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Obesity it's Correlation with Sleep Patterns and Cardiorespiratory Fitness in Medical College Students of Mmimsr, Ambala.

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ABSTRACT

Background: With the advancement in technology and change in lifestyle, social shifts have been moving towards night life and the correlation between obesity and sleep duration has become even much stronger. Present study was done to find out any correlation between obesity with sleep patterns and cardiorespiratory fitness among the medical college students of MMIMSR, Mullana. **Methods**: 500 participants, of which 250 male and 250 female student participants of age group 18-25 years were randomly taken from Maharishi Markandeshwar Institute of Medical Sciences and Research, Mullana [Ambala] for the study. The students were examined thoroughly under similar laboratory condition so as to exclude those with the history of any acute or chronic illness or on long term medication or with a history of traumatic injuries. Pittsburg sleep quality Index (PSQI) scale was taken to access sleep patterns. Each student was given a standardized and validated questionnaire in a form of proforma to determine their sleep patterns. By using Quetelet index, BMI of each student was calculated and Cardiorespiratory fitness was estimated indirectly by following the protocol of Queen's College Step Test [QCT] method by calculating VO2max. **Results:** The result of our study showed highly positive significant association and correlation between obesity and sleep patterns in both male and female groups and highly significant correlation between obesity and cardiorespiratory fitness in both male and female groups. **Conclusion**: Proper awareness and education at early stage is extremely important to impress the consequences of low sleep duration and in prevention of development of obesity and improvement in the cardiorespiratory fitness.

Keywords: Obesity; QCT;Vo2max; Cardiorespiratory fitness.

INTRODUCTION

Obesity is well-known disorder of the 21st century which is constantly on the rise, carrying with it the vast variety of health related factors. Obesity, a sedentary lifestyle disease has been a topic of concern from past several years as the prevalence has been increasing at epidemic rate.[1] With the rise in weight there has been a simultaneous epidemic of chronic sleep deprivation as well.[2-4] Major changes in lifestyle such as unbalanced diets, alcohol intake, and lack of sleep can be detrimental to the students' well-being. Sleep deficiency and irregularity in sleep patterns have also been a common occurrence among doctors, as well as medical students for many years now. It is of great significance in the medical fraternity, as future doctors are highly susceptible to irregular sleep patterns and duration.[5-10] Development of low cardiorespiratory fitness in young adults has become an apparent factor for developing cardiovascular morbidities in the later middle age. Increase in the body fat, predicted by body mass index is an add on factor for the development of cardiovascular diseases. Cardiorespiratory fitness can be assessed by calculating VO2max of the individual. VO2max is directly associated with the cardiorespiratory fitness, more is the fitness greater is the value of VO2max.[11] So, in view of increasing incidence of obesity and decreased physical fitness along with changes in sleep pattern and duration this study was planned. We also assessed the sleep patterns and calculate the cardiorespiratory fitness. The data collected was analyzed for studying correlation between these parameters.

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MATERIALS AND METHODS

Study was conducted in Department of Physiology. Students who completed their minimum six months of their study were recruited for the study from

Maharishi Markandeshwar Institute of Medical Sciences and Research, Mullana [Ambala]. The study comprised of 500 healthy subjects of which 250 male student participants and 250 female student participants were taken. Approval for the study was taken from the Institutional ethical committee.

Inclusion criteria:

Apparently healthy, non-smoker, non-alcoholic male and female participants in the age group of 18-25 years were taken for the study.

Excluding criteria:

Participants with the history of any acute or chronic illness or with a history of Traumatic injuries and on a long term medication.

Sleep patterns and duration determination

Sleep patterns and duration determination was done by using PSQI scale. A form of proforma with a standardized and validated questionnaire was given to each participant. According to the performed scoring instructions of the Pittsburgh sleep quality index grading and scoring of the PSQI was done.[12]

Body Mass Index

By using Quetelet index, BMI was calculated i.e. Body weight taken in kilograms divided by square root of Body height taken in meter.

