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### Original Article

## Effect of sleep duration on arterial blood pressure in medical students

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#### ABSTRACT

Sleep is naturally recurring state characterized by reduced or absent consciousness, relatively suspended sensory activity, and inactivity of nearly all voluntary muscles. It is observed in all mammals, all birds, and many reptiles, amphibians, and fish. Sleep is often thought to help conserve energy. Aims & objective: To find out the correlation of sleep duration with BMI and arterial blood pressure of Medical Students. Material and method: Cross-sectional study was done on 150 medical students of Dr. S.N. Medical College, Jodhpur. Medical students both boys and girls were selected and interviewed for the duration of sleep at night and average duration of sleep per week since last six months was determined. Data regarding age, sex, height, weight and arterial blood pressure per standard methods. Results: In the present study Observation shows decrease in sleep duration increase in blood pressure values in both boys and girls and did not found any association between sleep duration and BMI.

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### 1. Introduction

Sleep is naturally recurring state characterized by reduced or absent consciousness, relatively suspended sensory activity, and inactivity of nearly all voluntary muscles. It is distinguished from quiet wakefulness by a decreased ability to react to stimuli, and is more easily reversible than being in hibernation or a coma.

Sleep is a heightened anabolic state, accentuating the growth and rejuvenation of the immune, nervous, skeletal and muscular systems. It is observed in all mammals, all birds, and many reptiles, amphibians, and fish. Sleep is often thought to help conserve energy, but actually decreased metabolism only about 5-10% [1].

Human sleep needs can vary by age and among individuals sleep is considered to be adequate when there is no day time sleepiness or dysfunction. A person's major sleep episode is relatively inefficient and inadequate when it occurs at the wrong time of day. [2]

For human adults 7-8 hours per night have been recommended as the optimal duration of sleep [3-4]. Approximately one third of our life is spent in an unconscious state. The alterations that occur during sleep make individuals vulnerable to various sleep disorders.

Researchers at the university of Warwick and university college London have found that lack of sleep can more than double the risk of death from cardiovascular disease, but that too much sleep can also be associated with a doubling of the risk of death, though not primarily from cardiovascular disease [5].

Various factors, such as age and sex influence average values, influence a person's average blood pressure and variations. In children the normal ranges are lower than for adults and depend on height. As adults age systolic pressure tends to rise and diastolic tends to fall. In the elderly, blood pressure tends to be above the normal adults range, largely because of reduced flexibility of the arteries.

Also, an individual's blood pressure varies with exercise, emotional reactions, sleep, digestion and time of day.

However, recent studies conducted in various part of the world indicate short sleep duration (<7 hours) as a risk factor for development of pre-hypertension and hypertension amongst adolescent and adults.

Sleep duration may be an important regulator of body weight and metabolism. Several epidemiologic studies have studied the association of sleep duration with obesity. During sleep our body's hormones that help to control appetite, energy metabolism, and glucose processing are secreted in more concentration.

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It is essential to determine the role of sleep quality and sleep quality in the pathogenesis of hypertension in the Indian population.

The study is to be framed keeping the hypothesis and short sleep duration may affect the blood pressure.

## 2. Material And Method:

To determine the influence of quantity and quality of sleep on the blood pressure levels, cross-sectional study was done on 150 medical students of Dr. S.N. Medical College, Jodhpur. Medical students both boys and girls were selected and interviewed for the duration of sleep at night and average duration of sleep per week since last six months was determined. Normal sleep duration is of seven hours per night and duration less than this was labeled as inadequate sleep.

