The association of eating habits and lifestyle with overweight and obesity among health sciences students in Taif University, KSA

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Abstract

Objectives: This work investigated the impacts of food habits and lifestyle on the prevalence of overweight (OW) and obesity (OB) among health sciences students (HSS) at Taif University, KSA.

Methods: A cross-sectional survey was conducted with 228 HSS in a university setting using a food frequency questionnaire. Body mass index (BMI) was used to assess weight gain, and waist circumference (W_C) was employed for the assessment of abdominal adiposity.

Results: The prevalences of OW and OB were 25.9% and 10.9%, respectively, with an overall prevalence of 36.8%. All demographic variables had an insignificant (P > 0.05) effect on W_C. There were significant links between gender, academic year and discipline and BMI (P < 0.05). Smoking, stress, duration of TV viewing, daylight and night sleep had an effect on BMI and W_C but were statistically insignificant (P > 0.05). Breakfast, light meals, eating with a family, fast food, and regular and diet soft drinks had insignificant impacts on BMI (P > 0.05).

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Introduction

The World Health Organization (WHO) has stated that in 2014, approximately 39% of the world’s adults (38% of males and 40% of females) were overweight,1 while in KSA, the corresponding percent was 68.2% (67.5% of men and 69.5% of women).1 The overall percent of obese adults in the world aged 18 years and more reached 13% (11% of males and 15% of females). The percent of obese adults in KSA was 2.6× higher than the world’s population (33.7% vs. 13%). The percent of obesity (39.5%) among adult females in KSA was higher than that of males (29.5%). The same trend was noted for the world’s population.

Overweight (OW) and obesity (OB) can affect the health and socio-economic status of those at risk. Increased rates of OW and OB is a main risk factor for non-communicable disorders such as heart disease, hypertension, type 2 diabetes mellitus, and some types of cancer (e.g., breast, colon, and endometrial).2 The socio-economic consequences of OW/OB include the following: poor self-image, decreased self-esteem, and restriction in production and mobility.3

Many research studies have investigated the impacts of food habits, lifestyle, and eating behaviours on the prevalence of OW/OB among university students across the globe.4,5 For instance, a Canadian study revealed that 22.9% of university students and 37.3% of staff were either obese or overweight.6 Regina et al.7 showed that only a small number of university students in Hong Kong participated in health-promoting behaviours.

While obesity intervention studies in a university settings have been conducted, they are fewer in number compared to epidemiological studies. For example, Hivert et al.4 conducted a randomized-controlled study in a Canadian university over a 2-year period. The participants received a health-promotion programme through educational/behavioural seminars. After 2 years, the results indicated a considerable improvement in blood lipid chemistry, body mass composition, and weight gain prevention.4 In another study, Emrich and Mazier7 found that taking a nutrition education course may result in a decrease of total and saturated fat intake by university students.

In KSA, several epidemiological studies have been conducted among university students. For example, Al-Reethaia et al.1 found that the prevalence of OW and OB among male HSS at a Saudi University was 21.8% and 15.7%, respectively.7 El-Quadh8 showed that the prevalence of OB among male HSS was higher than females (16.7% vs. 6.7%). A large percentage of the population of KSA is youth.3 The population of KSA has experienced significant changes in their lifestyles, which could be due to many factors such as rapid socio-economic changes, rapid urbanization, wide use of cars, and increased reliance on computers and other telecommunication.9 These factors have significant effects on lifestyle and food habits among the people of KSA, as society trends towards a more “Western diet”. Many research studies have shown that eating habits are the most crucial factors affecting the nutritional and health condition of schoolchildren and adolescents in the kingdom. For example, in a study conducted in Riyadh City, it was found that skipping breakfast was more prevalent among obese/overweight schoolgirls than among normal-weight schoolgirls. In another study conducted in Abah (KSA), it was shown that 28% of schoolchildren skipped breakfast. Furthermore, obesity and overweight rates were linked with infrequent intake of breakfast, frequent intake of fast food and sugary drinks, and low consumption of fruits/vegetables, eggs, and milk.7,10–16

Furthermore, no similar studies have been conducted among male university students at Taif University. To the best of our knowledge this is the first study that combined a questionnaire and anthropometric measurements as tools of investigation. The aim of the present study was to determine the prevalence of OW/OB and related risk factors in a Saudi university community. The detailed objectives were: to assess impacts of participant’s demographic characteristics on BMI and W_C and to evaluate the effects of participant’s dietary habits and lifestyle on BMI and W_C. The outcomes of the present study will be the basis of a second study, which is simply an intervention study.

Materials and Methods

Study design and study population

A cross-sectional study was carried out among HSS at Taif University from July to December 2015. The investigation methods included a pretested questionnaire and anthropometric measurements. All students attending HS colleges were invited to participate in this study. A random sample of 228 students from both sexes agreed to participate, signed written consents and completed the questionnaires.

Study instrument and methods

The study tools

The questionnaire was organized into two parts. The first part obtained the demographic characteristics of the respondents. Anthropometric measurements including height (metres), weight (kg), and waist circumferences (cm) were also collected in this part of the questionnaire. Height of the participants was determined to the nearest 0.2 cm using a measuring scale equipped with a sliding head component.
Body weight was determined using a calibrated digital balance to the closest 0.1 kg after asking subjects to take off their shoes and heavy clothes if possible. BMI was calculated using the standard equation.\textsuperscript{17} Cut off values for waist circumference are as follows: if \( W_C < 88 \) cm, then women were at lower risk of developing health problems; if \( W_C \geq 88 \) cm, the women were at high risk.\textsuperscript{17} Similarly, the cut off values for adult males are as follows: if \( W_C < 102 \) cm, then men were at lesser risk of developing health problems; if \( W_C \geq 102 \) cm, the men were at increased risk.\textsuperscript{17} Although BMI is a widely used screening tool, it has major restrictions as it cannot differentiate between lean and fat (muscle); it has been suggested that percent body fat plays a more important role in differentiating healthy from unhealthy subjects.\textsuperscript{18} Therefore, \( W_C \) was used as another instrument for assessing abdominal adiposity. Part two investigated the lifestyle and food habits among students. The questionnaire was designed by investigators to meet the criteria of the Research Ethical Committee at Taif University. The questionnaire was tested on 30 students from the same colleges to ensure validity and respondents' understanding. The results of the pilot study were not included in the study results.

The consent form was designed to meet the criteria of the Research Ethics Review committee (WHO ERC). The form consisted of information regarding the purpose of the study, participant selection, voluntary participation, study duration, possible side effects and risks. This form also provided the participant with information concerning benefits and confidentiality and the participant’s rights to refuse or withdraw from the study. Certificate of consent was the last section of the consent form.

### Ethical consideration

This study had obtained ethical approval (No: 85310) from the Research Ethical Committee at Taif University, KSA. Each student read and signed a written consent before filling the questionnaire.

### Analysis of data

The data obtained were coded, entered and analysed via the Statistical Package for the Social Sciences (IBM SPSS, version 22, Armonk, NY: IBM Corp.). Means, frequencies and percentages were employed to explain different factors. Chi-square analysis was utilized to determine the link between the students’ demographic characters, lifestyle, eating patterns and BMI and \( W_C \). A \( P \)-value < 0.05 was considered significant.

### Results

#### Effects of student's demographic characteristics on BMI & \( W_C \)

A total of 228 students from the HS Colleges completed the questionnaire. All students gave signed consent prior to participating in this study. Slightly more than half (79, 51.8\%) of the students had a normal BMI (48.8\% of males and 53.4\% of females), while 59 (25.9\%) were overweight (33.8\% of males and 21.6\% of females). A total of 25 (10.9\%) of subjects were obese. The combined OW/OB was much higher among males than females (50.1\% vs. 26.7\%). The results showed that gender had a significant effect on BMI (\( P = 0.001 \) (Table 1). The highest rate of combined OW/OB reported for the sixth year students was 8 students (72.7\%). Moreover, 81.8\% of sixth year students were obese.

