height was 170±10.0cm. Another study performed by Fabunmi et al., (2019)

shows that the average weight was 72.49±14.3kg. The subject's mean height was 165±8.44 (cm) which also shows resemblance to our study. The mean BMI of the urban school teachers was 26.70±5.55 which is similar to the finding of this study. Another study conducted by Fadupin et al., (2014) reported that female teachers were heavier but shorter than male teachers and their BMI (28.0±5.4 Kg/m) was significantly greater (<0.05) than that of male teachers (23.3±14.0 Kg/m) hence strongly support this study. Samanta, (2020) reported in a study that males had a BMI of 23.85±1.982 while females had a BMI of 28.02±1.018 which strongly supported this study.

In another study Fadupin et al., (2014) reported on the base of BMI that the proportion of male teachers with normal weight were (62.5%) almost doubled the number of female colleagues (30.1%). For male teachers, (10.4%) were underweight, (25.0%) were overweight and (2.1%) were Obese. For female teachers 39.8% were overweight and (20.4%) were Obese hence strongly support this study.

According to another study performed by Oloviera et al., (2015) reported that greater BMI was found in 58 percent of the teachers, in which 21.3% of female were being obese while 37.4 percent of female were overweight. For men, these figures were 42.3 percent and 11.5 percent, respectively but in terms of abdominal obesity, the percentages of "high" and "very high" hip circumference was 26.4 percent and 25.9% for women, while males had 15.4 percent and 3.8 percent respectively, which shows that female teachers had more fat and visceral fat than male teachers. The finding showed that the values come from this study is less than those of our study.

The findings of our study is also similar to that of Fabunmi et al., (2018) who reported that the fat percentage of enrolled subjects were 30.68 ± 9.49. Another similar study Fadupin et al., (2014) showed that the body fat percentage was twice high for females as for male teachers shows high significance ($p < 0.05$) and also the visceral fat was recorded high in female than male teachers.

**Table 3: Physical activities of the school teachers.**

| Variable | | N (%) | | | P-value |
|---|---|---|---|---|---|
| | | Total (n=100) | Male (n=54) | Female (n=46) | |
| **Exercise/Physical Activity** | **Yes** | 54 (54) | 39 (72.2) | 15 (32.6) | **0.017** |
| | **No** | 46 (46) | 15 (27.8) | 31 (67.4) | |
| **Frequency of Exercise** | **1 to 3 days** | 28 (28.0) | 19 (35.2) | 9 (19.6) | **0.019** |
| | **4 to 6 days** | 19 (19.0) | 16 (29.6) | 3 (6.5) | |
| | **Daily** | 7 (7.0) | 4 (7.4) | 3 (6.5) | |
| | **Never** | 46 (46.0) | 15 (27.8) | 31 (67.4) | |
| **Intensity of Exercise** | **Sedentary** | 66 (66.0) | 31 (57.4) | 35 (76.1) | **0.048** |
| | **Moderate** | 8 (8.0) | 5 (9.3) | 3 (6.5) | |
| | **Active** | 2 (2.0) | 2 (3.7) | 0 (0) | |
| | **Highly active** | 24 (24.0) | 16 (29.6) | 8 (17.4) | |

Table 3 shows the physical activities of the subjects. A significant change ($p<0.05$) was recorded for the physical activity, frequency of physical activity between the two groups. Male (72.2%) and female (32.6%) were doing physical activity. Exercise on daily basis was observed for only (7.4%) of male and (6.5%) of female teachers whereas the rest of teachers were doing physical activity 1 to 3 or 4 to 6 times per week. Male (29.6%) and female (17.4%) teachers were highly active whereas only 3.7% of male were active, 9.3% male and 6.5% female were moderate active and the rest of teachers were having sedentary physical activity. The total percentages of sedentary, moderate and very active physical activity of the subjects are 66%, 8% and 24%.

The present research findings show resemblance to that of Bretto et al., (2012) who reported that low, moderate, and high levels of physical activity were found in 46.3 percent, 42.7 percent, and 11 percent of the population, respectively. In other studies conducted by Monteiro et al., (2005), Matsudo et al., (2002) reported a low PA of 47.4 percent, a moderate PA of 12% percent and a high PA of 30.4 percent in study subjects. Another study on leisure-time reported that the subjects were havesimilar

results as compare to our study while 8.9% of them were experiencing low PA Halal et al. (2005). These findings strongly supports our study.