Normal weight is defined as BMI 18.5 to ≤ 22.9,

Overweight as BMI 23 to ≤ 24.9

Obesity as BMI ≥ 25 kg/m2,

Based on as per revised body type classification for Health ministry and Diabetes Foundation of India in 2008.[13]

Cardiorespiratory fitness

Queen's College Step Test [QCT] method was used to estimate VO2max or maximal oxygen uptake indirectly by following the protocol.[14] To perform Queens step test, a stepper of 16.25 inches height was used. Exercise was done for a total duration of 3 minutes and the pace was set by a metronome at a rate of 24 steps per minute for males and 22 steps per minute for females. After completion of exercise, pulse rate was noted from the 5th to the 20th second of recovery period. VO2max was calculated by using following equations.[1,4]

For males:

VO2max = 111.33 – [0.42 × pulse rate] [ml/kg/min]

For females:

VO2max= 65.81– [0.1847×pulse rate] [ml/kg/min]

Statistical Analysis:

Mean and standard deviation were obtained for quantitative data whereas percentage and proportion were obtained for qualitative data. By using Microsoft Excel and SPSS software Statistical analysis was done. To correlate Sleep patterns (PSQI), BMI and VO2max (ml/kg/min) Pearson correlation was used. P value <0.05 was considered as significant and <0.01 was considered as highly significant.

RESULTS

In present study it was found that, Mean global PSQI score in normal weight, overweight and obese group male [Table 1] was 1.8+0.82, 4.42+1.51, 8.92+1.8 respectively. It showed a significant ($p<0.05$) increase in normal vs overweight groups, highly significant ($p<0.01$) increase in overweight vs obese male groups and a highly significant ($p<0.01$) increase in normal vs obese male group respectively. Similarly, Mean global PSQI score in normal weight, overweight and obese group female [Table 2] was 2.04+0.9, 5.91+1.94 and 8.02+1.65 respectively. It showed a highly significant ($p<0.01$) increase in normal vs overweight groups, highly significant ($p<0.01$) increase in overweight vs obese female groups and a highly significant ($p<0.01$) increase in normal vs obese female group respectively. Results shows that with the increase in sleep disturbances there was a significant increase in the weight gain among both the male [Figure 1] and female group [Figure 2].

Mean Cardiorespiratory fitness i.e. VO2max in normal weight, overweight and obese male group [Table 3] was 56.5+4.83ml/kg/min, 46.7+6.45ml/kg/min and 38.5+3.9ml/kg/min. Similarly, Mean Cardiorespiratory fitness i.e. VO2max in normal weight, overweight and obese female group was 43.1+1.39ml/kg/min, 37.2+2.3ml/kg/min and 34.79+1.2ml/kg/min [Table 4]. VO2max showed a highly significant($p<0.01$) decrease in normal vs overweight male as well as female groups, overweight vs obese groups and normal vs obese groups respectively in both male group [Figure 3] and female group [Figure 4].

Table 1: Comparison of Global PSQI in three different groups among males

Groups	Mean Global PSQI (mean+SD)	Normal vs Overweight (p-value)	Overweight vs obese (p-value)	Normal vs obese (p-value)
Normal weight n=85	1.8+0.82	<0.05 S	<0.01 HS	<0.01 HS
Overweight group n=82	4.42+1.51			
Obese group n=83	8.92+1.8			

Table 2: Comparison of Global PSQI in three different groups among females

Groups	Mean Global PSQI (mean+SD)	Normal vs Overweight (p-value)	Overweight vs obese (p-value)	Normal vs obese (p-value)
Normal weight n=95	2.04+0.9	<0.01 HS	<0.01 HS	<0.01 HS
Overweight group n=80	5.91+1.94			
Obese group n=75	8.02+1.65			