#### Table 1: Effects of demographic characteristics on body mass index among health sciences students, Taif University, KSA.

| Body mass index | Freq. (%) | Under-weight | Normal-weight | Over-weight | Obesity | P-value |
|-----------------|-----------|--------------|---------------|-------------|---------|---------|
| Gender          |           |              |               |             |         |         |
| Male            | 80 (35.1\%) | 1 (1.3\%)   | 39 (48.8\%)   | 27 (33.8\%) | 13 (16.3\%) | 0.001   |
| Female          | 148 (64.9\%) | 25 (16.9\%) | 79 (53.4\%)   | 32 (21.6\%) | 12 (8.1\%)  |         |
| Academic year   |           |              |               |             |         |         |
| 1st             | 57 (25\%)  | 11 (19.3\%) | 25 (43.9\%)   | 14 (24.6\%) | 7 (12.3\%) | 0.005   |
| 2nd             | 39 (17.1\%) | 4 (10.3\%)  | 24 (61.5\%)   | 9 (23.1\%)  | 2 (5.2\%)   |         |
| 3rd             | 48 (21.1\%) | 3 (6.3\%)   | 32 (66.7\%)   | 9 (18.8\%)  | 4 (8.3\%)   |         |
| 4th             | 41 (18\%)  | 5 (12.2\%)  | 22 (53.7\%)   | 91 (18.8\%) | 4 (8.3\%)   |         |
| 5th             | 32 (14\%)  | 2 (6.3\%)   | 13 (40.6\%)   | 11 (34.6\%) | 6 (18.8\%)  |         |
| 6th             | 11 (14.8\%) | 1 (9.1\%)   | 2 (18.2\%)    | 6 (54.5\%)  | 2 (18.2\%)  |         |
| Academic discipline  | | | | | | <0.001 |
| Medicine        | 32 (14\%)  | 2 (6.3\%)   | 15 (46.9\%)   | 12 (37.5\%) | 3 (9.4\%)  |         |
| Pharmacy        | 147 (64.5\%) | 13 (8.8\%) | 83 (56.5\%)   | 34 (23.1\%) | 17 (11.6\%) |         |
| Health Sciences | 4 (1.8\%)  | 1 (25\%)    | 2 (50\%)      | 0 (0\%)     | 1 (2.5\%)  |         |
| Preparatory     | 45 (19.7\%) | 10 (22.2\%) | 18 (40\%)    | 13 (28.9\%) | 4 (8.9\%)  |         |
| Location of residency | | | | | | 0.629 |
| Taif North      | 51 (22.4\%) | 6 (11.8\%)  | 29 (56.9\%)   | 11 (21.6\%) | 5 (9.8\%)  |         |
| Taif South      | 68 (29.8\%) | 9 (13.2\%)  | 32 (47.1\%)   | 17 (25.0\%) | 10 (14.7\%) |         |
| Taif East       | 61 (26.8\%) | 8 (13.1\%)  | 33 (54.1\%)   | 14 (23.0\%) | 6 (9.8\%)  |         |
| Taif West       | 48 (21.1\%) | 3 (6.3\%)   | 24 (50.0\%)   | 17 (35.4\%) | 4 (8.3\%)  |         |
| Family income   |           |              |               |             |         |         |
| <SAR 5000       | 19 (8.3\%) | 1 (5.3\%)   | 10 (52.6\%)   | 6 (31.6\%)  | 2 (10.5\%) | 0.186   |
| SAR 5000–10,000 | 55 (24.1\%) | 4 (7.3\%)   | 28 (50.9\%)   | 19 (34.5\%) | 4 (7.3\%)  |         |
| SAR 10,000–15,000 | 52 (22.8\%) | 3 (6.3\%)   | 35 (67.3\%)   | 9 (17.3\%)  | 5 (9.6\%)  |         |
| SAR >15,000     | 102 (44.7\%) | 18 (17.6\%) | 45 (44.1\%)   | 25 (24.5\%) | 14 (13.7\%) |         |
| Living with family |     |            |               |             |         | 0.288   |
| Yes             | 214 (93.9\%) | 26 (12.1\%) | 113 (52.8\%)  | 52 (24.3\%) | 23 (10.8\%) |         |
| No              | 14 (6.1\%)  | 0 (0\%)     | 5 (35.7\%)    | 7 (50\%)    | 2 (14.3\%) |         |

Total 228 (100\%) 26 (11.4\%) 118 (51.8\%) 59 (25.9\%) 25 (10.9\%)
of the previous year’s students had an abnormal weight (Table 1). This means that 4 out of 5 students in their senior year had an abnormal weight. There was a strong relationship \( (P = 0.005) \) between academic level and BMI. Although most of the participants \( (n = 147, 64.5\%) \) were from the College of Pharmacy, the rate of OW and OB \( (34.7\%) \) in this college was ranked second after medical school students \( (n = 15, 46.9\%) \). A significant \( (P < 0.001) \) association was noted between academic discipline and BMI (Table 1).

The southern part of Taif had the highest number \( (68, 29.8\%) \) of residents included in the study. Only 32 \( (47.1\%) \) of them had a normal BMI, while 27 \( (39.7\%) \) were either overweight or obese. Location of residency had an insignificant effect on BMI \( (P = 0.629) \) (Table 1).

The OW and OB among students in low-income families were \( 42.1\% \), while \( 38.2\% \) of high-income students were obese or overweight. Furthermore, \( 55.8\% \) of students from high-income families had abnormal body weight. Family income had insignificant impact on body weight \( (P = 0.186) \) (Table 1).

Majority of subjects \( 214 (93.9\%) \) lived with their families, while only \( 14 (6.1\%) \) did not. Of those who lived away from families, \( 9 (60.3\%) \) were either overweight or obese. Living with families had an insignificant \( (P = 0.288) \) impact on BMI. There was an insignificant difference between living with family and BMI \( (P = 0.446) \) or W_C \( (P = 0.941) \) (Table 1).

Effects of student’s lifestyle on BMI & W_C

Although the majority of participants were non-smokers \( (n = 204, 89.5\%) \), smoking rate did not affect BMI \( (P = 0.720) \) or W_C \( (P = 0.435) \) (Tables 2 and 3). More than half \( (121, 53.1\%) \) of student suffered from stress in their lives (Table 2). Of these students, \( 46 (38.1\%) \) were either overweight or obese, but no significant \( (P = 0.402) \) link was noted between stress and BMI (Table 2).

Regarding physical activity; \( 110 (48.2\%) \) of students did not exercise. The prevalence of OW and OB among them was \( 24 (21.8\%) \) and \( 12 (10.9\%) \), respectively (Table 2). The same trend was noted for W_C, as only \( 9 (8.2\%) \) subjects were at risk of developing health problems \( (P = 0.936) \) (Table 3). Running was the most frequent activity \( (63, 52.9\%) \), while swimming \( (8, 6.7\%) \) was the least common type of physical activity practiced by the participants (Table 2). No significant effect was observed for type of exercise on BMI \( (P = 0.14) \) (Table 2) and on W_C \( (P = 0.543) \) (Table 3).

Forty-two of the student respondents watch TV 4–6 h per day, but the highest \( (19, 38.0\%) \) rate of OW and OB was reported by those who watch TV 2–4 h a day (Table 2). Furthermore, the effects of TV watching on BMI was statistically insignificant \( (P = 0.880) \). Although, the highest risk \( (6, 10.9\%) \) of developing health problems was among those who spent > 8 h of watching TV, the link between TV viewing and W_C was insignificant \( (P = 0.590) \) (Table 3).

The majority of participants \( 144, 64.4\% \) sleep more than 2 h, and more sleep during the day, with \( 20 (55.6\%) \) of these individuals being overweight, while the rate of obesity was \( 13 (16.8\%) \). The highest percent of subjects \( 86, 38.2\% \) sleep 6–8 h per night, however, the highest rates of OW \( (26, 30.2\%) \) and different types of obesity \( (12, 14.0\%) \) were noted for this category (Table 2).