**Table 4: Frequency of food being consumed by the subjects.**

| Variables | | N (%) | | | P-value |
|---|---|---|---|---|---|
| | | Total (n=100) | Male (n=54) | Female (n=46) | |
| **Cereals** | **Never/monthly/scarcely** | 0 (0) | 0 (0) | 0 (0) | **0.041** |
| | **1 to 3 days in a week** | 0 (0) | 0 (0) | 0 (0) | |
| | **4 to 6 days in a week** | 22 (22.0) | 9 (16.7) | 13 (28.3) | |
| | **Daily** | 78 (78.0) | 45 (83.3) | 33 (71.7) | |
| **Fast food** | **Never/monthly/scarcely** | 0 (0) | 0 (0) | 0 (0) | **0.034** |
| | **1 to 3 days in a week** | 75 (75.0) | 39 (72.2) | 36 (78.3) | |
| | **4 to 6 days in a week** | 13 (13.0) | 10 (18.5) | 3 (6.5) | |
| | **Daily** | 12 (12.0) | 5 (9.3) | 7 (15.2) | |
| **Fruits** | **Never/monthly/scarcely** | 0 (0) | 0 (0) | 0 (0) | **0.023** |
| | **1 to 3 days in a week** | 48 (48.0) | 25 (46.3) | 23 (50.0) | |
| | **4 to 6 days in a week** | 32 (32.0) | 18 (33.3) | 14 (30.4) | |
| | **Daily** | 20 (20.0) | 11 (20.4) | 9 (19.6) | |
| **Vegetable** | **Never/monthly/scarcely** | 0 (0) | 0 (0) | 0 (0) | 0.513 |
| | **1 to 3 days in a week** | 33 (33.0) | 20 (37.0) | 13 (28.3) | |
| | **4 to 6 days in a week** | 23 (23.0) | 13 (24.1) | 10 (21.7) | |
| | **Daily** | 44 (44.0) | 21 (38.9) | 23 (50.0) | |
| **Meat products** | **Never/monthly/scarcely** | 0 (0) | 0 (0) | 0 (0) | **0.039** |
| | **1 to 3 days in a week** | 51 (51.0) | 27 (50.0) | 24 (52.2) | |
| | **4 to 6 days in a week** | 33 (33.0) | 17 (31.5) | 16 (34.8) | |
| | **Daily** | 16 (16.0) | 10 (18.5) | 6 (13.0) | |
| **Milk products** | **Never/monthly/scarcely** | 0 (0) | 0 (0) | 0 (0) | **0.043** |
| | **1 to 3 days in a week** | 47 (47.0) | 27 (50.0) | 20 (43.5) | |
| | **4 to days in a week** | 33 (33.0) | 17 (31.5) | 16 (34.8) | |
| | **Daily** | 20 (20.0) | 10 (18.5) | 10 (21.7) | |
| **Beverages** | **Never/monthly/scarcely** | 0 (0) | 0 (0) | 0 (0) | **0.019** |
| | **1 to 3 days in a week** | 48 (48.0) | 27 (50.0) | 21 (45.7) | |
| | **4 to 6 days in a week** | 31 (31.0) | 18 (33.3) | 13 (28.3) | |
| | **Daily** | 21 (21.0) | 9 (16.7) | 12 (26.1) | |

Table 4 shows the frequency of food consumed by the teachers. A significant variation ($P<0.05$) was recorded for the intake of cereals, fast food, meat, milk and beverages whereas a non- significant variation ($P>0.05$) in term of vegetable intake per week. However less percentage of male and female teachers consume fruits, milk and meat products in daily basis. Males (83.3%) and females (71.7%) teachers were daily consuming cereals while males (46.3%) and females (50.0%) had consumed fruits up to 3 days in a week. Some of the teachers (24.1%) of males and (21.7%) female had consumed vegetables up to 4 days in a week while males (50.0%) and females (43.5%) had consumed milk and dairy products up to 3 days in a week respectively. The total intake of milk and milk products were recorded as 47% 3 time a week. Males (16.7%) and females (26.1%) had daily consumed beverages and juices. The fast food consumption was high in females than males. The meat consumption on daily basis was recorded 18.5% in males and 13.0% in females.

