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General Medicine

STUDY ON HABITUAL SLEEP PATTERNS AND ASSOCIATED RISK IN ACUTE MYOCARDIAL INFARCTION

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ABSTRACT **Background:** Sleep is a necessary physiological process of restitution and recovery. Studies have shown that sleep deprivation has adverse affects on several cardiovascular disease factors like Blood pressure, sympathetic tone and glucose tolerance. Hence, this study was conducted in a tertiary care centre in Vijayawada, Andhra Pradesh to identify possible asosciation between sleep patterns and acute MI. **Materials And Methods:** A retrospective case control study was conducted in Siddhartha medical college, Vijayawada, Andhra Pradesh. A total of 50 cases of first acute MI and 50 controls matched to age, gender, presence of diabetes mellitus, hypertension , alcoholism and smoking were selected. Data on medical co-morbidities, socio-economi c status, smoking, alcohol use, usage of caffeinated drinks and history of sleep patterns was collected using a self answered questionnaire. Data collected was analysed using online calculators. **Results:** In this study, out of 50 cases, 31 cases had the habit of taking day time naps as compared to 14 controls (p value = 0.001). Mean maximum nap duration among cases and controls was 54.6+/- 36.8 and 20.4 +/- 18.72 respectively (p value =0.0031) . No significant difference in the duration of night time sleep was noted among cases and controls. Complaints of feeling irritated , having a headache on waking up were noted more in cases than controls (30 versus 16, p value = 0.019). loss of sleep and disturbed sleep in the recent past was noted more among cases than controls (34 versus 14, p value <o.oo1) . **Conclusion:** A significant association was seen between day time nap duration, sleep deprivation , disturbed sleep and occurrence of first Acute MI. Sleep deprivation seems to be a potential risk factor for Acute MI.

KEYWORDS : sleep deprivation, disturbed sleep, Acute MI

INTRODUCTION

In the current stressful lives, normal sleep patterns are adversely affected both in terms of quality and quantity. It is reported that about 1/3 of adult population sleep less than 6 hours per night, suggesting that we live in a "sleep deprived society"[1] . Factors responsible for this change may be due to (I) increased environmental light , (ii)longer workdays/commuting time, (iii) increase in shift work and night work and (iv) advent of television,radio and the internet[2]- a consequence of urbanization and globalization. Sleep is a necessary process for physiological restitution and recovery. Sleep deprivation has adverse impact on immunological,endocrine and metabolic activities of the body. [3]Studies showed that an increased number of micro arousals per hour in a person is associated with an increase in blood pressure,cortisol levels and blood lipid levels.[4]Multiple studies have shown that short term sleep deprivation has adverse effects on body like increased insulin resistance, reduced glucose tolerance,increased sympathetic tone and blood pressure[5,6,7]- all of which are known risk factors for cardiovascular diseases.[8]. Short term sleep deprivation is associated with elevated C-reactive protien, inflammatory marker which is independently related to Cardiovascular Diseases.[9] Further, short sleep duration along with sleep disturbances have greater risk of CVD than those without sleep disturbances.[10] This showed that habitual sleep patterns of the current generation could be one contributing factor for CVD.

MATERIALS AND METHODS

This is a Retrospective/case control study which was conducted in Government General Hospital, Vijayawada from June 2021 to August 2021. A total of 50 patients as cases and 50 controls who were matched with age, sex, presence of Hypertension, Diabetes mellitus, smoking and alcohol use were considered for the study.

Inclusion Criteria:

50 Patients between ages 20-80 years diagnosed with first AMI admitted to cardiology and General Medicine departments of Government General Hospital were considered. Patient with first AMI diagnosed with chest pain suggestive of myocardial ischemia for >20 min with ECG showing ST segment elevation or ST segment depression in two contiguous leads or elevation of cardiac enzymes (qualitative Troponin I assessment by immunochromatography) or Echocardiographic evidence of Regional Wall Motion Abnormality. Controls recruited are Non-cardiac patients from other departments of G.G.H or healthy attendants of patients admitted in G.G.H.

Exclusion Criteria :

Patients who are on long term sedatives or on treatment for sleep disorders and patients with prior history of Cardiovascular Diseases are excluded from the study.