Effects of eating habits on BMI & W_C

The results showed that breakfast intake was relatively common among students. Approximately half \( (106, 46.5\%) \) of them have breakfast daily, and only \( 17 (7.5\%) \) never have breakfast (Table 4). Against expectations, the highest rate of OW and OB \( (47.1\%) \) was for those who ate breakfast 4 times a week, while for those who skipped breakfast, the rate was \( (29.8\%) \) (Table 2). No significant association with BMI \( (P = 0.936) \) or with W_C \( (P = 0.889) \) was noted (Tables 4 and 5).

Overall \( 145 (63.6\%) \) of participants had their meals with their families daily. Of these individuals, \( 34.5\% \) were obese or overweight, while \( 17 (7.5\%) \) rarely have meals with their families. Nonetheless, there was an association between eating with family and BMI, but it was statistically insignificant \( (P = 0.222) \). The results of this study did not find a significant link between having meals with family and W_C \( (P = 0.495) \) (Table 4).

Students who used to eat fast food more than 2–3 times per week \( (104, 45.6\%) \) suffered from obesity \( (10, 10.6\%) \) more than who never ate fast food \( (0, 0.00\%) \). The same pattern was noticed when W_C was used. However, fast food intake affected neither BMI \( (P = 0.572) \) (Table 4) nor W_C \( (P = 0.674) \) (Table 5).

The OW and OB prevalence among students who ate light meals on a daily basis was \( 29.0\% \), almost half compared to those who never ate light meals \( (55.5\%) \). Again, no considerable relationship was found between light meals uptake and BMI \( (P = 0.104) \) (Table 4) or W_C \( (P = 0.584) \) (Table 5).

Approximately one-fourth \( 56 (24.6\%) \) of students consumed soft drinks 1–3 times per week. The highest rate of OW and OB \( (48.6\%) \) was reported by students who never drank sugary drinks (Table 4). The results showed that students who consumed soft drinks 3–4 times per day had an increased risk \( (15.4\%) \) of developing health-related problems (Table 5). Soft drinks had no significant effect on either measurement \( (P > 0.05) \).

Results related to the consumption of diet drinks and the possibility of developing health problems was also examined, since the highest risk \( (15.8\%) \) was among those who drink 4–6 times per week. However, this link was statistically insignificant \( (P = 0.476) \) (Table 5).

Meat intake had no significant effects on BMI \( (P = 0.108) \) or W_C \( (P = 0.141) \) (Tables 4 and 5).

Fish and seafood intake had an insignificant effect on obesity rate \( (P = 0.170) \). Normal body weight was higher \( (64.7\%) \) among those who ate seafood than among students who never ate seafood \( (32.1\%) \). The obesity and overweight rate was the highest \( (39.3\%) \) among subjects who never ate fish and seafood. Consumption of fish and seafood had an insignificant \( (P = 0.789) \) effect on W_C (Table 6).

The highest \( (45.4\%) \) rate of OW and OB was found among students who never ate fried food, while the lowest rate was found among those who consumed fried food on a daily basis. However, this effect was statistically insignificant \( (P = 0.458) \). These results could be inconsistent with expectations. Fried food intake had no considerable \( (P = 0.547) \) impact on W_C (Table 7).
| Demographic characteristics | Waist circumference | Life-style variables | Waist circumference |
|-----------------------------|---------------------|----------------------|---------------------|
|                             | Freq. (%)           | No risk              | Risk                | P-value                  | Freq. (%)           | No risk              | Risk                | P-value                  |
| Gender                      |                     |                      |                     |                          |                     |                      |                     |                          |
| Male                        | 80 (35.1%)          | 76 (95.0%)           | 4 (5.0%)            | 0.181                    | Smoking             | Yes                  | 24 (10.5%)          | 23 (95.8%)             | 1 (4.2%)                | 0.435                  |
| Female                      | 148 (64.9%)         | 133 (89.9%)          | 15 (10.1%)          |                           | No                  | 204 (89.5%)          | 186 (91.2%)         | 18 (8.8%)                |                          |                      |
| Academic discipline         |                     |                      |                     |                          | Smoking of a family member | Yes                  | 79 (34.6%)          | 72 (91.1%)             | 7 (8.9%)                | 0.834                  |
| Medicine                    | 32 (14%)            | 28 (87.5%)           | 4 (12.5%)           | 0.566                    | No                  | 149 (65.4%)          | 137 (91.9%)         | 12 (8.1%)                |                          |                      |
| Pharmacy                    | 147 (64.5%)         | 134 (91.2%)          | 13 (8.8%)           |                           | Yes                  | 121 (53.1%)          | 112 (92.6%)         | 9 (7.4%)                 | 0.603                   |
| Health Sciences             | 4 (1.8%)            | 4 (100.0%)           | 0 (0.0%)            |                           | No                  | 107 (46.9%)          | 97 (90.7%)           | 10 (9.3%)                |                          |                      |
| Preparatory                 | 45 (19.7%)          | 43 (95.6%)           | 2 (4.4%)            |                           |                     |                      |                     |                          |                          |                      |
| Academic year               |                     |                      |                     |                          | Physical activity     | Yes                  | 118 (51.8%)          | 108 (91.5%)         | 10 (8.5%)                | 0.396                   |
| 1st                         | 57 (25%)            | 51 (89.5%)           | 6 (10.5%)           | 0.208                    | No                  | 110 (48.2%)          | 101 (91.8%)         | 9 (8.2%)                 |                          |                      |
| 2nd                         | 39 (17.1%)          | 37 (94.9%)           | 2 (5.1%)            |                           |                     |                      |                     |                          |                          |                      |
| 3rd                         | 48 (21.1%)          | 46 (95.8%)           | 2 (4.2%)            |                           |                     |                      |                     |                          |                          |                      |
| 4th                         | 41 (18%)            | 39 (95.1%)           | 2 (4.9%)            |                           |                     |                      |                     |                          |                          |                      |
| 5th                         | 32 (14%)            | 26 (81.3%)           | 6 (18.8%)           |                           |                     |                      |                     |                          |                          |                      |
| 6th                         | 11 (14.8%)          | 10 (90.9%)           | 1 (9.1%)            |                           |                     |                      |                     |                          |                          |                      |
| Family income               |                     |                      |                     |                          | Kind of exercise      | Running              | 63 (52.9%)          | 56 (88.9%)             | 7 (11.1%)                | 0.543                  |
| <SAR 5000                   | 19 (8.3%)           | 18 (94.7%)           | 1 (5.3%)            | 0.790                    | Swimming            | 8 (6.7%)            | 8 (100%)            | 0 (0.0%)                 |                          |                      |
| SAR 5–10,000                | 55 (24.1%)          | 51 (92.7%)           | 4 (7.3%)            |                           | Soccer              | 21 (17.6%)          | 19 (90.5%)         | 2 (9.5%)                 |                          |                      |
| SAR 10–15,000               | 52 (22.8%)          | 46 (88.5%)           | 6 (11.5%)           |                           | Dancing             | 27 (22.7%)          | 26 (21.8%)         | 1 (3.7%)                 |                          |                      |
| SAR >15,000                 | 102 (44.7%)         | 94 (92.2%)           | 8 (7.8%)            |                           | TV viewing          | <2 h/day             | 28 (12.3%)          | 25 (89.3%)             | 3 (6.7%)                | 0.990                  |
| Location of residency in Taif |                   |                      |                     |                          | 2–4 h/day            | 50 (21.9%)          | 48 (96.0%)         | 2 (4.0%)                 |                          |                      |
| North                       | 51 (22.4%)          | 46 (90.2%)           | 5 (9.8%)            | 0.348                    | 4–6 h/day            | 95 (41.7%)          | 87 (91.6%)         | 8 (8.4%)                 |                          |                      |
| South                       | 68 (29.8%)          | 62 (91.2%)           | 6 (8.8%)            |                           | >8 h/day             | 55 (24.1%)          | 49 (89.1%)         | 6 (10.9%)                |                          |                      |
| East                        | 61 (26.8%)          | 59 (96.7%)           | 2 (3.3%)            |                           | Never               | 27 (12.0%)          | 26 (96.3%)         | 1 (3.7%)                 | 0.775                   |
| West                        | 48 (21.1%)          | 42 (87.5%)           | 6 (12.5%)           |                           | <1 h                 | 13 (5.8%)            | 11 (84.6%)         | 2 (15.4%)                |                          |                      |
| Living with family          |                     |                      |                     |                          | 1–2 h                | 41 (18.2%)          | 38 (92.7%)         | 3 (7.3%)                 |                          |                      |
| Yes                         | 214 (93.9%)         | 197 (92.1%)          | 17 (7.9%)           | 0.406                    | 2–3 h                | 71 (31.6%)          | 65 (91.5%)         | 6 (8.5%)                 |                          |                      |
| No                          | 14 (6.1%)           | 12 (85.7%)           | 2 (14.3%)           |                           | ≥ 4 h                | 73 (32.4%)          | 66 (90.4%)         | 7 (9.6%)                 |                          |                      |
| Duration of day time sleep  |                     |                      |                     |                          | Duration of night sleep | <4 h                | 29 (12.9%)          | 26 (89.7%)             | 3 (10.3%)                | 0.583                  |
| <1 h                        | 13 (5.8%)           | 11 (84.6%)           | 2 (15.4%)           |                           | 4–6 h                | 76 (33.8%)          | 70 (92.1%)         | 6 (7.9%)                 |                          |                      |
| 1–2 h                       | 41 (18.2%)          | 38 (92.7%)           | 3 (7.3%)            |                           | 6–8 h                | 86 (38.2%)          | 77 (89.5%)         | 9 (10.5%)                |                          |                      |
| 2–3 h                       | 71 (31.6%)          | 65 (91.5%)           | 6 (8.5%)            |                           | >8 h                | 76 (33.8%)          | 33 (97.1%)         | 1 (2.9%)                 |                          |                      |
| Total                       | 228 (100%)          | 209 (91.7%)          | 19 (8.3%)           |                          | Total               | 228 (100%)          | 209 (91.7%)         | 19 (8.3%)                |                          |                      |
Rethaiaa et al.7 found that 21.8% of males from HS attributed to environmental and genetic factors. Al-
OB (40.1%) was higher than ours (36.8%), which could be 24.9% and 15.2%, respectively. The prevalence of OW and W_C (grains, and eggs, had insignificant effects on BMI and on 15.7% were obese).7 El-Quadh8 surveyed 72 males and 74 that 38.4% of participants were obese (BMI indicated 16.7% were obese). The prevalence of OW and OB (37.5%) in that Qassim University were overweight, while 15.7% were obesity (16.7%) among male students was much higher than that among females (6.7%).