The findings of this study are similar to those of Kanggil et al., (2017) who reported that the milk and dairy products are consumed by 23.5 percent of teachers up to 3 days in a week, in which 37.5 percent of teachers consume yoghurt and 75.5 percent of teachers consume white cheese on a daily basis. Eggs are consumed by 52.5 percent of teachers while 60.5 percent of teachers consume red meat, 66.5 percent of teachers consume chicken and 38.5 percent of teachers consumed fish 1-2 times per week respectively. Green leafy vegetables consumption on daily basis was reported (39.0 percent) and for

citrus fruits it was (56.0 percent) and other fruits were recorded (52.5) percent. Although the majority of the teachers (77.0%) ate white bread on a daily basis, the proportion of those who ate whole wheat or whole-grain breads are (18.0%). The outcomes are similar to our study. In another study conducted by Findholt et al., (2016) investigated that fast food had been consumed by 38.0 percent of elementary school teachers. Middle school teachers (43.0 percent) reported eating fruits up to three times each week and middle school teachers (12.0 percent) said they had never eaten meat. It was concluded from these studies that very less number of teachers consume fruits, meat on daily basis and the fast food intake was high on daily basis which resembles this study.

**Table 5: Macronutrient and energy intake of the subjects.**

| Variables | Means±S.D | | | Adequacy | P-value |
|---|---|---|---|---|---|
| | Total (n=100) | Male (n=54) | Female (n=46) | | |
| **Carbohydrate (g/day)** | 242.7±45.9 | 225.1±47.1 | 260.4±44.7 | Male=81.8% Female=94.6% | **0.026** |
| **Protein (g/day)** | 47.2±20.9 | 49.8±19.9 | 44.7±21.9 | Male= 88.9% Female=97.1% | 0.196 |
| **Fats (g/day)** | 58.5±13.6 | 41.4±11.8 | 75.7±15.4 | Male =67.8% Female=100% | **0.035** |
| **Energy** | 2035.2±587.1 | 1850.6±603.0 | 2135.7±470.3 | Male= 92.5% Female= 100% | **0.032** |

Table 5 shows the macronutrient and energy intake of the subject. For carbohydrate, fat, and energy consumption, a significant difference ($p<0.05$) was observed. Male and female school teachers consumed 225.1±47.1 and 260.4±44.7 grams of carbohydrates per day, respectively. The protein intake was 49.8±19.9 (g/day) and 44.7±21.9 (g/day), respectively. Male and female teachers consumed 41.4±11.8 (g/day) and 75.71±5.4 (g/day) of fat, respectively. The individual used 1850.6±603.3 (kcal/day) and 2135.7±470.3 (kcal/day) of energy each day. The total mean of carbohydrates, proteins, fats and energy was 242.7±45.9,47.2±20.9,58.5±13.6 and 2035.2±587.1.
The study's findings are similar to those of Ross et al., (2002), who reported that the carbohydrate intake of teachers was 198.5±43.8 (g/day).The protein intake was recorded as 55.6±17.6 (g/day) and the fat intake was 32.8±13.5 (g/day). However, the energy intake of the subject was 1685.4±467.4 (kcal/day). The study findings showed high means for carbohydrates, fats and energy as compare to this study. According to another study conducted by Ross et al., (2008) reported that the mean energy intake was 1576 kcal/day. The mean protein intake of the subjects was 58.5g/day and the mean carbohydrate intake was 199.4g/day. The mean fats intake was recorded as 36.3g/day. Hence the findings supported this study.