Table 3: Comparison of VO2 max (ml/kg/min) in three different groups among males

Groups	VO2 max (ml/kg/min) (mean+SD)	Normal vs Overweight (p-value)	Overweight vs obese (p-value)	Normal vs obese (p-value)
Normal weight n=85	56.5+4.83	<0.01 HS	<0.01 HS	<0.01 HS
Overweight group n=82	46.7+6.45			
Obese group n=83	38.5+3.9			

Table 4: Comparison of VO2 max (ml/kg/min) in three different groups among females

Groups	VO2 max (ml/kg/min) (mean+SD)	Normal vs Overweight (p-value)	Overweight vs obese (p-value)	Normal vs obese (p-value)
Normal weight n=95	43.1+1.39	<0.01 HS	<0.01 HS	<0.01 HS
Overweight group n=80	37.2+2.3			
Obese group n=75	34.79+1.2			

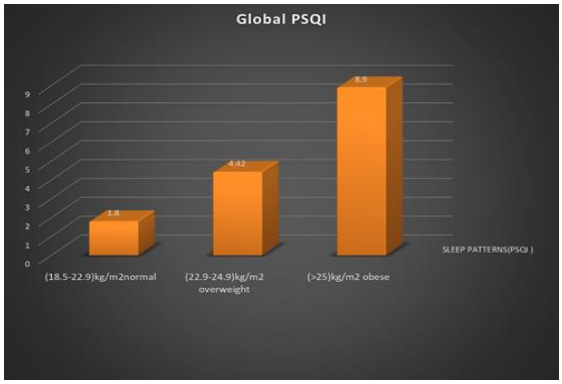

Figure 1: Global PSQI in three different groups among males

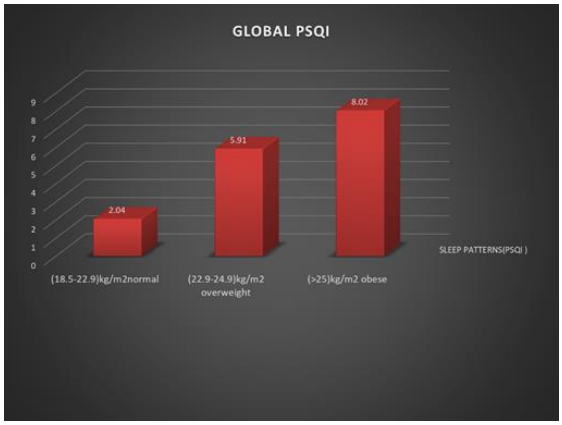

Figure 2: Global PSQI in three different groups among females

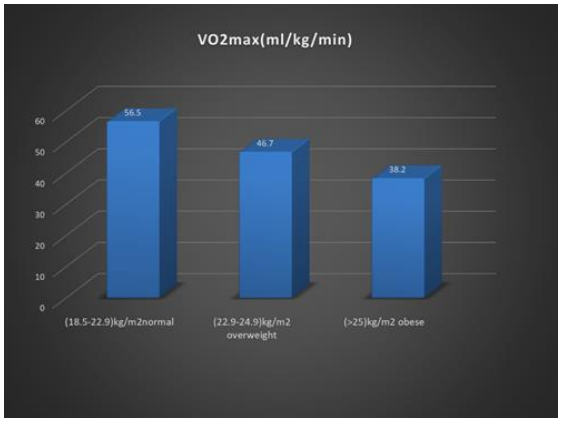

Figure 3: VO2 max (ml/kg/min)in three different groups among males

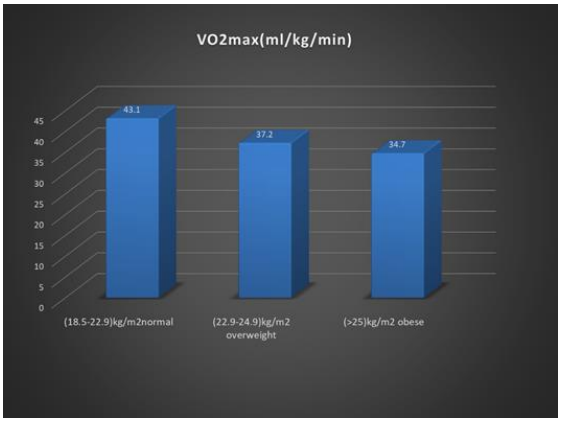

Figure 4: VO2 max (ml/kg/min)in three different groups among females

DISCUSSION

College is a time marked change, many students enjoy autonomy and freedom from direct supervision for the first time, they experience extra educational and social pressures, and erratic schedules. Due to the irregular sleep patterns and low sleep durations medical students themselves succumb towards obesity and this is mainly because students are in stressful conditions such as competition and examination, retaining large portions of their studies in a limited time interval.[21-23] This study showed that there is a considerable overall irregularity in sleep patterns along with a poor sleep quality among both male and female student participants. Our results support a positive relationship between obesity and poor sleep quality and irregular sleep. Obese students were having greater PSQI score than that of the normal weight student participants, which indicates increase in the sleep related problems and difficulty in sleep patterns. Deen. W. Beebe et al observed that the participants who were having disturbed sleep patterns, short sleep duration and more disturbed sleep were overweight when compared control group.[19] Our result correlates with Patel SR et al,[10] Gangwisch JE et al,[6] which in their studies found a direct association between sleep disturbance, short sleep duration and weight increase which leads to obesity. Gaultney in his study found 27% of college students were at risk for sleep disorders which likely

to disturb sleep patterns.[23] Kripke et al;[2] Cummings et al,[3] all found a direct relationship between sleep duration and increase weight gain in adults. Lund by using the Pittsburgh Sleep Quality Index (PSQI), identified 63.9% of college students were having poor-quality sleep, they also experience total restricted sleep, sleep schedules were erratic, and were having sleep disturbances.