The order of OW and OB from highest to lowest was as follows: 6th > 5th > 1st > 2nd > 3rd (4th). Although the lowest percent of participants were from the sixth year, this group of students had the highest rate of OW and OB (72.7%), while the second highest (53.2%) was reported for the 5th-year students. Several studies indicate those particular periods of our lives that are more likely to affect lifestyle and hence body mass.3 For example, the transition period from high school to university seems to be linked with a decrease in physical activities and an increase in sedentary activates, leading students to gain weight.22 Similarly, Morrow et al.25 indicated a weight decrease (2.4 pounds) among females entering their freshman year. The highest rate of OW and OB among the 6th-year students could be

Others types of food, namely, milk, fruits/vegetables, grains, and eggs, had insignificant effects on BMI and on W_C (P > 0.05) (Tables 6 and 7).

Discussion

This study indicated that 36.8% of participants were overweight and obese. Similar results were reported in different areas of KSA. For example, Al-Qahtani and his team19 showed that the prevalence of OB and OW was different areas of KSA. For example, Al-Qahtani and his team19 showed that the prevalence of OB and OW was 29.7% of females were overweight and obese. Obesity and overweight among males was 1.7× higher than females, likely due to awareness of females about their body appearance20 as well as the fact that males and females differ in regards to lifestyles. These results agreed with those of Al-Hazzaa and his colleagues in KSA.21 Results of this study disagreed with the findings of Farghly et al.20 In a study conducted in a Canadian university, the prevalence of OW and OB among males was higher than that among females (29.3% vs. 20.9%), which agreed with our findings.

Table 3: Effects of participant’s lifestyle on body mass index among health sciences students, Taif University, KSA.

| Freq. (%) | Body mass index | P-value |
|-----------|-----------------|---------|
|           | Under-weight    | Normal-weight | Over-weight | Obesity |
| Smoking   | Yes 24 (10.5%)  | 3 (12.5%) | 15 (62.5%) | 3 (12.5%) | 3 (12.5%) | 0.720 |
|           | No 204 (89.5%) | 23 (11.3%) | 103 (50.5%) | 56 (27.5%) | 22 (10.8%) | |
| Smoking of a family member | Yes 79 (34.6%) | 13 (16.5%) | 38 (48.1%) | 19 (24.1%) | 9 (11.4%) | 0.488 |
|           | No 149 (65.4%) | 13 (8.7%) | 80 (53.7%) | 40 (26.8%) | 16 (10.8%) | |
| Role of stress | Yes 121 (53.1%) | 12 (9.9%) | 63 (52.1%) | 36 (29.8%) | 10 (8.3%) | 0.402 |
|           | No 107 (46.9%) | 14 (13.1%) | 55 (51.4%) | 23 (21.5%) | 15 (13.9%) | |
| Physical activity | Yes 118 (51.8%) | 11 (9.3%) | 59 (50%) | 35 (29.7%) | 13 (11.0%) | 0.443 |
|           | No 110 (48.2%) | 15 (13.6%) | 59 (53.6%) | 24 (21.8%) | 12 (10.9%) | |
| Duration of Physical activity per week | < 1 h 45 (37.5%) | 3 (6.7%) | 26 (57.8%) | 13 (28.9%) | 3 (6.7%) | 0.376 |
|           | 2 h or less 22 (18.3%) | 1 (4.5%) | 13 (59.1%) | 4 (18.2%) | 4 (18.2%) | |
|           | 3 h 20 (16.7%) | 3 (15%) | 11 (55%) | 5 (25%) | 1 (5%) | |
|           | 4 h 10 (8.3%) | 1 (10%) | 5 (50%) | 2 (20%) | 2 (20.0%) | |
| Kind of exercise | Running 63 (52.9%) | 4 (6.3%) | 31 (49.2%) | 22 (34.9%) | 6 (9.5%) | 0.142 |
|           | Swimming 8 (6.7%) | 2 (25%) | 4 (50%) | 2 (25%) | 0 (0.0%) | |
|           | Soccer 21 (17.6%) | 0 (0.0%) | 12 (57.1%) | 4 (19%) | 5 (23.8%) | |
|           | Dancing 27 (22.7%) | 5 (18.5%) | 13 (48.1%) | 7 (25.9%) | 2 (7.4%) | |
| TV viewing, using computer or play video games | <2 h/day 28 (12.3%) | 6 (21.4%) | 12 (42.9%) | 7 (25.0%) | 3 (10.7%) | 0.880 |
|           | 2–4 h/day 50 (21.9%) | 6 (12.0%) | 25 (50.0%) | 15 (30.0%) | 4 (8.0%) | |
|           | 4–6 h/day 95 (41.7%) | 9 (9.5%) | 51 (53.7%) | 24 (25.3%) | 11 (11.6%) | |
|           | > 8 h/day 55 (24.1%) | 5 (9.1%) | 30 (54.5%) | 13 (23.6%) | 7 (12.7%) | |
| Duration of day time sleep | Never 27 (12.0%) | 4 (14.8%) | 13 (48.1%) | 8 (29.6%) | 2 (7.4%) | 0.552 |
|           | <1 h 13 (5.8%) | 1 (7.7%) | 9 (69.2%) | 0 (0.0%) | 3 (23.1%) | |
|           | 1–2 h 41 (18.2%) | 1 (2.4%) | 22 (53.7%) | 11 (26.8%) | 7 (17.1%) | |
|           | 2–3 h 71 (31.6%) | 11 (15.5%) | 34 (47.9%) | 20 (28.2%) | 6 (8.4%) | |
|           | ≥ 4 h 73 (32.4%) | 9 (12.3%) | 37 (50.7%) | 20 (27.4%) | 7 (9.6%) | 0.936 |
| Duration of night sleep | <4 h 29 (12.9%) | 2 (6.9%) | 17 (58.6%) | 8 (27.6%) | 2 (6.9%) | |
|           | 4–6 h 76 (33.8%) | 9 (11.8%) | 41 (53.9%) | 18 (23.7%) | 8 (10.5%) | |
|           | ≥ 8 h 86 (38.2%) | 9 (10.5%) | 39 (45.3%) | 26 (30.2%) | 12 (14%) | |
| Total     | 228 (100%) | 26 (11.4%) | 118 (51.8%) | 59 (25.9%) | 25 (10.9%) |
explained as follows: students in their senior year have completed all courses requirements and all their efforts towards training. This year is a transition period between university setting and the job market. Thus, this period could be accompanied with an increase in physical inactivity and sedentary behaviours, poor eating habits, and stress-related eating. A failure of students in their senior year to adapt to stress may negatively affect their eating behaviours. Therefore, further studies should be conducted to investigate these results.