**Table 6: Frequencies of food consumed in relation to body mass index.**

| Variable | | Body mass index (%) | | | | P-value |
|---|---|---|---|---|---|---|
| | | Underweight | Normal | Overweight | Obese | |
| **Cereals** | **Never/monthly/scarcely** | 0 (0) | 0 (0) | 0 (0) | 0 (0) | 0.348 |
| | **1 to 3 days in a week** | 0 (0) | 0 (0) | 0 (0) | 0 (0) | |
| | **4 to 6 days in a week** | 0 (0) | 8 (24.2) | 8 (25.8) | 6 (20.0) | |
| | **Daily** | 6 (100) | 25 (75.8) | 23 (74.2) | 24 (80.0) | |
| **Fast food** | **Never/monthly/scarcely** | 0 (0) | 0 (0) | 0 (0) | 0 (0) | **0.017** |
| | **1 to 3 days in a week** | 6 (100) | 27 (81.8) | 21 (67.7) | 21 (70.0) | |
| | **4 to 6 days in a week** | 0 (0) | 3 (9.1) | 6 (19.4) | 4 (13.3) | |
| | **Daily** | 0 (0) | 3 (9.1) | 4 (12.9) | 5 (16.7) | |
| **Fruits** | **Never/monthly/scarcely** | 0 (0) | 0 (0) | 0 (0) | 0 (0) | 0.554 |
| | **1 to 3 days in a week** | 3 (50.0) | 13 (39.4) | 15 (48.4) | 17 (56.7) | |

| | | | | | | |
|---|---|---|---|---|---|---|
| | **4 to 6 days in a week** | 2 (33.3) | 12 (36.4) | 9 (29.0) | 9 (30.0) | |
| | **Daily** | 1 (16.7) | 8 (24.2) | 7 (22.6) | 4 (13.3) | |
| **Vegetable** | **Never/monthly/scarcely** | 0 (0) | 0 (0) | 0 (0) | 0 (0) | 0.100 |
| | **1 to 3 days in a week** | 2 (33.3) | 11 (33.3) | 10 (32.3) | 10 (33.3) | |
| | **4 to 6 days in a week** | 1 (16.7) | 8 (24.2) | 7 (22.6) | 7 (23.3) | |
| | **Daily** | 3 (50.0) | 14 (42.4) | 14 (45.2) | 13 (43.3) | |
| **Meat products** | **Never/monthly/scarcely** | 0 (0) | 0 (0) | 0 (0) | 0 (0) | **0.027** |
| | **1 to 3 days in a week** | 4 (66.7) | 16 (48.5) | 15 (48.4) | 16 (53.4) | |
| | **4 to 6 days in a week** | 2 (33.3) | 12 (36.4) | 11 (35.5) | 8 (26.7) | |
| | **Daily** | 0 (0) | 5 (15.2) | 5 (16.1) | 6 (20.0) | |
| **Milk product** | **Never/monthly/scarcely** | 0 (0) | 0 (0) | 0 (0) | 0 (0) | **0.043** |
| | **1 to 3 days in a week** | 2 (33.3) | 15 (45.5) | 14 (45.1) | 16 (53.3) | |
| | **4 to 6 days in a week** | 2 (33.3) | 10 (30.3) | 10 (32.3) | 11 (36.7) | |
| | **Daily** | 2 (33.3) | 8 (24.2) | 7 (22.6) | 3 (10.0) | |
| **Beverages and juice intake** | **Never/monthly/scarcely** | 0 (0) | 0 (0) | 0 (0) | 0 (0) | **0.049** |
| | **1 to 3 days in a week** | 4 (66.6) | 16 (48.5) | 14 (45.1) | 14 (46.6) | |
| | **4 to days in a week** | 1 (16.7) | 12 (36.4) | 10 (32.3). | 8 (26.7) | |
| | **Daily** | 1 (16.7) | 5 (15.2) | 7 (22.6) | 8 (26.7) | |

Table 6 illustrates the frequency of foods consumed in relation to the body mass index. Intake of fast food, meat, milk, and beverages was found to have a significant relation ($p<0.05$) with BMI. Intake of cereals, fruits and vegetables have non-significant relation ($p>0.05$) with body mass index. Cereals, milk, fruits and vegetable consumption are high among normal, underweight and obese group on daily basis as compared to the underweight group while the consumption of fast food, meat and beverages are also high among normal, underweight and obese group on daily basis. Those who were taking cereals on daily basis were 6 (100%) underweight, 25 (75.8%) were normal, 23(74.2%) were overweight, 24(80%) were obese.

