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Original Article

Public Health Section

A Comparative Study of Body Composition and Sleep Habits Between Male and Female Students

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ABSTRACT

Introduction: Elevated body composition is associated with many health hazards and it is also strongly associated with sleep habits of individuals.

Aim: To compare body composition and sleep habits between male and female students.

Materials and Methods: A total of 500 subjects (N=500) were chosen using a convenience sampling technique, Male students (N=250) and female students (N=250). Body composition was measured using Bioelectric Impedance Analyser, Sleep habits were measure with Pittsburg Sleep Quality Index (PSQI) and Epworth Sleepiness Scale (ESS). Independent sample t-test was used to compare body composition and sleep habit for male and female students.

Results: The result showed that there is a significant difference between male and female students for the Body Mass Index (BMI), body fat, total body water, except PSQI and ESS. Whereas, no significant difference existed between male and female students to PSQI and ESS for sleep habits.

Conclusion: Sleep habits also need further commitment towards the factors that may obstruct with good quality of sleep. Authors may develop evidence-based strategies according to the individual need for prevention of obesity and abnormal sleep habits.

Keywords: Community health, Obesity, Public health, Sleepiness

INTRODUCTION

A persons' health subsequently depends upon the level of his body composition. It consist percentage of fat, bone, water, and muscle. Many health consultants around the world agreed that there is a health danger if the level of fat is too high in the human body. Presently it is clear that the factors of body composition are wide and involve multiple interfaces of cultural, environmental, social and lifestyle factors. A high level of fat percentage associated with a threat for health problems for stance high blood pressure, high blood cholesterol, diabetes, and sleeping disorder. Numerous studies found that there is an effect of sleep on body composition.

Sleep is a natural process that allows the body and brain to rest and recover. Irregular sleep patterns, inadequate sleep quality, and insufficient sleep play a significant role to determine the health status of individuals. Quality of sleep is not only effective as an indicator of health but also a key component of quality of life [1]. American adults reported around 27.5% to 29.1% short sleep duration [2]. Numerous studies have investigated the relationship between obesity and sleep. Sleep apnea has an estimated prevalence of 9% to 28% among females and 27% to 34% among males, 30 to 70 years of age [3]. Every person requires sleep; both genders experiences sleep differently throughout their lifetimes. They face different challenges to sleep. Females are more prone to insomnia, while males are more likely to suffer from a sleep disorder like sleep apnea and snoring. Galland BC et al., reported poor sleep quality by 56% of participants and were more common in girls (63.1%) than in boys (44.5%), and sleep hygiene was significantly worse in females [4]. The symptoms for insomnia prevalence increased in females from 3.4% to 12.2% and in males from 4.3% to 9.1% [5]. The studies on sleep and body composition in the Saudi region on adolescent found that there is an inverse relationship between poor sleep duration (less than seven hours per day) and obesity/overweight [6,7]. Mahfouz MS et al., revealed that university female students have poor sleep quality (69.1%) as they slept a mean of 4.77 hours/night [8]. In particular, epidemiological studies had shown a contrary correlation between sleep duration and BMI [9]. Sleep medicine in Saudi Arabia emphasising that there are many demands for further sleep studies to discuss the issues on the prevalence of numerous sleep disorders amongst Saudi population related to lifestyle and body composition [10].

Although longitudinal research is needed to confirm study results, researchers observed a counter relationship between duration of sleep and risk towards obesity development in children. In addition, every 30 minutes of sleep disruption leads to a 3% decline in daytime activity. Overall, study results indicate that sufficient duration and quality of sleep are significant factors for childhood obesity prevention [11]. Researchers found significant prediction between sleep duration in overweight male and z-score of BMI, where the long duration of sleep was linked with risk for overweight and lower BMI. In both regression models calculated for female adolescents, the duration of sleep is not a predictor for the risk of overweight or BMI z-score, indicating a gender difference in BMI and duration of sleep [12]. Many types of research are necessary to estimate how sleep effects on body composition, Inadequate sleep may also increase the chances to eat more, particularly if time spent in an inactive way, like browsing the internet, playing video games, watching television even taking unhealthy foods habits. Daily routine work at home that leads to reduced sleep and increased food intake. However, the latest evidence linking BMI with sleep for a different population. There is little evidence for body fat, but not for the total body water with sleep habits for male and female students. In the present study authors investigated about body composition (BMI, body fat, and body water) and sleep habits amongst male and female students which would be helpful in identifying the effect of sleep habits on the body composition and adopt the preventive strategies for obesity and abnormal sleep.

MATERIALS AND METHODS

This comparative study was performed in the eastern region of Saudi Arabia. The data collection was done between academic years 2017-2018 at College of Applied Medical Sciences, Dammam. Ethical approval was obtained from the Institutional Review Board (IRB) from deanship of research, Imam Abdulrahman

Bin Faisal University, Dammam, Saudi Arabia (IRB-2017-03-165). All participants participated in this study voluntarily, and the researchers received consent from the participants before the start of the test. The exclusion criteria for this study were to include those individuals, who suffer from physical or mental disabilities, cardiac problems, or any chronic illness, and pregnancy. The sample size was calculated as 250 male and 250 female, in a normal population with 90% power and 5% significant level. All the participants were adult students of applied medical Science courses.