Socio-economic status had insignificant effect on rates of OW and OB, which disagreed with those of Amin et al.\textsuperscript{13} and the findings of Al-Hazzaa et al.\textsuperscript{21}

Physical activity is defined as any movement of body skeletal muscles that results in energy expenditures over the basal level.\textsuperscript{26} It is well known that physical activity is of great importance for normal growth as well as development and maintenance of healthy children and adolescents. Moderate and vigorous are two levels of physical activities. A moderate level is when the heart rate exceeds 139 beat per minute, while the vigorous level is when the heart rate exceeds 159 beat per minute.\textsuperscript{26} According to the American Heart Association, these two levels should be performed by children and youths for at least 60 min a day.\textsuperscript{26} In physically active students, OW and OB (39.7%) were higher than the corresponding rates (32.7%) in physically inactive students, which was against expectation. Nonetheless, the difference was statistically insignificant ($P = 0.628$). Recent published data showed that the majority of Saudi children (60%) and adolescents (71%) were physically inactive.\textsuperscript{26} Omer et al.\textsuperscript{10} reported much higher rates of physical inactivity (91.7%).

| Table 4: Effects of participants’ eating habits on body mass index among health sciences students, Taif University, KSA. |
|---------------------------------------------------------------|
| **Freq. (%)** | **Body mass index** | **P-value** |
| **Under-weight** | **Normal-weight** | **Over-weight** | **Obesity** |
| Breakfast intake | | | |
| Never | 17 (7.5%) | 3 (17.6%) | 9 (52.9%) | 3 (17.6%) | 2 (11.8%) | 0.697 |
| 2/wk. | 34 (14.9%) | 6 (17.6%) | 19 (55.9%) | 7 (20.6%) | 2 (5.9%) |
| 3/wk. | 37 (16.2%) | 2 (5.4%) | 20 (51.4%) | 9 (24.3%) | 6 (16.2%) |
| 4/wk. | 34 (14.9%) | 1 (2.9%) | 17 (50.0%) | 11 (32.4%) | 5 (14.7%) |
| ≥5/wk. | 106 (46.5%) | 14 (13.2%) | 53 (50.0%) | 29 (27.4%) | 10 (9.4%) |
| Light meals (snacks) intake | | | |
| Daily | 62 (27.2%) | 10 (16.1%) | 34 (54.8%) | 10 (16.1%) | 8 (12.9%) | 0.104 |
| 4–6/wk. | 43 (18.9%) | 1 (2.3%) | 22 (51.2%) | 14 (32.6%) | 6 (13.9%) |
| 1–3/mo. | 66 (28.9%) | 5 (7.6%) | 39 (59.1%) | 16 (24.2%) | 6 (9.1%) |
| 1–2/mo. | 30 (13.2%) | 7 (23.3%) | 14 (46.7%) | 6 (20.0%) | 3 (10.0%) |
| Never | 27 (11.8%) | 3 (11.1%) | 9 (33.3%) | 13 (48.1%) | 2 (7.4%) |
| Eating with family | | | |
| Daily | 145 (63.6%) | 13 (9.0%) | 82 (56.6%) | 37 (25.5%) | 13 (10.0%) | 0.222 |
| 3–4/wk. | 47 (20.6%) | 7 (14.9%) | 24 (51.1%) | 8 (17.0%) | 8 (17.0%) |
| 1–2/wk. | 19 (8.3%) | 5 (26.3%) | 7 (36.8%) | 6 (31.6%) | 1 (5.3%) |
| Rarely | 17 (7.5%) | 1 (5.9%) | 5 (29.4%) | 8 (47.1%) | 3 (17.6%) |
| Never | 27 (11.8%) | 3 (11.1%) | 9 (33.3%) | 13 (48.1%) | 2 (7.4%) |
| Fast food intake | | | |
| Daily | 17 (7.5%) | 6 (12.5%) | 9 (56.3%) | 3 (18.8%) | 2 (12.5%) | 0.572 |
| 4–6/wk. | 33 (14.5%) | 3 (9.1%) | 16 (48.5%) | 7 (21.2%) | 7 (21.2%) |
| 2–3/wk. | 104 (45.6%) | 14 (13.5%) | 50 (48.1%) | 29 (27.9%) | 11 (10.6%) |
| 1–2/mo. | 69 (30.3%) | 7 (10.1%) | 41 (59.4%) | 16 (23.2%) | 5 (7.2%) |
| Never | 6 (2.6%) | | | | |
| Soft drink intake | | | |
| More than 4 cans per day | 8 (3.5%) | 1 (12.5%) | 4 (50.0%) | 3 (37.5%) | 0 (0.0%) | 0.336 |
| 3–4 cans per day | 12 (5.7%) | 1 (7.7%) | 6 (46.2%) | 3 (23.1%) | 3 (23.1%) |
| 1–2 cans daily | 36 (15.8%) | 4 (11.1%) | 18 (50.0%) | 9 (25.0%) | 5 (13.9%) |
| 4–6 times/wk. | 33 (14.5%) | 6 (18.2%) | 15 (45.5%) | 7 (21.2%) | 5 (15.1%) |
| 1–3 times/wk. | 56 (24.6%) | 11 (19.6%) | 26 (46.4%) | 14 (25.0%) | 5 (8.9%) |
| 1–2 times/mo. | 47 (20%) | 3 (6.4%) | 31 (66.0%) | 8 (17.0%) | 5 (10.6%) |
| Never | 35 (15.4%) | 0 (0.0%) | 18 (51.4%) | 15 (42.9%) | 2 (5.7%) |
| Diet soft drink intake | | | |
| Daily | 20 (9.8%) | 2 (10.0%) | 10 (50.0%) | 4 (20.0%) | 4 (20.0%) | 0.395 |
| 4–6/wk. | 19 (8.3%) | 3 (15.8%) | 8 (42.1%) | 4 (21.1%) | 4 (21.1%) |
| 1–3/wk. | 29 (12.7%) | 2 (6.9%) | 16 (55.2%) | 8 (27.6%) | 3 (10.3%) |
| 1–2/mo. | 29 (12.7%) | 1 (3.4%) | 14 (48.3%) | 10 (34.5%) | 4 (13.8%) |
| Never | 131 (57.5%) | 18 (7.3%) | 70 (53.4%) | 33 (25.2%) | 10 (7.7%) |
| Meat intake | | | |
| Daily | 67 (29.4%) | 7 (10.4%) | 37 (55.2%) | 15 (22.4%) | 8 (11.9%) | 0.108 |
| 1–2/wk. | 65 (28.5%) | 7 (10.8%) | 35 (53.8%) | 15 (23.1%) | 8 (12.3%) |
| 3–4/wk. | 57 (25.0%) | 7 (12.3%) | 23 (40.4%) | 22 (38.6%) | 5 (8.8%) |
| 5–6/wk. | 24 (10.5%) | 2 (8.3%) | 13 (54.2%) | 5 (20.8%) | 4 (16.7%) |
| Never | 15 (6.6%) | 3 (20.0%) | 10 (66.7%) | 2 (13.3%) | 0 (0.0%) |
| Liver intake | | | |
| Daily | 2 (0.9%) | 0 (0.0%) | 1 (50%) | 1 (50%) | 0 (0.0%) | 0.022 |
| 1–2/wk. | 113 (49.6%) | 11 (9.7%) | 57 (50.4%) | 30 (26.5%) | 15 (13.3%) |
| 3–4/wk. | 10 (4.4%) | 0 (0.0%) | 8 (80%) | 1 (10%) | 1 (10%) |
| 5–6/wk. | 10 (4.4%) | 2 (20%) | 5 (50%) | 0 (0.0%) | 3 (30%) |
| Never | 90 (40.8%) | 13 (14.4%) | 47 (50%) | 27 (29%) | 6 (6.5%) |
| Total | 228 (100%) | 26 (11.4%) | 118 (51.8%) | 59 (25.9%) | 25 (10.9%) |
et al.\textsuperscript{11} found that the frequency of physical activity decreased as age increased in both sexes and that boys were more active than females. Racette et al.\textsuperscript{24} found that the percent of university students engaging in aerobic exercise declined considerably from 62\% to 55\% by the second year. Keating et al.\textsuperscript{27} found that approximately 40\%–59\% of university students were physically inactive. Lee and Yuen Loke\textsuperscript{5} found that 68.8\% of university students in Hong Kong engaged in any form of physical activity, and only 13.8\% of students exercised on a regular basis.