These findings are similar to that of Holland et al., (2014) who reported that the frequency of fast-food, meat, milk and beverages was found to be strongly related to BMI. BMI shows a non-significant relation with vegetables, fruits and cereals. (10 fast food linked to an increase of 1 kg body weight; $p<0.001$). According to another similar study Shori et al., (2017) reported that more than half of the participants ate fast food at least once a week. Despite the fact that 59 percent of the individuals were overweight or obese. These findings shows strong support to this study.

Findings from the study of Duffy et al., (2007) reported that 40% of the participants increased their weekly fast food, beverages and meat intake. Fast food consumption is linked to BMI. Similarly, increased fast food consumption and beverages consumption in year 7 was linked to a 0.16 unit higher BMI in year 10.

**Table 7: Frequencies of food consumed in relation to waist to hip ratio.**

| **Variable** | | **Waist to hip ratio** | | **P-value** |
|---|---|---|---|---|
| | | **Normal** | **At risk** | |
| **Cereals** | **Never/monthly/scarcely** | 0 (0) | 0 (0) | 0.402 |
| | **1 to 3 days in a week** | 0 (0) | 0 (0) | |
| | **4 to 6 days in a week** | 10 (22.2) | 12 (21.8) | |
| | **Daily** | 35 (77.9) | 43 (78.2) | |
| **Fast food** | **Never/monthly/scarcely** | 0 (0) | 0 (0) | **0.020** |
| | **1 to 3 days in a week** | 34 (75.6) | 41 74.5) | |
| | **4 to 6 days in a week** | 6 (13.3) | 7 (12.7) | |
| | **Daily** | 5 (11.1) | 7 (12.7) | |
| **Fruits** | **Never/monthly/scarcely** | 0 (0) | 0 (0) | 0.167 |
| | **1 to 3 days in a week** | 21 (46.7) | 27 (49.1) | |
| | **4 to 6 days in a week** | 12 (26.7) | 20 (36.4) | |
| | **Daily** | 12 (26.7) | 8 (14.5) | |

| | | | | |
|---|---|---|---|---|
| **Vegetables** | **Never/monthly/scarcely** | 0 (0) | 0 (0) | 0.376 |
| | **1 to 3 days in a week** | 12 (26.7) | 21 (38.2) | |
| | **4 to 6 days in a week** | 10 (22.2) | 13 (23.6) | |
| | **Daily** | 23 (51.1) | 21 (38.2) | |
| **Meat product** | **Never/monthly/scarcely** | 0 (0) | 0 (0) | **0.016** |
| | **1 to 3 days in a week** | 24 (53.3) | 27 (49.1) | |
| | **4 to 6 days in a week** | 16 (35.6) | 17 (30.9) | |
| | **Daily** | 5 (11.1) | 11 (20.0) | |
| **Milk product** | **Never/monthly/scarcely** | 0 (0) | 0 (0) | **0.037** |
| | **1 to 3 days in a week** | 22 (48.9) | 25 (45.5) | |
| | **4 to 6 days in a week** | 13 (28.9) | 20 (36.4) | |
| | **Daily** | 10 (22.2) | 10 (18.2) | |
| **Beverages and juices intake** | **Never/monthly/scarcely** | 0 (0) | 0 (0) | **0.036** |
| | **1 to 3 days in a week** | 28 (62.2) | 20 (36.4) | |
| | **4 to 6 days in a week** | 10 (22.2) | 21 (38.2) | |
| | **Daily** | 7 (15.6) | 14 (25.5) | |

Table 7 shows the consumption of food in relation to the waist to hip ratio of the subjects. In connection to the waist to hip ratio categories, there was a significant relation ($p<0.05$) in the consumption of fast food, meat, milk, and beverages and juices with waist to hip ratio. Intake of cereals, fruits and vegetables have non-significant relation ($p>0.05$) with waist to hip ratio. Cereals, milk, fruits and vegetable consumption are high among normal group on daily basis as compared to the risky group while the consumption of fast food, meat and beverages are high in risky group on daily basis.

These findings correlates with the study of Newby et al., (2003) who reported that the five foods were discovered to be high in calories (white bread, alcohol, sweets, and meat and potatoes). Subjects in the unhealthy food group (1.32 ±0.29 cm) changed their waist-to-hip ratio more than three times as much as those in the healthy food groups (0.43± 0.27 cm). A diet rich in fruits, vegetables, low-fat dairy, whole grains, and low in red and minced meat, fast food, and drinks was linked to lower waist-to-hip ratio hence strongly supported this study. In another study of Romaquera et al., (2011) found significant ($p<0.05$) relation between food groups consumption and waist to hip ratio hence strongly supported this study and it was also reported that the consumption of fruits and dairy products was linked to lower (WC),White bread, processed meat, margarine, and cold/soft beverages were all found to be positively linked with ΔWC.