The results of the study also showed that VO2max a measure of cardiorespiratory fitness was significantly different in obese and non-obese subjects. VO2max which is considered to be the most valid index of cardiorespiratory fitness indicates the efficiency of transport of O2 to working muscles on cardiorespiratory fitness. VO2max showed a highly significant($p<0.01$) decrease in normal vs overweight male as well as female groups, overweight vs obese groups and normal vs obese groups respectively in both male group and female group. Our study correlates with the earlier studies done by Rowland et al,[16] Ozcelick et al,[17] & Welch et al,[18] in which they found a highly significant correlation between Obesity and cardiorespiratory fitness(VO2max). Bandoyopadhyay in their study found that due to excess fat deposition cardiorespiratory fitness in obese girls was less as compared to normal.[7] P Setty et al 2012 in their study also finds a significant correlation between obesity and cardiorespiratory fitness.[15]

CONCLUSION

For a country to have a full potential it requires its doctors, citizens to be healthy and have a good cardiovascular fitness. In both men and women a low physical and cardiovascular fitness attributes to the risk factors for all-cause mortality. A healthy body is a necessity for an individual so that daily tasks can be performed vigorously and alertly. It helps to withstand stress and carry on, in circumstances where a physically unfit person could not continue.

The students involved in this study shows highly significant positive correlation between Obesity and Sleep patterns (PSQI) , thus there was a significant increase in the Global PSQI score in overweight and obese male and female student participants as compare to the normal student participants which showed increase in the difficulty in sleep patterns and sleep related problems . A highly significant correlation was seen between obesity and cardiorespiratory fitness (VO2max (ml/kg/min), which also suggests that students which were having disturbed sleep patterns (PSQI) were either overweight or obese and cardiorespiratory fitness (VO2max) among these groups was far less when compared to normal weight students. The risk of hypertension, obesity, cardiovascular diseases as well as asthma and other respiratory problems have shown to be decreased with improvement in cardiovascular fitness of an individual. So, proper awareness and education at early stage is extremely important to impress the consequences of low sleep duration and in prevention of development of obesity and improvement in the cardiorespiratory fitness.

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