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A Study to Determine Sleeplessness as a Potential Predisposing Factor for Myocardial Infarction

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Abstract:-

- ***Background***

It is well-established that insufficient sleep is related to more than one acute and persistent illness and leads to elevated mortality and morbidity for cardiovascular illnesses. In recent years, there has been growing interest in sleep-associated investigations. Significant interest has currently been focused on the impacts of sleep deficiency and disturbance on various organs and how they modulate an increasing listing of disease processes. This study aims to bring awareness about the importance of sleep in Myocardial Infarction patients and makes it necessary to counsel patients to change their lifestyle which could help reduce the possible morbidity and mortality rates in the population.

- ***Methodology***

A prospective observational study was conducted on 400 MI patients (males and females) aged between 20-60 years who were enrolled in Sri Jayadeva Institute of Cardiovascular Science and Research Hospital from February 2021 to April 2021 to assess sleep duration and quality in MI patients using Pittsburgh Sleep Quality Index (PSQI) scoring scale and a self-designed patient profile form.

- ***Results***

It was observed that males (77%) were more prone to cardiovascular conditions due to impaired sleep as compared to females (23%) with the baseline age of 50-60 years (46.8%) at the highest risk. Patients who were married (98.8%) and had a habit or abstinence from smoking and drinking (61.3% and 76.5% respectively), staying in urban places (63.5%), and without any significant medical history were observed to have cardiovascular diseases attributed to their poor sleep practice. Daily wagers were often sleep-deprived due to physical and financial stress which can cause high morbidity rates in the population.

- ***Conclusion***

The study suggests a positive correlation between sleep deprivation and myocardial injury. Patients with impaired sleep might be at moderate risk of poor cardiac prognosis followed by a subsequent attack of MI.

Keywords:- *Sleep Deprivation, Myocardial Infarction, Pittsburgh Sleep Quality Index, Blood Pressure, Cardiovascular Disease.*

I. INTRODUCTION

Cardiovascular diseases are the most common cause of morbidity and mortality globally.the wide array of cardiovascular diseases, coronary artery disease (CAD) is the most prevalent and subsequently leads to ischemic heart disease (IHD) characterized by angina, which progresses to myocardial infarction (MI). IHD accounts for 80% of cardiovascular deaths Although mortality due to MI has reduced drastically over the years as a result of increased awareness of the earlier symptoms of CAD and IHD aiding in timely diagnosis and initiation of medication as well as the development of percutaneous coronary intervention to identify the atherosclerotic or arterial causes of CAD as well as to re-establish coronary blood flow, there is yet increased morbidity of the disease in developing countries, contributing towards restricted quality of life. The various causes and risk factors of MI can be broadly categorized into 3 categories, namely myocardial ischemia, non-atherosclerotic causes, and lifestyle contributors. Myocardial ischemia can be due to CAD, rheumatic heart disease (RHD), or congenital heart diseases, while the non-atherosclerotic causes comprise coronary vasospasm, arteritis, cardiogenic shock, and trauma, A large number of lifestyle factors and comorbidities have been found to contribute to the development of MI, such as dyslipidemia, psychosocial distress, diabetes mellitus, smoking, high blood pressure, overweight, alcoholism, lethargy, and a diet low in fruits and vegetables Sleep, when simply defined, is a reversible behavioral state of perceptual disengagement from and unresponsiveness to the environment. It is also a complex combination of physiologic and behavioral processes. Sleep is typically (but not necessarily) accompanied by postural lying down, behavioral quiescence, closed eyes, and all the other indicators one commonly associated with sleeping. In unusual situations, other behaviors can occur during sleep, such as sleepwalking, sleep talking, teeth grinding, and other physical activities. Anomalies involving sleep processes also include disturbance of sleep—sleep itself, dream imagery, or muscle weakness— leading to wakefulness.

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It is extensively recognized that insufficient sleep is associated with various acute and chronic diseases and results in increased mortality and morbidity for cardiovascular diseases. Sleep deprivation is associated with an increased incidence of adverse cardiovascular disease events. Sleep deprivation may be an important risk factor for obesity, type-2 diabetes, and hypertension and is potentially an independent predictor of stroke, CAD, and CVD. Tissue repair and cellular immune function are impaired due to sleep deprivation and thus potentially influence overall morbidity and mortality. To understand the role of sleep, many studies have been performed focusing on aspects of the duration of work, occupation, age and gender, and duration of sleep. Various studies have been performed to determine the consequences of sleep deprivation by using instruments like the Pittsburgh Scale Quality Index scoring scale, and King's Health Questionnaire for evaluating sleep quality .