Method of Data Collection:

A pre-tested questionnaire on sleep habits and quality was administered to all cases and controls. The Questionnaire recorded data of identification of all participants (Name, Age, Gender), Socioeconomic status (Occupation, Night shifts / rotational shifts at work), Medical co-morbidities (Hypertension, Diabetes mellitus, other illnesses) , Smoking, Alcohol use, Drug abuse, Consumption of caffeinated drinks and sleep history. History of co morbidities was self reported and caffeine use was asked in the number of standard cups of caffeinated drinks they consumed per day.

Sleep is a complex physiological process influenced by various factors and as such is highly difficult to study sleep patterns. In the present study, Sleep is studied under three main categories. (I) nap characteristics, (II) Quantitative sleep Characteristics, (III) Qualitative sleep characteristics. The qualitative characteristics of sleep were described under five aspects. A) Frequency of wake ups per night, B) causes for wake up, C) subjective ease of going back to sleep, D) feeling on waking up in the morning, E) loss of sleep in the recent past (last one month).

Informed Consent :

Informed consent was taken from all participants prior to enrollment in the study. Approval from Institutional ethics Committee was taken before the commencement of study.

Statistical Analysis :

The data collected was entered into a spreadsheet in Microsoft Office Excel and the data was analysed using online calculators on www.socscistatistics.com. Continuous variables were expressed as mean +/- standard deviation and categorical variables as percentages. The results obtained were compared using Student T-test for means and Chi Square test for proportions. A p value <0.05 was taken to indicate statistical significance.

RESULTS

The general characteristics of the study participants is notified in the Table below. The mean age of cases and controls is 56.73+/-10.32 and

56.1+/-10.33 respectively.

The p values obtained show that there is no significant difference between the cases and controls in terms of general characteristics .

S.No	Characteristics	Cases	Controls	P Value
1	Male sex	31	31	1
2	Mean age	56.73(10.32)	56.1(10.33)	0.7
3	Hypertension	31	31	1
4	Diabetes mellitus	21	19	0.66
5	Smoking habit	22	22	1
6	Alcohol use	18	14	0.64
7	Rotation shift/night shift	10	7	0.55
8	Caffeine intake (standard cups per day)			
	Minimum	2.4(1.69)	2.38(1.32)	0.357
	Maximum	2.64(2.16)	2.65(1.49)	0.32
Nap characteristics of the participants				
Characteristic		cases	controls	P value
Day time nap- yes		31	13	**<0.0001**
Mean minimum nap duration(SD)		48.6(22.7)	19.4(12.10)	0.088
Mean Maximum nap duration (SD)		54.6(36.8)	20.4(18.72)	**0.0031**
Nap frequency(SD) per week		4.1(3.3)	1.84(1.7)	0.126
Mean min sleep duration (SD) in min		7.26(1.34)	7.51(1.36)	0.848
Mean max sleep duration(SD) in min		7.81(1.24)	8.48(1.42)	0.999
FREQUENCY OF WAKE UPS PER NIGHT				
Mean minimum no. of wake ups per night(SD)		1.84(1.24)	2.02(1.65)	0.702
Mean maximum no.of wake ups per night (SD)		2.18(1.63)	2.49(2.14)	0.803
CAUSES FOR WAKING UP				
Cause		Cases(44)	Control(40)	
Thoughts(%)		17(38.6)	8(20)	
Bodily urges(%)		40(90.9)	34(85)	
External disturbances(%)		2(4.54)	9(22.5)	
EASE OF GOING BACK TO SLEEP				
		Cases (44)	Controls(40)	
Easy		30(68.18)	30(75)	
Difficult		14(31.8)	10(25)	
PARTICIPANT'S FEELING ON WAKING UP FROM SLEEPING				
Tired/stressed		15	13	0.88
Headache/irritated		15	8	**0.019**
Normal/relaxed		10	19	0.547
NO.OF PARTICIPANTS WHO LOST SLEEP IN THE LAST MONTH				
		Cases (n=50)	Controls (n=50)	P value
yes		34(68)	14(28)	**<0.0001**

The nap characteristics of the cases and controls showed that 31 cases had the habit of taking daytime naps where as only 13 controls has the habit of daytime napping (p value <0.00001).

The mean maximum nap time was found to be 54.6+/-36.8 among cases and 20.4+/-18.72 in controls (p value = 0.0031).

