

## Original Article

# FREQUENCY OF METABOLIC SYNDROME AND ITS RELATION WITH SLEEP DEPRIVATION IN MEDICAL OFFICERS OF TERTIARY CARE HOSPITAL

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### ABSTRACT

**Background:** This study aimed to evaluate the frequency of sleep deprivation and its association with metabolic syndrome in medical officers of a tertiary care hospital.

**Material and Methods:** It was a descriptive cross-sectional study of 100 cases. Non-probability purposive sampling technique was used. The study span was 6 months. Doctors of age 20 to 40 years of age were selected. Firstly, a history of sleep deprivation was taken concerning WHO-recommended criteria. After that their results for metabolic syndrome were compared. ATP III criteria for metabolic syndrome were followed.

**Results:** Out of 100 doctors, 79 were found to be sleep-deprived and 21 were not sleep deprived with a mean deviation of 65.10. In this sample, 39 persons were having MetS and 61 were normal. When we did the cross-tabulation of sleep-deprived persons with metabolic syndrome the cumulative percentage was as follows. Persons who were not sleep-deprived and have no Mets were 18(85.7%). Persons having no sleep deprivation but met S were 3(14.3%). Persons having sleep deprivation but no Mets were found to be 43(54.4%). The persons who were sleep-deprived and also metabolic syndrome was 36(45.6)%. Pearson Chi-Square= 6.82<sup>a</sup> and p-value = 0.009 statistically significant.

**Conclusion:** People who are sleep deprived have more chances to develop metabolic syndrome than people having normal sleep patterns.

**Key Words:** Sleep deprivation, metabolic syndrome, cardiovascular diseases.

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## INTRODUCTION

Sleep is a physiological mechanism that regulates various body mechanisms including some endocrine functions. In the developing era, sleep deprivation is affecting our society.

Sleep deprivation can cause our body to suffer from metabolic disorders including obesity, hypertension, insulin resistance, and dyslipidemia leading to Metabolic syndrome (MetS). Metabolic syndrome is a complex disturbance in metabolism leading to diabetes mellitus type 2 (DMT2) or cardiovascular risks. It is defined in various ways by National Cholesterol Education Program – Third Adult Treatment Panel (NCEP ATP III), World Health Organization (WHO), International Diabetes Federation (IDF), and the European Group for the Study of Insulin Resistance (EGIR).<sup>1,2</sup>

NCEP ATP III is a commonly used metabolic syndrome criterion, metabolic syndrome consists of at least three of the following: elevated waist circumference,

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high triglyceride levels, low high-density cholesterol levels, hypertension, and high fasting glucose.<sup>1,2</sup>

Sleep deprivation is divided into Acute sleep deprivation and chronic sleep deprivation. Acute sleep deprivation occurs when a person suffers from a lack of sleep for one or two nights consecutively. On the other hand chronic sleep deprivation occur when one could not continuously manage to sleep five hours per night for up to one year or more. Sleep duration mostly affects body lipid profile irrespective of gender. Sleep durations less than 5 hours affects body insulin resistance leading to DMT2.<sup>3</sup>

In addition sleep deprivation is related to a raised level of evening cortisol, impaired glucose tolerance, decreased secretion of leptin hormone, and increased sympathetic nervous system activity.<sup>4</sup> According to a recent survey the sleep duration is decreasing in the past few decades. In 1990 average sleep duration was nine hours per day which has been decreased to 6 hours in 2000. The recommended sleep duration is 7 hours for adults and 10 hours for children.<sup>5</sup>

Excessive use of mobile phones or other electronic devices changes the physiological excretion of melatonin, which regulates sleep-wake cycles. There is a huge population of students and medical staff who are suffering from sleep deprivation because of their routine duties or night shifts.<sup>6</sup>

Different studies have been conducted to show the relation between sleep deprivation and obesity, increased BMI, or raised levels of serum triglycerides<sup>7</sup>

J Osiane Broussard et al observed that one night of poor sleep could equal six months of a high-fat diet. According to the obesity society annual meeting at obesity week SM 2015 in Los Angeles, Insufficient sleep affects insulin sensitivity in the same way as a high-fat diet.<sup>8</sup>