**Tabl 8: Body mass index in relation to the energy and macronutrient intake.**

| **Variables** | **Body mass index (Mean±S.D)** | | | | **P-value** |
|---|---|---|---|---|---|
| | **Underweight** | **Normal** | **Overweight** | **Obese** | |
| **Carbohydrate (g/day)** | 198.6±50.6 | 208.8±38.8 | 216.0±52.1 | 217.3±32.7 | **0.027** |
| **Protein (g/day)** | 51.1±17.1 | 53.7±20.5 | 53.2±21.4 | 59.7±21.3 | 0.345 |
| **Fat (g/day)** | 41.4±11.7 | 43.0±12.4 | 45.0±18.4 | 45.3±13.6 | **0.015** |
| **Energy (Kcal/day)** | 1439.1±467.4 | 1638.1±397.2 | 1918.5±748.4 | 2069.5±492.9 | **0.029** |

Table 8 shows the macronutrient intake in relation to the body mass index of the subjects. A significant association ($P<0.05$) was recorded for carbohydrate, fats and energy in relation to the body mass index whereas a non-significant relation ($p>0.05$) as found between protein and BMI. The carbohydrate intake were observed high in overweight and obese groups as compare to normal and underweight. The protein intake was found high in overweight and obese groups. The fat intake was found almost the same in overweight and obese groups. The calories intake was also high in overweight and obese groups.

These findings are similar to those of Herrera et al., (2003) who reported that males had a greater BMI and EI than females, and the two variables were positively associated in the male and female subgroups tested. Except for fats, calorie intake was found to have a significant impact on BMI in the analyzed sample. Hence support this study Fesken et al., (1991) who reported the BMI and carbohydrate intake were found to have a positive connection with pastries. These findings imply that energy balance and a high carbohydrate diet in the elderly may be linked to the development of glucose intolerance.

**Table 9: Body mass index in association with intensity of physical activity.**

| Variable | | Body mass index (%) | | | | P-Value |
|---|---|---|---|---|---|---|
| | | Underweight | Normal | Overweight | Obese | |
| Intensity of Physical Activity | Sedentary | 2 (33.3) | 24 (72.7) | 16 (53.3) | 24 (77.4) | 0.025 |
| | Moderate | 0 (0) | 5 (15.2) | 2 (6.7) | 1 (3.2) | |
| | Active | 0 (0) | 1 (3.0) | 1 (3.3) | 0 (0) | |
| | Highly Active | 4 (66.7) | 3 (9.1) | 11 (36.7) | 6 (19.4) | |

Table 9 shows the BMI in relation with intensity of physical activity. A significant relation ($p<0.05$) was observed for intensity of physical activity in relation to BMI. Finding suggests that as the intensity of physical activity increases, the body mass index changes, and vice versa as the intensity decreases, the body mass index rises. Sedentary PA was observed high in normal, overweight and obese groups whereas the moderate PA level was found high in normal group. The active PA level was found high in normal and overweight group. The highly active PA level was observed in underweight and overweight groups.

According to the study's the findings are similar to those of Kim et al., (2005) who reported that decrease in activity of metabolic equivalent [MET] 10 times per week was linked with BMI increased by 0 .14 kg/m$^2$ and skin thickness increased by 0.62 mm (0.17 skin thickness) for black participants and 0.09 kg/m$^2$ and 0.63 mm (0.13) for white participants. For black participants, the difference in BMI between active and inactive individuals aged 18 or 19 years was 2.98 kg/m$^2$, while for white girls it was 2.10 kg/m$^2$.The amount of changes in BMI and skin thickness for moderately active participants was nearly equal between active and sedentary subjects. The findings correlates with the findings of our study that intensity of physical activity are in relation with BMI. Fuentas et al., (2018) reported that LTPA levels are proportional to BMI and WC. Between the quintuple excess of LTPA (Q1 to Q5), the difference in BMI and WC was 2.1 kg/m$^2$. Low-power LTPA has a negative relationship with BMI but not WC, whereas moderate/strong LTPA has a negative relationship with both BMI and WC. The lowest LTPA correlated with the prevalence of normal obesity, and the quintile of complete and moderate/severe LTPA was associated with a lower risk of recurrent obesity and gastrointestinal problems.