The objective of this study was guided towards an increasing understanding of healthy sleep patterns and their effects on the progressive outcome of MI. The current study will help in establishing sleep deprivation and associated sleep disorders as formidable predisposing factors for the development of MI in people belonging to various age groups, which will throw light on the requirement of necessary amendments in the existing guidelines for the control, prevention, and management of MI to include sleep disorders as significant contributing factors, along with their management, for a successful reduction in the incidence and mortality of MI in the country.

- *Abbreviations and Acronyms* -
- *MI - Myocardial Infarction*, PSQI - Pittsburgh Sleep Quality Index, CAD - Coronary Artery Disease, IHD - Ischemic Heart Disease, RHD - Rheumatic Heart Disease, CVD - Cardiovascular Disease

II. METHODOLOGY

A prospective observational study was conducted in the cardiac care unit. The study was conducted for a period of 12 months between February 2021 and February 2022 at Sri Jayadeva institute of cardiovascular research, Bangalore-69. The study included patients Aged >20 years and <60 years and patients with myocardial infarction, and excluded patients Aged <20 years and >60 years. The study was done after institutional ethics committee approval (ref no: SJICR/EC/2021/009). Patients consecutively being admitted to Sri Jayadeva institute of cardiovascular research were included.

➢ *Data Collection Procedure*

A protocol was made and submitted to the Institutional Ethics Committee. After the approval of the Institutional Ethics Committee, the study was conducted and the informed consent form was signed by the patients. A self-designed patient profile form was filled with the necessary details from the patient like demographic data, past medical history (PMH), medication history, comorbid conditions and the serum values of International normalized ratio (INR), Partial thromboplastin time (PTT), Activated partial thromboplastin time (APTT), Prothrombin time (PT), Differential count (DC) will be assessed and analyzed along with other clinical data of Electrocardiogram (ECG) and 2D echocardiogram to help determine the extent of MI about the PSQI scale. The Pittsburgh sleep quality index (PSQI) scale, which is a validated questionnaire, was filled by the investigators by interrogating the questions from PSQI to the patients.

III. DATA ANALYSIS

➢ *The Pittsburgh Sleep Quality Index(PSQI)*

The Pittsburgh sleep quality index (PSQI) was developed in 1988, by Buysse and his colleagues, to create a standardized measure designed to gather consistent information about the subjective nature of people's sleep habits and provide a clear index that both clinicians and patients can use. It differentiates “poor” from “good” sleep by measuring seven domains: subjective sleep quality, sleep latency, sleep duration, habitual sleep efficiency, sleep disturbances, use of sleep medications, and daytime dysfunction of sleep over the last month. It is a questionnaire-based scoring scale consisting of 19 self-related questions and 5 questions rated by the bed partner or roommate (if one is available). The questions only relate to the patient's usual sleep habits during the past month Only self-related questions are included in the scoring. The 19 self-rated items are combined to form seven “component” scores each of which holds scores ranging from 0-3 concerning the quality of sleep experience i.e., excellent, good, and poor. After filling out the PSQI scale, the patient was counseled about the importance of sleep Later, a comparison of both data was done to establish an association between sleeplessness and MI.

➢ *Statistical Analysis*

The data collection form was statistically assembled using Microsoft Excel. A structured study proforma was used to document the relevant demographic and clinical data of the study subjects on a real-time basis. Statistical Methods: Descriptive and inferential statistical analysis has been carried out in the present study. Results on continuous measurements are presented on Mean ± SD (Min-Max) and results on categorical measurements are presented in Number (%). Significance is assessed at a 5 % level of significance. SPSS 22.0, and R environment ver.3.2.2 were used for the analysis of the data, and Microsoft Word and Excel have been used to generate graphs, and tables.