Sleepless nights cause increased secretion of ghrelin and decreased secretion of leptin hormone leading to increased appetite and obesity. A cardiovascular epidemiology study conducted by Bidulescu on 1515 African Americans also noticed that the

effect of short sleep duration with dyslipidemia raised Triglycerides levels and the effect of long sleep duration with the low level of HDL-C.<sup>9</sup>

Health care residents and other professionals like police officers with deprived sleep have altered cognitive ability, behavior, and social vigilance.<sup>10</sup>

A study by Mustahsan et al showed overall, sleep deprivation was more common among females than males. The physical and mental health was also impaired because of weight changes, insomnia, decreased libido, obstructive sleep apnoea, blood pressure problems and post-menstrual dysmorphic disorders.<sup>11</sup>

This study aimed to establish an association of sleep deprivation with MetS in medical officers. The study will help health care workers devise strategies to improve sleeping habits leading to decreased metabolic disorders or metabolic syndrome.

## MATERIAL AND METHODS

It was a descriptive cross-sectional study of 100 cases. A nonprobability purposive sampling technique was used. The study span was 6 months. Doctors of age 20 to 40 years of age were selected. Firstly history of sleep deprivation was taken concerning WHO-recommended criteria. After that their results for metabolic syndrome were compared. ATP III criteria for metabolic syndrome, was followed. Sample was taken to the chemical pathology section of the AIMC Pathology department.

Samples were labeled properly and processed in the lab on BECKMAN COULTER AU480 at Chemical Pathology Section AIMC Lahore.

Data were analyzed by SPSS 20.0. Quantitative data i-e age will be summarized as mean and standard deviation. The categorical value will be expressed in the form of frequency and percentages. Bar charts and pie charts will be used to display the data. Appropriate statistical tools will be applied to analyze the data.

## RESULTS

Out of 100 doctors, 79 were found to be sleep-deprived and 21 were not sleep deprived. with a mean deviation of 65.10. In this sample 39 persons were having Mets and 61 were normal. when we did the cross-tabulation of sleep-deprived persons with metabolic syndrome the cumulative percentages were as follows. Out of 21 participants 18 (85.7%) were having neither sleep deprivation nor metS while 3 (14.3%) were having metS but did not have sleep deprivation. Out of 79 participants 43 (54.4%) had sleep deprivation but did not have metS and 36 (45.6%) were having both sleep deprivation and metS. Pearson Chi-Square= 6.82<sup>a</sup> and p-value = 0.009 statistically significant.

**Table-1.** Comparison of variables means with or without Metabolic syndrome

Parameter	Metabolic Syndrome			
	NO (61)		YES (39)	
	Mean	SD	Mean	SD
Sleep Deprived h/w	79.42	21.07	61.47	39.25
Waist. cm	80.19	9.35	86.82	5.53
Weight. kg	60.93	11.42	70.89	9.56
Height. feet	5.25	0.29	5.33	0.36
BMI	23.50	3.29	27.27	3.45
Triglyceride	129.63	36.23	166.00	32.99
Cholesterol	169.95	37.71	231.79	31.48
BP systolic	117.69	11.56	127.84	12.25
BP diastolic	76.79	9.41	85.21	6.45
BSR	96.00	22.97	118.58	23.26

This table summarizes the whole data. having all parameters mean and SD about met S and sleep deprivation

**Table-2.** Frequency Distribution of Sleep Deprivation and Metabolic syndrome

Parameter	Response	Frequency
Sleep Deprivation	No	21 (21%)
	Yes	79 (79%)
Metabolic Syndrome	No	61 (61%)
	Yes	39(39%)

**Table-3.** Cross Tabulation Metabolic Syndrome and Sleep Deprivation

		Metabolic Syndrome		Total
		No	Yes	
Sleep Deprivation	No	18 (85.7%)	3 (14.3%)	21 (100.0%)
	Yes	43 (54.4%)	36 (45.6%)	79 (100.0%)
Total		61 (61.0%)	39 (39.0%)	100 (100.0%)

The table shows a high percentage of the group having both sleep deprivation with metabolic syndrome that is 36. 70.5%