**Table 10: Body mass index in relation to the energy and macronutrient intake.**

| Variables | Body mass index (Mean±S.D) | | | | P-value |
|---|---|---|---|---|---|
| | Underweight | Normal | Overweight | Obese | |
| Carbohydrate (g/day) | 198.6±50.6 | 208.8±38.8 | 216.0±52.1 | 217.3±32.7 | **0.027** |
| Protein (g/day) | 51.1±17.1 | 53.7±20.5 | 53.2±21.4 | 59.7±21.3 | 0.345 |
| Fat (g/day) | 41.4±11.7 | 43.0±12.4 | 45.0±18.4 | 45.3±13.6 | **0.015** |
| Energy (Kcal/day) | 1439.1±467.4 | 1638.1±397.2 | 1918.5±748.4 | 2069.5±492.9 | **0.029** |

Table 10 shows the macronutrient intake in relation to the body mass index of the subjects. A significant association ($P<0.05$) was recorded for carbohydrate, fats and energy in relation to the body

mass index whereas a non-significant relation ($p>0.05$) as found between protein and BMI. The carbohydrate intake were observed high in overweight and obese groups as compare to normal and underweight. The protein intake was found high in overweight and obese groups. The fat intake was found almost the same in overweight and obese groups. The calories intake was also high in overweight and obese groups.

These findings are similar to those of Herrera et al., (2003) who reported that males had a greater BMI and EI than females, and the two variables were positively associated in the male and female subgroups tested. Except for fats, calorie intake was found to have a significant impact on BMI in the analysed sample. Hence support this study Fesken et al., (1991) who reported the BMI and carbohydrate intake were found to have a positive connection with pastries. These findings imply that energy balance and a high carbohydrate diet in the elderly may be linked to the development of glucose intolerance.

**Table 11: Macro nutrient and energy intake in relation to the waist to hip ratio.**

| Variable | Waist to hip ratio | | P-value |
|---|---|---|---|
| | Normal | At risk | |
| **Carbohydrate** | 225.2±41.1 | 250.3±49.6 | **0.029** |
| **Protein** | 49.4±20.2 | 53.9±22.5 | 0.377 |
| **Fat** | 38.6±14.6 | 47.6±11.8 | **0.047** |
| **Energy** | 1875.4±473.1 | 2190.6±389.4 | **0.028** |

Table 11 shows the energy and macro-nutrient intake in relation to waist to hip ratio. A significant association was found between the intake of carbohydrates, fats and energy with waist to hip ratio, which means if the intake of carbohydrates, fats and energy increases it may results in the increase of waist to hip ratio. The intake of carbohydrates, fats, protein and energy were high in risk group as compare to normal group.

According to the findings of this study that are similar to those of Loffle et al., (2017) who reported that a high-carbohydrate, dietary fibre, and fructose diet was linked to a significant rise in WC. A high sucrose diet, total protein, animal protein, and alcohol were all linked to a small rise in WC. A diet heavy in whole carbs, sucrose, fructose, animal protein, and vegetable fat was linked to a significant rise in HC. A diet heavy in animal fat, saturated fat, and protein was linked to a modest rise in HC. Fructose, sucrose, total fats, and total protein were all linked to changes in WC and HC in men. Dietary fibre, fructose, alcohol, animal protein, total protein, animal fat, and vegetable fat were all linked to increases in WC and HC in women. These findings support this study. The results from this study resembles to those of Nikbazamet al., (2013) reported that fats intake for women, was linked to WC. Obesity and the prevalence of high carbohydrate and fat diets were found to have a significant direct association WC.