Height and Body Composition Measurement

Height was measured to the nearest 0.1 cm with a portable electronic calibrated stadiometer (Detecto Scale- model 750, USA) and body composition {Body Mass Index (BMI), Body Fat (BF) and Total Body Water (TBW)} determined by using bioelectric impedance analysis (BIA) (iOi 253, Jawon Medical, S.Koria). BIA showed excellent relative agreement to the estimated true value {ρ=0.97 (0.96, 0.98)} [13]. BIA has been used in several researches with various populations to compare four-compartment model [14]. The assessment was done according to the manufacturer instruction. As the device was ready to measure, the participants were instructed to stand in the middle of the device, barefoot, with the front of the feet in contact with the anterior electrodes and the heel touching the posterior electrodes. Demographic particulars were entered into the device and participants asked to grip the hand-hold electrodes with both hands and to start the measurement press the button attached with it. Body composition was measured in the morning.

Pittsburg Sleep Quality Index (PSQI)

The PSQI was used to measure usual sleep habits and sleep disturbance during the prior month only. The PSQI based on 24 questions (4 questions are open-ended and 20 questions are to be evaluated as 0-3 score), 19 questions are self-reported and 5 questions involved secondary feedback. Only self-reported questions were used for the quantitative evaluation of sleep quality as perceived through the participants. A total of 19 self-reported questions used to get total scores (range: 0-21) as a global score. This score stipulates the summary of the participant's quality of life of the last month [15]. The scoring test-retest reliability correlation coefficient was 0.85 and internal consistency was Cronbach's alpha 0.83.

Epworth Sleepiness Scale (ESS)

Epworth Sleepiness Scale is a very inexpensive and easy to use for individuals and large groups. It is a unitary scale that is reliable and valid for measuring a person's average sleep propensity in daily life during the course of the day. The measure consists of eight items on a four-point Likert's scale on which respondents rate their response regarding the chance of dozing in each situation, from 0 (would never) to 3 (high chance). The ESS score (the sum of eight items scores) can range from 0-24. The score 0-5 advice lower normal, 6-10 advice higher normal, 11-12 mild excessive, 13-15 moderate excessive and 16-24 severe excessive daytime sleepiness. The questionnaire takes >2-3 minutes to respond. The internal consistency of the eight questions was Cronbach's alpha between 0.73 and 0.90 (mean=0.82) in different studies [16,17]. The test-retest reliability intraclass correlation coefficient also varied 0.81 and 0.93 in different studies [18-21].

Confidence Test

The reliability test of the data showed that the Cronbach's alpha coefficient was 0.702, which had a high level of credibility and could be used for the evaluation of males and females students.

STATISTICAL ANALYSIS

The collected data were analysed by using SPSS version 21.0 software. To evaluate the score of body composition and sleep habits descriptive statistic were used. The "independent sample *t*-test" was employed to determine the significant differences between males and females students. The level of significance was set at 0.05.

RESULTS

Participant's anthropometric characteristic are presented in below [Table/Fig-1]. The [Table/Fig-2] shows the descriptive statistic for BMI, BF, TBW, PSQI, and ESS of males and females. It revealed that males' participants have higher BMI, BF, TBW, PSQI, and ESS than females' students.

	Age (year)	Height (cm)	Weight (kg)	BMI (Kg/m^2)
Male (Mean±SD)	19.44±3.33	166.86±8.63	76.05±27.14	27.03±8.38
Female (Mean±SD)	19.35±2.79	157.14±5.33	57.08±13.61	23.10±5.28

[Table/Fig-1]: Descriptive statistic of males and females.

Variables	Gender	N	Mean±SD	Std. Error Mean
BMI	Male	250	27.03±8.38	0.53
	Female	250	23.10±5.28	0.33
BF	Male	250	22.98±15.57	0.98
	Female	250	18.38±12.80	0.81
TBW	Male	250	38.31±9.53	0.60
	Female	250	28.30±4.02	0.25
PQSI	Male	250	8.14±2.24	0.14
	Female	250	7.97±2.32	0.15
ESS	Male	250	10.97±3.62	0.23
	Female	250	10.47±4.06	0.26

[Table/Fig-2]: Descriptive statistic of body mass index, body fat, total body water, pittsburgh sleep quality index, and epworth sleepiness scale of males and females.

The [Table/Fig-3] shows the statistical analysis for the different variables using independent sample t-test. Since the value for the BMI, BF, TWB, PSQI and ESS is greater than 0.05 equal variance was assumed. The calculated t-value for BMI, BF and TBW were 6.270, 3.605, and 15.295 respectively. It revealed that there was a significant difference in BMI, BF and TBW between males and females at 0.05 significant level (p≤0.001) whereas, the calculated t-value for PSQI and ESS were 0.844 and 1.302 respectively. It revealed that there was no significant difference in PSQI and ESS between males and females at 0.05 significant level (p=0.399 and 0.193).