Although 41.7\% of overweight and obese students spent 4–6 h watching TV, the highest OW and OB was noted for students who spent 2–4 h a day on TV viewing. A similar effect was reported by Omer et al.\textsuperscript{10} Our results did not find a significant link between BMI and TV watching, computer or other electronic devices. All tested lifestyles in this study showed insignificant ($P > 0.05$) effects on $W_C$, thus, further study is recommended to investigate such results.

Breakfast is considered to be the most significant meal throughout the day for many reasons, including the fact that breakfast intake provides children, especially those attending school, with enough energy for proper brain functions, enhancing learning skills.\textsuperscript{15} Without breakfast, body energy reserves will be depleted over a 12-h gap between dinner and breakfast; thus, it results in a decrease in the level of glucose in the blood. If this decline is significant, it can result in a quick disturbance in cerebral function.\textsuperscript{15} The highest percentage of OW and OB (47.1\%) was for students who ate breakfast 4 times a week, while the combined one (29.8\%) was for those who skipped their breakfast. Breakfast intake had an insignificant effect ($P = 0.936$) on BMI or $W_C$ ($P = 0.856$), which agrees with the finding of both Omer et al.\textsuperscript{10} and Al-Rethaiaa et al.\textsuperscript{7}

\begin{table}[h]
\begin{center}
\begin{tabular}{|c|c|c|c|c|}
\hline
\textbf{Table 5: Effects of participants’ eating habits on waist circumference of health sciences students, Taif University, KSA.} & \multicolumn{4}{c|}{\textbf{Waist circumference}} \\
\hline
& \textbf{Freq. (\%)} & \textbf{No risk} & \textbf{Risk} & \textbf{$P$-value} \\
\hline
\textbf{Breakfast intake} & & & & \\

\text{Never} & 17 (7.5\%) & 16 (94.1\%) & 1 (5.9\%) & 0.889 \\

\text{2/wk.} & 34 (14.9\%) & 32 (94.1\%) & 2 (5.9\%) & \\

\text{3/wk.} & 37 (16.2\%) & 33 (89.2\%) & 4 (10.8\%) & \\

\text{4/wk.} & 34 (14.9\%) & 32 (94.1\%) & 2 (5.9\%) & \\

\text{≥5/wk.} & 106 (46.5\%) & 96 (90.6\%) & 10 (9.4\%) & \\
\hline
\textbf{Light meals intake} & & & & \\

\text{Daily} & 62 (27.2\%) & 57 (91.9\%) & 5 (8.1\%) & 0.584 \\

\text{4–6/wk.} & 43 (18.9\%) & 37 (86\%) & 6 (14\%) & \\

\text{2–3/mo.} & 66 (28.9\%) & 61 (92.4\%) & 5 (7.6\%) & \\

\text{1–2/mo.} & 30 (13.2\%) & 29 (96.7\%) & 1 (3.3\%) & \\

\text{Never} & 27 (11.8\%) & 25 (92.6\%) & 2 (7.4\%) & \\
\hline
\textbf{Eating with family} & & & & \\

\text{Daily} & 145 (63.6\%) & 134 (92.4\%) & 11 (7.6\%) & 0.495 \\

\text{3–4/wk.} & 47 (20.6\%) & 44 (93.6\%) & 3 (6.4\%) & \\

\text{1–2/wk.} & 19 (8.3\%) & 17 (89.5\%) & 2 (10.5\%) & \\

\text{Never} & 17 (7.5\%) & 14 (82.4\%) & 3 (17.6\%) & \\
\hline
\textbf{Fast food intake} & & & & \\

\text{Daily} & 16 (7.0\%) & 16 (100\%) & 0 (0.0\%) & 0.674 \\

\text{4–6/wk.} & 33 (14.5\%) & 30 (90.9\%) & 3 (9.1\%) & \\

\text{2–3/wk.} & 104 (45.6\%) & 95 (91.3\%) & 9 (8.7\%) & \\

\text{1–2/mo.} & 69 (30.3\%) & 62 (89.9\%) & 7 (10.1\%) & \\

\text{Never} & 6 (2.6\%) & 6 (100\%) & 0 (0.0\%) & \\
\hline
\textbf{Soft drink intake} & & & & \\

\text{More than 4 cans per day} & 8 (3.5\%) & 7 (87.5\%) & 1 (12.5\%) & 0.499 \\

\text{3–4 cans per day} & 13 (5.7\%) & 11 (84.6\%) & 2 (15.4\%) & \\

\text{1–2 cans daily} & 36 (15.8\%) & 3 (86.1\%) & 5 (13.9\%) & \\

\text{4–6/wk.} & 33 (14.5\%) & 29 (87.9\%) & 4 (12.1\%) & \\

\text{2–3/wk.} & 56 (24.6\%) & 53 (96.4\%) & 3 (5.4\%) & \\

\text{1–2/wk.} & 47 (20\%) & 44 (93.6\%) & 3 (6.4\%) & \\

\text{Never} & 35 (15.4\%) & 34 (97.1\%) & 1 (2.9\%) & \\
\hline
\textbf{Diet soft drink intake} & & & & \\

\text{Daily} & 20 (8.8\%) & 18 (90\%) & 2 (10\%) & 0.476 \\

\text{4–6/wk.} & 19 (8.3\%) & 16 (84.2\%) & 3 (15.8\%) & \\

\text{1–3/wk.} & 29 (12.7\%) & 27 (93.1\%) & 2 (6.9\%) & \\

\text{1–2/mo.} & 29 (12.7\%) & 25 (86.2\%) & 4 (13.8\%) & \\

\text{Never} & 131 (57.5\%) & 123 (93.9\%) & 8 (6.1\%) & \\
\hline
\textbf{Meat intake} & & & & \\