## DISCUSSION

There are many studies, showing the relation between metabolic syndrome and sleep deprivation however, all have not the same results. Some studies show that there is a relationship between sleep deprivation with short sleeping hours but some studies are showing that long sleep durations affect our body metabolism and induce diabetes mellitus type 2 and cardiovascular diseases but still there is a controversy that long sleep durations lead to metabolic syndromes or not.<sup>2,5,11</sup>

There is a contrast between genders as well. a cohort study conducted on 7696 Chinese males shows that there is a relationship between long and short sleep deprivation in men but this association is not found in females some articles and recent researches prove that increase in the level of fasting blood glucose, total cholesterol, systolic and diastolic blood pressure is correlated with people sleeping less than 6 hours per day.<sup>12</sup>

A Korean study performed in July 2008 show a U shape curve between metabolic syndrome and sleep deprivation. shows that metabolic syndrome risk increases with sleep deprivation. there is more prevalence of hypertension and abdominal obesity in people having less sleep than 5 hours per day and those who sleep more than nine hours per day have more value of triglycerides and LDL cholesterol.<sup>13</sup>

A meta-analysis in 2014, revealed that sleep deprivation and metabolic syndrome and strongly correlated in males and females both but there is no relationship found between the

long sleep duration and metabolic syndrome but controversy is still there. Research shows that evening cortisol is raised with sleepiness nights. increases the secretion of the sympathetic nervous system and also the leptin hormones. but the actual mechanism is still not known.<sup>14</sup>

CVD is the primary clinical outcome of metabolic syndrome. According to ATP III, high blood sugar level or diabetes mellitus is the high-risk factor for CVD. In past studies, we have seen that sleep cycles and changed lifestyle changes are contributing to developing metabolic syndrome. our one-third of the population is having metabolic syndrome.<sup>15</sup> Being a health care professional doctors know the symptoms indication and way of developing metabolic syndrome but still, it was found at a higher ratio among them as well.<sup>16</sup> This is because of the reason their alternative duties and hectic work hours and disturbed sleep-wake cycles.

This study conducted in Jinnah hospital Lahore was very exclusive and unique. All the doctors got equal chances to be in the study. The samples were taken on a random basis. It was simply a descriptive and cross-sectional study in nature. For sleep calculations, various scales and sleep parameters were under consideration. Epworth sleepiness scale and taking a history of doctors based on this background supported accurate result findings. for metabolic syndrome the ATP III and WHO criteria were followed. metabolic syndrome is the group of conditions so it included various parameters. taking history for waist circumferences and weight height helped in calculating BMI body mass indices. The results we got prove the relationship between sleep deprivation and metabolic syndrome. as per previous studies Several researchers have examined the effect of working long on-call hours on performance and cognitive functioning.<sup>3,8-10,17</sup> even though working extended shifts may also result in impaired mood and decreased alertness, which can impair cognitive functioning and physician performance with a negative impact on patients' and doctors' safety, very few

researchers have studied these effects.<sup>11,18</sup> To fill this research gap, this study examined the effect of acute sleep deprivation due to working extended on-call hours on both mood and alertness in junior physicians in a teaching hospital.

This is the cluster of various metabolic risk factors. ATP III mostly uses this insulin-resistant syndrome term. this indicates that insulin-resistant is primary and other factors develop in response to insulin resistance. although the ATP III also indicated that the CVD is the first clinical symptom develop in response to Mets or having insulin resistance. the risk of diabetes mellitus type 2 also increases. other diseases like polycystic ovarian syndrome. gallstones of cholesterol fatty liver and asthma.<sup>19</sup>

These components of the metabolic syndrome constitute a particular combination of major and emerging risk factors. CVD and obesity specifically abdominal obesity, sessile lifestyle, smoking, high LDL cholesterol, low HDL cholesterol, having a family history of chronic heart diseases, aging, insulin resistance glucose intolerance, pro-inflammatory state and prothrombotic states are the major risk factors. Every factor of metabolic syndrome should be identified.<sup>20,21</sup>

## CONCLUSION

People who are sleep deprived have more chances to develop metabolic syndrome than people having normal sleep patterns.

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## AUTHOR'S CONTRIBUTION

FS: Drafting of manuscript  
 NH: Data analysis  
 ZN: Review manuscript  
 SM: Critical review  
 MIJ: Critical review & final approval

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