Variables	N	Mean Difference	Std. Error Difference	t	Sig. (2-tailed)
BMI	500	3.928	0.626	6.270	≤0.001*
BF	500	4.594	1.274	3.605	≤0.001*
TBW	500	10.008	0.654	15.295	≤0.001*
PQSI	500	0.172	0.204	0.844	0.399
ESS	500	0.448	0.344	1.302	0.193

[Table/Fig-3]: Comparison of the variables amongst males and females.
*Significant at 0.05 level

DISCUSSION

From the findings, it was observed that the male participants possess more score for BMI, body fat, total body water, PSQI, and ESS, that means male students have more body composition and poor sleep habits. Whereas, females students possess less score of BMI, body fat, total body water, PSQI, and ESS that means female students have less body composition and good sleep habits. There were significant differences between male and female for BMI, BF, and TBW. Whereas, no significant difference between PSQI and ESS for male and female students.

Emerging evidence suggests that sleep restriction contributes to obesity in males and females such as Yeh SSS and Brown RF, they investigate the association between body mass index and poor sleep quality [22]. They observed that poor sleep quality was

significantly associated (p=0.01) with high BMI. Wirth MD et al., also investigated the relationship between BMI, fat percentage and sleep quality [23]. They found that greater BMI and body fat percentage have a direct significant relationship (p=0.05) with poor sleep quality between males and females. PSQI score was higher (6.42) in medical students with a significant difference (p=0.001) with non-medical students and they have poor sleep quality [24]. Markwald RR et al., suggest that weight gain and obesity may an independent risk factor due to poor sleep conditions [25]. Among older adults, sleeping ≤5 hours and sleeping 8 or 9 hours habitual sleep duration was associated with obesity and with short-term weight gain in women, but no association existed between sleep duration among Spanish adults [26]. A study conducted in Sweden with 5508 women, revealed that the women who reported ESS were more likely significantly associated (p=0.0006) as obese and less likely to be within the ideal BMI (Range 20-25) than who was not sleepy (p=.34) [27]. Bixler EO et al., found a strong relationship between Excessive Daytime Sleepiness (EDS) and BMI, revealing that the prevalence of EDS enhanced exponentially in those categorised as overweight [28].

Pengpid S and Peltzer K, revealed that good sleep habits were related to overweight or obesity for female students, while poor sleep habits were not related to overweight or obesity [29]. Tu X et al., found that Chines females during their middle and old aged have low fruits consumption that was linked with short sleep duration [30]. Oginska H and Pokorski J, demonstrate that males required less sleep length than female and showed a lower level of daytime sleepiness [31]. Otaibi HH, investigate the relationship between a different measure of obesity and sleep quality [32]. He found significant association of BMI (p≤0.001) and body fat percentage (0.025) for sleep quality, and conclude that undergraduate university female students have poor sleep quality and poor sleep quality was related to body fat percentage, overweight, and obesity. In one study BMI was lower in intern (22.4±2.73) than postgraduate medical students (23.16±2.21). The PSQI score was lower in undergraduates (5.76±2.39) than postgraduates (7.80±2.5) [33]. Cheng SH et al., show the following factors to be significant predictors of poor sleep: female gender (p=0.001), undergraduate students (p=0.023), skipping breakfast (p=0.001), tea-drinking (p=0.026) [34]. Conclude that poor sleep quality was associated with skipped breakfast and tea by undergraduate female students in Taiwan. Cheng SH et al., and Suen LK et al., validate the findings that poor sleep quality of university students significantly associated (p=0.001) with females also [34,35]. Author revealed that there was a significant negative correlation between daytime sleepiness and sleep duration. BMI has a significant positive correlation with sleep disturbance in medical students [33]. Ji A and Wang R, conduct a study on sleep quality of college students of China and results revealed that the overall sleep quality of undergraduates was poorer (male=7.50±1.97; female=7.61±2.37. p=0.004), the quality of sleep for males was better than that of females [36]. Many studies recommend that there was a significant difference between males and females for sleep and obesity. It was found that sleep duration associated with obesity. Males might be more susceptible to sleep loss than females.

LIMITATION

This study was limited to only the adult population and it was conducted in the eastern region of Saudi Arabia. This study could be further advance and improved with several consideration as all age population could be included from other regions too and investigate the association between various factors that affect sleep habits as well.

CONCLUSION

From the finding of the study, authors can conclude that there is a significant difference in male and female for the BMI, body fat, total body water, except PSQI and ESS. Whereas, no significant difference has existed between male and female for PSQI and ESS for sleep habits. Numerous researches are undertaken throughout Saudi Arabia for the prevention and treatment of obesity. Sleep habits also require further commitment towards the factors that may obstruct with good quality of sleep. The health agencies must develop evidence-based strategies according to the individual need for prevention of obesity and abnormal sleep habits.

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