Data regarding age, sex, height, weight and arterial blood pressure were collected as per standard methods described under:

### Procedure for measuring height, weight and Blood pressure:

Weight of each student were recorded in light clothing without shoes. Height was recorded to the nearest of 0.5 cm using a Stadiometer while the subject stand bare-footed with his head in horizontal plane, and body weight was recorded to the nearest 100 gm. All measurements were taken twice. A third measurement was if the first two differed by more than 0.5cm (height) and 0.2 kg (weight) [6]

The BMI was then being calculated as weight in kilograms divided by height in meter squared. The WHO has devised a separate classification for Asians where in persons with BMI < 18.5 are considered underweight, with BMI > 18.5 - 23 are considered normal weight, with BMI > 23 - 25 are labeled as overweight and with BMI > 25 are obese.

Blood Pressure was measured in seated position by using mercury sphygmomanometer with right forearm horizontal on the table. After the application of appropriate sized cuff (covering approximately 2/3 of the upper arm), it was gradually inflated to approximately 20 mm Hg above the point at which radial pulse disappears. The pressure within the cuff was released at a rate of approximately 2 mm/sec, while auscultation with stethoscope over the brachial artery. The onset of sounds (Korotkoff's phase-I) was taken as indicative of systolic pressure and disappearance of sound (Korotkoff's phase-V) as indicative of diastolic pressure. The recorded data were analyzed statistically to arrive at the conclusions according to the aim and objectives set as above.

## 3. Result And Discussion

Reflecting changing lifestyles, people are sleeping less in modern societies [7]. A good sleep of adequate duration is essential because sleep fragmentation and sleep deprivation, commonly seen in contemporary society, are associated with multiple health disorders, including cardiovascular diseases (CVD) [8]. Several sleep-related phenomena, such as sleep disordered breathing,

nocturnal hypertension, and high variability of nocturnal blood pressure (BP), have been suggested to be independent risk factors for cardiovascular events. Short duration of sleep has been shown to be related to obesity.

The World Health Organization (WHO) describes overweight and obesity as one of today's most important public health problems, which is escalating as a global epidemic. It is also increasingly recognized as a significant problem in developing countries and countries undergoing economic transition.

The prevalence of overweight and obesity among children and adolescents has increased significantly in the developed countries during the past two decades and similar trends are being observed even in the developing world, though less rapidly.

This trend is of major concern because it will lead to increased incidence of coronary artery diseases & hypertension, diabetes, obstructive sleep apnoea, esophageal reflux & gastric emptying disturbances, osteoarthritis & flat feet, dyslipidaemia and overall increase in morbidity and mortality in later life.

There are evidences that children and adolescents of affluent families are increasingly becoming overweight/obese in recent times, possibly because of decreased physical activity & sedentary life styles and change in dietary habits.

Some studies have suggested that there could be an association between the duration of sleep in humans and development of the obesity. The number of hours sleep per night is one of the recently discussed new parameters, which are intensively studied.

For human adults 7-8 hours per night have been recommended as the optimal duration of sleep. Several epidemiologic studies have studied the association of sleep duration with obesity and diabetes. Obesity may be due to the increased levels of orexigenic (appetite increasing) hormone ghrelin and cortisol & decreased of leptin.

Insufficient sleep may lead to adverse health effects and influence body weight. In population studies a dose-response relationship between short sleep duration and high body mass index (BMI) has been reported among all age groups. In one of the largest studies, elevated BMI was positively associated with sleep duration less than 7-8 hours/day.

Many evidences are there to show that reduced sleep duration may lead to increased BMI, increased obesity and therefore acting as a main predisposing factor for hypertension, atherosclerosis, dyslipidemia and coronary artery disease. In western Rajasthan, no study is on the record regarding the association between sleep duration and its effect on BMI and blood pressure.

Firstly we tried to elucidate the pattern of normal blood pressure values in medical students both boys and girls. In our study we examined 78 boys and 72 girls and found that systolic and diastolic blood pressure of boys was  $122.66 \pm 9.76$  and  $88.38 \pm 10.57$  mmHg respectively. Whereas in girls it was slightly less than

boys 7 found to be  $111.75 \pm 10.29$  systolic and  $77.27 \pm 8.63$  mmHg. Without considering the effect of gender the blood pressure recorded as  $118.11 \pm 11.34$  systolic and  $83.67 \pm 11.23$  mmHg diastolic. The results are depicted in the following table [Table no.1]

According to our observations systolic & diastolic blood pressure in boys, girls and irrespective of gender were found to be  $122.66 \pm 9.76$  &  $88.38 \pm 10.57$ ,  $111.75 \pm 10.29$  &  $77.27 \pm 8.63$  and  $118.11 \pm 11.34$  &  $83.67 \pm 11.23$  mmHg respectively.