IV. RESULTS

The results from the survey of 400 myocardial patients at Sri Jayadeva Institute of cardiology, Bangalore supported our expected hypothesis. Our current studies have established a significant association between unhealthy sleep qualities with prevailing cardiovascular diseases, particularly myocardial infarction. The study uses demographic data (age), social (habits), laboratory (enzyme

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levels) and radiographical (2d-echo) parameters relevant to the cardiovascular health state of patients which is then correlated clinically to sleep quality using a standardized sleep assessment scoring scale knows as PSQI (Pittsburgh sleep quality index). Most of the patients belonged to the age group of 51-60 years (46.8%) and 41-50 years (37.5%) and were men (77%). About 39% and 23.5% of the patients stated to be smokers and alcohol consumers, respectively. Approximately 44% and 43% of the patients recruited in the study were known to have hypertension and type-2 diabetes mellitus, respectively. The study includes multiple logistic regression models to determine the association between the measures of sleep impairment and MI. Multivariate models were fitted to adjust for potential confounding from baseline demographic and occupational covariates. Cardiovascular biomarkers were added to the models. We used prior knowledge and the methods of Directed Acyclic Graphs to identify potential confounders, which included age, sex, occupation, shift work, stress, smoking status, alcohol consumption, recent events before MI, marital status, diabetes, hypertension, and other comorbidities. A total of 400 subjects were recruited from February 2021 to April 2021 based on the inclusion and exclusion criteria to assess the association between sleep deprivation and Myocardial infarction using Pittsburgh Scale Quality Assessment Scale. Among the patients included in the study, 103 patients (about 26%) had low score PSQI scores (i.e., <5), while the remaining 297 patients (about 74%), which constituted the majority of the population, had high PSQI scores (i.e., >5). Most of the patients belonged to the age group of 51-60 years (46.8%) and 41-50 years (37.5%) and were men (77%). About 39% and 23.5% of the patients stated to be smokers and alcohol consumers, respectively. Approximately 44% and 43% of the patients recruited in the study were known to have hypertension and type-2 diabetes mellitus, respectively. However, no significant association was found between the PSQI score and age, gender, social habits, or comorbidities (Table 1).

Table 1: Baseline Characteristics against PSQI Score

PARAMETER	LOW PSQI SCORE (N=103)	HIGH PSQI SCORE (N=297)	TOTAL (N=400)	P-VALUE
Age (in years), n (%)				
21-30	1 (1)	5 (1.7)	6 (1.5)	0.212
31-40	19 (18.4) 0.212	38 (12.8)	57 (14.3)	0.212
41-50	43 (41.7)	107 (36)	150 (37.5)	0.212
51-60	40 (38.8)	147 (49.5)	187 (46.8)	0.212
Gender, n (%)				
Female	24(23.3)	68(22.9)	92(23)	0.933
Male	79(76.7)	229(77.1)	308(77)	0.933
Occupation, n (%)				
Government	-	-	10(2.5)	-
Corporate employee	-	-	32(8.0)	-
Entrepreneur	-	-	27(6.75)	-
Daily wager	-	-	130(32.5)	-
Driver	-	-	55(13.75)	-
Farmer	-	-	45(11.25)	-

Our study objectives and significance are varied from other studies in a way that includes the effect of unhealthy sleep patterns and quality on the Asian ethnic population which demonstrates a considerable change in population gender, age, occupation, and many more parameters. This study could be used by clinical pharmacists in hospital care set up as an additional counseling point for MI patients to help improve the quality-of-life years. On the assessment of laboratory data of recruited subjects, it was seen that patients with impaired sleep had elevated laboratory values suggestive of a poor prognosis of the disease. However, no statistically significant association could be established between the lab values and PSQI score

V. CONCLUSION

Although sleep plays an important role in disease prevention and recovery, currently a huge number of people suffer from sleep deprivation; it can cause impairments in cognition, memory, emotional stability, and in the regulation of immunological and inflammatory responses. But as such our understanding of the regulation and molecular mechanisms of sleep deprivation on cardiovascular disease remains elementary. Hence, the evaluation of sleep deprivation should be more diversified in case of age, gender, and other comorbid conditions and experimental models. Poor sleep not only affects our day-to-day functioning and quality of life but also increases the risk of

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disease and possibly poor prognosis following cardiovascular events such as AMI. Our study suggests a positive correlation between sleep deprivation and subsequent myocardial injury, patients with impaired sleep might be at moderately higher risk of poor cardiac prognosis followed by a first-time AMI. Therefore, it is crucial to evaluate the sleep quality of every patient suffering from cardiovascular disease and the patient must be counseled to follow a healthy sleep pattern. Further longitudinal studies are needed to ascertain that the evaluation of sleep quality might be useful in the prevention of secondary cardiovascular ailment.

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