\text{Daily} & 67 (29.4\%) & 62 (92.5\%) & 5 (7.5\%) & 0.141 \\

\text{1–2/wk.} & 65 (28.5\%) & 55 (84.6\%) & 10 (15.4\%) & \\

\text{3–4/wk.} & 57 (25.0\%) & 54 (94.7\%) & 3 (5.3\%) & \\

\text{5–6/wk.} & 24 (10.5\%) & 23 (95.8\%) & 1 (4.2\%) & \\

\text{Never} & 15 (6.6\%) & 15 (100\%) & 0 (0.0\%) & \\
\hline
\textbf{Liver intake} & & & & \\

\text{Daily} & 2 (0.9\%) & 2 (100\%) & 0 (0.0\%) & \\

\text{1–2/wk.} & 113 (49.6\%) & 101 (89.4\%) & 12 (10.6\%) & 0.318 \\

\text{3–4/wk.} & 10 (4.4\%) & 10 (100\%) & 0 (0.0\%) & \\

\text{5–6/wk.} & 10 (4.4\%) & 8 (80\%) & 2 (20\%) & \\

\text{Never} & 93 (40.8\%) & 88 (94.6\%) & 5 (5.4\%) & \\
\hline
\textbf{Total} & 228 (100\%) & 209 (91.7\%) & 19 (8.3\%) & \\
\hline
\end{tabular}
\end{center}
\end{table}
et al.\textsuperscript{8} reported that approximately 15.7% of Saudi college students skipped their breakfast.

The results support the initial hypothesis that eating with family has a negative impact on W_C. It is rational to assume that frequent intake of family meals would be linked with a family has a negative impact on W_C. It is rational to assume that frequent intake of family meals would be linked with a low prevalence of OW/OB. Several possible mechanisms were cited by Utter et al.\textsuperscript{25} for the positive links between eating with family and youth nutrition, including the availability of healthy food choices at home, family discussions concerning food and nutrition, and/or parental modelling healthy eating. Conversely, no such considerable impact was noted on BMI. Amin et al.\textsuperscript{13} showed a positive correlation between consumption of food away from family and BMI. These results contradicted those of Al-Rethaiaa et al.\textsuperscript{7} who found a considerable negative correlation between BMI and taking meals with family and youth nutrition, including the theoretical positive link between soft drinks and BMI could be that excessive sugars are stored as fat in the body, leading to weight increase and obesity.\textsuperscript{29} Furthermore, diets high in sugar have contributed to the development of other disorders, such as dyslipidaemia and insulin resistance diabetes.\textsuperscript{32} Collison et al.\textsuperscript{11} found a positive correlation between consumption of sugary drinks and BMI and W_C among male students aged 10–19 years in Riyadh City (KSA). Moreover, Collison et al.\textsuperscript{11} suggested that as the age of schoolchildren increases, there is a trend towards sugary foods and less healthy food options.

Unlike fatty meats, seafood is considered a good source of protein with a low content of saturated lipids. Furthermore, fish contains a good amount of beneficial n-3 fatty acids. The results showed an insignificant (P = 0.170) effect of seafood on BMI and on W_C (P = 0.789). Seafood with the beneficial n-3 fatty acids has been shown to be efficient in weight reduction and loss of abdominal adiposity in a number of trials. For example, in a randomized controlled trial of calorie-limited diets, the inclusion of fish (either lean or fatty) or fish oil in the energy-restricted diet resulted in an almost 1 kg weight reduction in young overweight men.\textsuperscript{31}

It is well known that fruits/vegetables play a very important role in reducing overall energy uptake, because of high contents of water and fibres. Thus, adding fruits and vegetables to the meals is beneficial in weight control. The highest rate of OW and OB (48.6%) was for those who never consumed such drinks. Theoretically, high-calorie drinks are expected to increase BMI.\textsuperscript{29} One probable explanation of the theoretical positive link between soft drinks and BMI could be that excessive sugars are stored as fat in the body, leading to weight increase and obesity.\textsuperscript{29}

### Table 6: Effects of participants’ food patterns on body mass index of health sciences students, Taif University, KSA.

| Food Pattern                | Freq. (%) | Body mass index |
|-----------------------------|-----------|----------------|
|                            |           | Under-weight   | Normal-weight | Over-weight | Obesity |
| Egg intake                  |           |                |               |            |         |
| ≥12/wk.                     | 10 (4.4%) | 1 (10%)        | 4 (40%)       | 4 (40%)    | 1 (10%) |
| 8–11/wk.                    | 8 (3.5%)  | 1 (12.5%)      | 6 (75%)       | 1 (12.5%)  | 0 (0%)  |
| 5–7/wk.                     | 36 (15.8%)| 1 (2.8%)       | 16 (44.4%)    | 10 (27.8%) | 9 (25%) |
| 2–4/wk.                     | 58 (25.4%)| 6 (10.3%)      | 35 (60.3%)    | 11 (19%)   | 6 (10.3%) |
| <2/wk.                      | 84 (36.8%)| 10 (11.9%)     | 43 (51.2%)    | 25 (29.8%) | 6 (7.1%) |
| Never                       | 32 (14%)  | 7 (21.9%)      | 14 (43.8%)    | 8 (25%)    | 3 (9.4%) |
| Fish and seafood intake     |           |                |               |            |         |
| 1–2/mo.                     | 123 (53.9%)| 8 (6.5%)      | 67 (54.5%)    | 32 (26%)   | 16 (13%) |
| 3–4/mo.                     | 48 (21.1%)| 7 (14.6%)      | 24 (50%)      | 11 (22.9%) | 6 (12.5%) |
| 5–6/mo.                     | 12 (5.3%) | 2 (16.7%)      | 7 (58.3%)     | 3 (25%)    | 0 (0%)  |
| >6/mo.                      | 17 (7.5%) | 1 (5.9%)       | 11 (64.7%)    | 5 (29.4%)  | 0 (0%)  |
| Never                       | 28 (12.3%)| 8 (28.6%)      | 9 (32.1%)     | 8 (28.6%)  | 3 (10.7%) |
| Fried food intake           |           |                |               |            |         |
| Daily                       | 16 (7%)   | 1 (6.3%)       | 10 (62.5%)    | 2 (12.5%)  | 3 (18.8%) |
| 1–2/wk.                     | 101 (44.3%)| 10 (9.9%)     | 57 (56.4%)    | 25 (24.8%) | 9 (8.9%) |
| 3–4/wk.                     | 59 (25.9%)| 9 (15.3%)      | 27 (45.8%)    | 16 (27.1%) | 7 (11.9%) |
| 5–6/wk.                     | 30 (13.2%)| 2 (6.7%)       | 16 (53.3%)    | 7 (23.3%)  | 5 (16.6%) |
| Never                       | 22 (9.6%) | 4 (18.2%)      | 8 (36.4%)     | 9 (40.9%)  | 1 (4.5%) |
| Milk intake                 |           |                |               |            |         |
| Daily                       | 43 (18.9%)| 4 (9.3%)       | 29 (67.4%)    | 10 (23.3%) | 0 (0%)  |
| 1–2/wk.                     | 86 (37.7%)| 12 (14%)       | 40 (46.5%)    | 20 (23.3%) | 14 (16.4%) |
| 3–4/wk.                     | 43 (18.9%)| 5 (11.6%)      | 22 (51.2%)    | 9 (20.9%)  | 7 (16.3%) |
| 5–6/wk.                     | 31 (13.6%)| 4 (12.9%)      | 16 (51.6%)    | 9 (29%)    | 2 (6.5%) |
| Never                       | 25 (11%)  | 1 (4%)         | 11 (44%)      | 11 (44%)   | 2 (8%)  |
| Fruit/vegetable intake      |           |                |               |            |         |
| ≥5/d.                       | 13 (5.7%) | 2 (15.4%)      | 3 (23.1%)     | 6 (46.2%)  | 2 (15.4%) |
| 3–4/d.                      | 51 (22.4%)| 2 (3.9%)       | 29 (56.9%)    | 11 (21.6%) | 9 (17.7%) |
| 1–2/d.                      | 126 (55.3%)| 19 (15.1%)   | 71 (56.3%)    | 25 (19.8%) | 11 (8.7%) |
| Never                       | 38 (16.7%)| 3 (7.9%)       | 15 (39.5%)    | 17 (44.7%) | 3 (7.9%) |
| Grain intake                |           |                |               |            |         |
| ≥5 servings/d.              | 25 (11%)  | 2 (8%)         | 13 (52%)      | 8 (32%)    | 2 (8%)  |
| 3–4 servings/d.             | 55 (24.1%)| 12 (21.8%)     | 30 (54.5%)    | 7 (12.7%)  | 6 (10.9%) |
| 1–2 servings/d.             | 134 (58.9%)| 11 (8.2%)     | 71 (53%)      | 37 (27.6%) | 15 (11.1%) |
| Never                       | 14 (6.1%) | 1 (7.1%)       | 4 (28.6%)     | 7 (50%)    | 2 (14.3%) |
| Total                       | 228 (100%)| 26 (11.4%)     | 118 (51.8%)   | 59 (25.9%) | 25 (10.9%) |
vegetables would be linked with a low prevalence of OW/OB, but the results indicated the opposite, possibly due to, in Saudi society, the fact that the intake of raw fruits and vegetables during meals is not a common eating habit. Vegetable consumption in the majority of Saudi diets is too little to influence the overall calorie intake, and since most Saudis consume fruits at the end of their meals as a treat, it therefore results in losing their “satiety impact.” Amin and his team found that OW and OB male schoolchildren consume fewer servings of fresh fruits (26.5% vs. 41.4% in lean) and vegetables (36.8% vs. 39.4%) compared to their normal classmates in Al-Hassa (KSA). Lee and Yuen Loke found that over 60.0% of university students in Hong Kong failed to consume fruits on a daily basis, but female students eat 3 servings of vegetables per day.