**Table 12: Intensity of physical activity in association with the waist to hip ratio.**

| Variable | | Waist to hip ratio | | P-value |
|---|---|---|---|---|
| | | Normal | At risk | |
| **Intensity of Physical Activity** | **Sedentary** | 27 (60.0%) | 39 (70.9) | **<0.001** |
| | **Moderate** | 5 (11.1%) | 3 (5.5) | |
| | **Active** | 1 (2.2%) | 1 (1.8%) | |
| | **Highly Active** | 12 (26.7) | 12 (21.8%) | |

Table 12 shows the intensity of physical activity in relation to the waist-to-hip ratio. Waist-to-hip ratio and physical activity intensity were found to have a significant relationship ($p<0.001$). This reveals that physical activity and waist-to-hip ratio are highly inversely related. As the intensity of physical activity declines, the waist-to-hip ratio rises. Sedentary PA was observed high in risk group whereas

the moderate PA level was found high in normal group. The active PA level was found high in normal group. The highly active PA level was observed in normal group.
These results are similar to those of Trichopolou et al., (2001) who reported that men and women experienced different outcomes in terms of PA and WC. Link between energy intake and expenditure with WHR was found. Higher calorie intakes and higher energy expenditures, on the other hand, were connected to higher and lower WHRs in men significantly. Because the WHR is a strong predictor of various chronic diseases, evidence of a high effect of physical activity on the WHR in males may provide a partial explanation for how the effect of physical exercise is mediated and why men are more effective than women in lowering disease risk. These results support this study.

**Table 13: Correlation between dietary intake and nutritional status.**

| Variable | Weight | Height | BMI | Waist | Hip | Waist to Hip |
|---|---|---|---|---|---|---|
| **Carbs** | .029 | .138 | .142 | .104* | .027* | .295* |
| **Protein** | .061 | .066 | -.096* | -.239* | -.212* | -.135* |
| **Fats** | .237* | .071 | .021* | .390** | .348** | .369** |
| **Energy** | .320** | .035 | .341** | .416** | .401** | .406** |

Table 13 shows the correlation between dietary intake and nutritional status. Carbohydrates was significantly correlated with waist circumference, hip circumference and waist to hip ratio. Proteins was negatively correlated with BMI, WC, HC, and WTH. Fats and energy was highly correlated with weight, BMI, waist circumference, hip circumference and waist to hip ratio.
The findings of this study are comparable to those of Moon et al., (2020) who reported that in both genders, the predictor BMI was positively connected with protein and animal protein intake in its range, but adversely correlated with vegetable protein. In men, the negative relationship between BMI and polysaccharide intake was linked to overall BMI. Only in normal-weight women does there appear to be a weak link between BMI and total and saturated fat levels. Finally, depending on BMI, the link between BMI and macronutrient diet differs. In both sexes, animal protein diet was positively linked with BMI without calorie consumption, however polysaccharide intake was negatively associated with BMI only in males. The findings correlate with the results of this study. Yucheng et al., (2005) who reported that the glycemic index and glycemic reaction rate was associated with diverse carbohydrate diets these were found to be favourably correlation with body weight index, but not with daily carbohydrate intake, percentage of calories from carbohydrates, or glycemic load. The findings demonstrate correlation between carbohydrate type and body weight.
[7]

## CONCLUSION AND RECOMMENDATION

### CONCLUSION:

- It was concluded that the female school teachers had a greater body mass index as compared to the male School teacher.
- Males were more active as compared to female.
- The Intake of cereals, fruits, and meat on daily basis was high among male whereas the intake of fast food, vegetable, beverages was high among females. The intake of milk on daily basis was recorded the same.
- Fast food, meat, milk, and beverage consumption were found to have a significant relationship with body mass index and waist-to-hip ratio.
- Physical activity, intake of carbohydrate, fats and energy showed a significant relation with body mass index.

### RECOMMENDATION:

The following few recommendations are proposed to adults (School teachers) on the basis of current research.

1. Intake of nutrient dense food should be more as compared to energy dense food and intake of fast food and beverages should be limited.
2. In addition to fruits and vegetables, milk and dairy products, bread and cereals, and other foods, Dietary fat, refined sugar, and salt must all be reduced.
3. Daily duration of physical activity must be 30 to 40 minutes per day.
4. Nutrition-related seminars/symposiums, and workshops should be held in schools and colleges to raise community knowledge of the importance of nutrition and to teach employees to getoptimum nutrients in their daily meals.

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