Recent evidences suggest that more than half of the adult population in USA is overweight or obese, with the percentage increasing over the last 15 years. The number of adults who are overweight or obese; is also increasing at an alarming rate, with more than 17% of college students in USA being overweight or obese, and even higher percentages among African American and Hispanic students.

Physical inactivity, poor dietary choices, increased caloric intake, increased stress and disturbed sleep patterns, in addition to many other factors, contribute to the increased weight gain and obesity in college - aged young adults.

In many cases, increased body weight contributes to the development of the metabolic syndrome in adolescents and young adults, including impaired glucose tolerance, insulin resistance, hyperlipidemias, elevated blood pressure and increased abdominal fat.

The main aim of our study was to look for whether any association exists between adequacy of sleep and blood pressure or not.

Table 3 shows that sleeping hours do not bear any relation with BMI, neither in boys nor in girls i.e. increase or decrease in sleeping hours do not change BMI. This is in contrast with many researchers who have reported negative relation between sleeping hours and BMI values. This may be due to inadequate sample size. In this study, spite of no effect on BMI, sleep is affecting blood pressure values. It might be due to the fact that before having any appreciable effect on BMI, sleep may have an effect on arterial morphology leading to increase in blood pressure.

Adamkova et al (2008) have detected significant association between the duration of sleep and both BMI ( $P < 0.001$ ) and body weight ( $P < 0.05$ ). This association was found both in males and females and was not age dependent [9]. Studies conducted by Gottlieb et al (2006), Javaheri et al (2008) and Gangwisch et al (2006) indicate short sleep duration as a risk factor for development of prehypertension and hypertension amongst adolescents and adults. These studies have shown that restricted hours of sleep at nights result in significant rise in blood pressure during the day time on the following day. Our results regarding relation between blood pressure and sleep are also in conformity with these studies.

**Table: 1 - Age & Sex Specific Reference Values of Systolic and Diastolic Blood Pressure in Medical Students.**

	SBP (mmHg)	DBP (mmHg)
Boys [n=78]	$122.66 \pm 9.76$	$88.38 \pm 10.57$
Girls [n=72]	$111.75 \pm 10.29$	$77.27 \pm 8.63$
Both [n=150]	$118.11 \pm 11.34$	$83.67 \pm 11.23$

**Table: 2 - Effect of BMI on Mean Systolic & Diastolic Blood Pressure in Boys and Girls.**

BMI	SBP (Boys)	SBP (Girls)	DBP (Boys)	DBP (Girls)
<18.5 [n=18]	119.56	110.68	85.72	77.27
18.5 – 23 [n=41]	122.46	115.21	88.34	79.94
>23 – 25 [n=9]	123.33	112.88	88.33	77.35
> 25 [n=410]	128.5	115	93.4	81.25

**Table: 3- Effect of Inadequate & Adequate Sleep on BMI in Boys & Girls**

Sleeping Hrs.	BMI in Boys	BMI in Girls
Inadequate	$21.18 \pm 2.79$	$20.58 \pm 3.02$
Adequate	$21.51 \pm 5.02$	$19.65 \pm 2.97$

#### 4. CONCLUSION:

Our results shows that obesity (BMI) is on increasing trend, Increase in BMI is positively associated with mean blood pressure values. Average duration of sleep is more in boys as compared to girls. With decrease in sleep duration we found increase in blood pressure values in both boys and girls. We did not found any association between sleep duration and BMI.

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