In the present study, when \( W_C \) was used to assess nutritional status, it was found that 95.2% of participants were at no health risk linked with excess abdominal lipids since they consumed 1–2 or more servings of fruits and vegetables per day.

### Study limitations

This study relied on BMI as a widely used screening tool for body weight, but it could not detect changes in percent body fat, total fat weight as well as total fat-free weight. The precision of self-reported data is one of the main drawbacks of cross-sectional studies like this one. Another possible limitation could be that the sample size was relatively small (\( n = 228 \)). If the sample size was increased, then the accuracy of the study would be increased. Although this study reported a high rate of overweight and obesity (36.8%) among university students, this study did not investigate body composition, since some of this increase could be due to increases in muscle mass.

### Conclusions

The prevalence of OW and OB was 25.9% and 10.9%, respectively, while the combined one was 36.8%; 11.4% of students were underweight. All demographic variables had an insignificant \((P > 0.05)\) effect on \( W_C \). Meanwhile, there was a significant link between gender, academic year and discipline and BMI. Although 48.2% of students admitted that they were physical inactive, this effect was insignificant on both indicators. Smoking, stress, duration of TV viewing, and daylight and night sleep had an effect on BMI and \( W_C \), but this was statistically insignificant. Breakfast, light meals, eating with a family, fast food, and regular and diet soft drinks had an insignificant effect on BMI. All eating habits tested had insignificant effect on \( W_C \). A considerable relationship was observed between consumption of liver and BMI. Meat, egg, milk, fruit and vegetable and grain intake

| Table 7: Effects of participants’ food habits on waist circumference of health sciences students, Taif University, KSA. |
|-----------------|----------------|----------------|------------|
|                  | Freq. (%)      | No risk        | Risk       | \( P \)-value |
| Egg intake       |                |                |            |              |
| \( \geq 12/wk. \) | 10 (4.4%)      | 10 (100%)      | 0 (0%)     | 0.386        |
| 8–11/wk.         | 8 (3.5%)       | 8 (100%)       | 0 (0%)     |              |
| 5–7/wk.          | 36 (15.3%)     | 30 (83.3%)     | 6 (16.7%)  |              |
| 2–4/wk.          | 58 (25.4%)     | 53 (91.4%)     | 5 (8.6%)   |              |
| <2/wk.           | 84 (36.8%)     | 78 (92.9%)     | 6 (7.1%)   |              |
| Never            | 32 (14%)       | 30 (93.8%)     | 2 (6.3%)   |              |
| Fish and seafood intake |        |                |            |              |
| 1–2/mo.          | 123 (53.9%)    | 113 (91.9%)    | 10 (8.1%)  | 0.789        |
| 3–4/mo.          | 48 (21.1%)     | 43 (86.3%)     | 5 (10.4%)  |              |
| 5–6/mo.          | 12 (5.3%)      | 12 (100%)      | 0 (0%)     |              |
| >6/mo.           | 17 (7.5%)      | 16 (94.1%)     | 1 (5.9%)   |              |
| Never            | 28 (12.3%)     | 25 (89.3%)     | 3 (10.7%)  |              |
| Fried food intake |                |                |            |              |
| Daily            | 16 (7%)        | 15 (93.8%)     | 1 (6.3%)   | 0.547        |
| 1–2/wk.          | 101 (44.3%)    | 90 (89.1%)     | 11 (10.9%) |              |
| 3–4/wk.          | 59 (25.9%)     | 54 (91.5%)     | 5 (8.5%)   |              |
| 5–6/wk.          | 30 (13.2%)     | 28 (93.3%)     | 2 (6.7%)   |              |
| Never            | 22 (9.6%)      | 22 (100%)      | 0 (0%)     |              |
| Milk intake      |                |                |            |              |
| Daily            | 43 (18.9%)     | 42 (97.7%)     | 1 (2.3%)   | 0.339        |
| 1–2/wk.          | 86 (37.7%)     | 80 (93%)       | 6 (2.6%)   |              |
| 3–4/wk.          | 43 (18.9%)     | 37 (86%)       | 6 (14%)    |              |
| 5–6/wk.          | 31 (13.6%)     | 28 (90.3%)     | 3 (9.7%)   |              |
| Never            | 25 (11%)       | 22 (88%)       | 3 (12%)    |              |
| Fruit/vegetable intake |            |                |            |              |
| \( \geq 5/d. \)  | 13 (5.7%)      | 11 (84.6%)     | 2 (15.4%)  | 0.162        |
| 3–4/d.           | 51 (22.4%)     | 44 (86.3%)     | 7 (13.7%)  |              |
| 1–2/d.           | 126 (55.3%)    | 120 (95.2%)    | 6 (4.8%)   |              |
| Never            | 38 (16.7%)     | 34 (89.5%)     | 4 (10.5%)  |              |
| Grain intake     |                |                |            |              |
| \( \geq 5 \) servings/d. | 25 (11%) | 23 (92%) | 2 (8%) | 0.302        |
| 3–4 servings/d.  | 55 (24.1%)     | 50 (90.9%)     | 5 (9.1%)   |              |
| 1–2 servings/d.  | 134 (58.8%)    | 125 (93.3%)    | 9 (6.7%)   |              |
| Never            | 14 (6.1%)      | 11 (78.6%)     | 3 (21.4%)  |              |
| Total            | 228 (100%)     | 209 (91.7%)    | 19 (8.3%)  |              |
had no significant effect on BMI. All varieties of foods had no significant effect on WLC. This study recommends the creation of health awareness plan to educate university students concerning healthy lifestyle and healthy food options. It also recommends a health education programme to tackle high rates of overweight and obesity.

Conflict of interest

The authors have no conflict of interest to declare.

Authors’ contributions

FAH was actively involved in planning and designing this work, and writing this manuscript. ASE was actively involved in data analysis, research design and writing. AAA, WAY, SSA, and FSB were actively involved in designing the questionnaire, data collection and analysis among male students. They were also active in writing the manuscript. Additionally, the authors of this research critically reviewed this manuscript and approved the final version.

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