The quantitative sleep characteristicsshowed that the Mean sleep durations are higher in controls than cases, it did not reach statistical significance The qualitative characteristics of sleep are summarized . Based on responses given by participants who woke up at night, the reasons for waking up are broadly categorized into A) Thoughts and Psychological disturbances B) Bodily urges (hunger/thirst/urination) C) External disturbances. Based on the responses when asked about how they felt on waking up un the morning, three categories are made. I) Tired/stressed II) Headache / irritated III) Relaxed/normal. As shown, there are no statistical significant differences between cases and controls in terms of frequency of waking ups per night. Though the most common cause of waking up in both cases and controls was bodily urges, the wakeups due to thoughts and psychological disturbances were numerically higher in cases compared to controls. Also observed is that more number of cases complained of feeling irritated or having a headache after waking up when compared to controls (15 vs 8, p value =0.019). additionally ,34 cases and 12 controls complained of loss of sleep or disturbed sleep in the last one month (p <0.0001).

DISCUSSION

In the current study, we have evaluated the association between habitual sleep patterns, both qualitative and quantitative, and occurrence of first AMI. We have observed that there is no statistically significant difference between cases and controls in the number of sleep hours obtained in the night. Hence, the Null hypothesis of no association between sleep duration during night and occurrence/risk of AMI cannot be disproved in this study. Nevertheless, several other studies have shown association between short duration of sleep is associated with increased risk of AMI[11,12]. The Fukoka Heart Study has shown that short sleep duration of five hours or less (<=5) per night and frequent loss of sleep i.e two or more nights per week with less than five hours of sleep per night were associated with a two to three fold increase in the risk of AMI[13]. This increase in risk of cardiovascular disease (CVD) in short sleepers was correlated with a rise in the levels of C-reactive protein which is an inflammatory marker that can predict cardiovascular morbidity[9]. Some other studies have suggested that both longer as well as shorter hours of sleep are associated with an increased risk of Cardiovascular Disease/AMI suggesting a U-shaped association [14,15]. In other studies, only longer hours of sleeping was associated with the risk of AMI.[16,17]Though we did not find inter group differences in terms of duration of sleep between cases and controls ,average sleep duration was close to the recommended 7-8 hours per day in both groups.

In our study, we have observed that significantly higher number of cases had the habit of taking daytime naps when compared to controls. Furthermore, a statistically significant difference in nap duration between controls and cases has been observed. Based on the results, a statistically significant association between increased daytime nap duration and occurrence of first AMI was found in the present study. These findings were consistent with the several studies which have shown daytime napping as an independent risk factor for Cardio vascular Disease.[18,19,20] However, some studies have shown a negative association between daytime naps and AMI. [21,22] Morning time of the day was noted to have the highest risk for Cardiovascular events due to the rapid rise in Blood Pressure due to activation of sympathetic nervous system. Since pattern of blood pressure during daytime napping are similar to that of nocturnal sleep,[24] a rapid rise in blood pressure after napping [25] could be associated with sympathetic nervous system activation and risk of AMI . The pro thrombotic effects of acute change in posture in the morning [26] could also occur after daytime napping and could play a role in triggering thrombotic cardio vascular events. Some other studies have shown that risk of AMI is much higher in short sleepers who have ongoing sleep disturbances than those without sleep disturbances.[27] The probable mechanism between disturbed sleep and risk of AMI may be explained as follows. Disturbed sleep leads to an inability to reduce sympathetic system stimulation and activation of cardiovascular system at night, there by preventing adequate rest and restoration. [28] Disturbed sleep may promote inflammation in blood vessels and cause disturbances of immune function. [29]Disturbed sleep may also increase blood pressure, blood glucose concentrations and blood cholesterol concentrations, [30] all of which are risk factors for AMI.

Strengths and limitations

The strength of our study is careful matching between cases and controls to avoid confounding from important cardiovascular risk factors such as age, gender, smoking, alcohol use, diabetes mellitus and hypertension. The advantage of this case control study was being resource,time and cost efficient.

CONCLUSION

This study in indian population found no association between sleep duration at night and incidence of first AMI. However, increased day time nap duration was found to be significantly associated with AMI. Significant association was also found between disturbed sleep / poor quality of sleep and risk of AMI. In addition, it was also found that loss of sleep in the recent past was significantly associated with incidence of AMI. Hence, sleep deprivation seems to be a potential risk factor for Acute Myocardial Infarction. Therefore, understanding the underlying Mechanisms linking sleep deprivation to Cardiovascular diseases can

help us better understand the patho-physiological mechanisms leading to development of Acute Myocardial Infarction.

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