Assessment of Change in Sleep Quality Before and After Primary Percutaneous Transluminal Coronary Angioplasty: A Hospital Based Prospective Study

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Abstract: *Primary PTCA is the treatment of choice for patients with Acute Myocardial Infarction. The patients with Acute Myocardial Infarction (MI) as well as those who undergo PTCA have altered sleep quality. The primaryobjective of this study was to investigate the effects of PTCA on sleep quality in patients following the procedure. This follow up study was conducted at Department of Cardiology, LF Hospital Angamaly. This study focused on 60 patients diagnosed with acute MI who underwent primary PTCA. In this study, we investigated the alterations in pre-procedural, one-month and two-month post-procedural sleep quality following primary PTCA. The Pittsburgh Sleep Quality Index (PSQI) was used to evaluatesleep quality. This study shows that there is a significant change in sleep quality in patients who underwent primary PTCA. In the first month after the procedure, sleep quality decreased, followed by an improvement in sleep quality in the second month.*

Keywords: coronary artery disease, Acute MI, Primary PTCA, Sleep quality, PSQI

1. Introduction

Cardiovascular diseases (CVDS) is the most common cause of death worldwide [1]. According to the World Health Organization (WHO), around 17.9 million people die annually due to cardiovascular disease worldwide, with an estimated 23 million deaths by year 2030[2]. In addition to optimal medical management, treatment options for Coronary Artery Disease (CAD) include Coronary Artery Bypass Graft (CABG) and Percutaneous Coronary Intervention or Percutaneous Transluminal Coronary Angioplasty (PTCA) [3].

PTCA done in patients with Acute ST Elevation Myocardial Infarction (STEMI) is called Primary Angioplasty. Primary PTCA has evolved over last few decades as an alternative to drug therapies like fibrinolysis (clot lysis medicines) and is currently the treatment of choice for Acute Myocardial Infarction. A detailed description of this treatment is beyond the scope of this article. Briefly a sheath is inserted percutaneously to any of the arteries. A catheter is inserted through this sheath and is optimally placed in coronary arteries. After confirming coronary block by angiogram, a small wire is introduced into the coronary artery and is kept across the block. Over the wire a balloon is passed and kept across the block, the inflation of this balloon crack opens the block and establish the blood flow in that coronary artery. This procedure is often completed by implanting a coronary stent.

Sleep is a basic need and important for overall well-being. Most people experience sleep problems at some point of their lives which could be due to periods of stress, changes in sleep habits, personal problems or environmental factor. Sleep quality is an important factor for our sleep and for the body to recover during sleep[4].

Poor SQ is common among patients after coronary artery bypass graft surgery (CABG). The results of a systematic review showed that more than 50% of patients experienced sleep problems through hospitalization and 6 months after heart surgery. Factors that influence sleep disturbance during hospitalization and 6 months after discharge are different. During hospitalization, physical and environmental factors (e.g. pain, cardiac function, and noise) and through 6 months after recovery, psychological factors such as anxiety and mood disturbance affect the SQ of the patients [3]. Poor SQ interferes with the cardiac patients' quality of life [5,6,7].

Sleep quality (SQ) is defined as the subject's satisfaction with sleep experience, integrating domains of sleep initiation, sleep maintenance, sleep quantity, and refreshment upon awakening [8]. Several large epidemiological studies have found that short sleep duration and poor sleep quality are associated with cardiovascular disease (CVD). For example, short sleep duration and difficulty falling asleep were predictors of incident myocardial infarction (MI) among women, sleep difficulty was associated with Coronary Heart Disease (CHD) mortality among men [9]. Obstructive sleep is a risk factor for atrial fibrillation and heart failure

2. Materials and Methods

This prospective study was conducted on 60 patients who underwent primary PTCA at three study time points: within 1 week (preprocedural), 1 month, and 2 months after the procedure at Department of Cardiology LF Hospital, Angamaly. The investigation was approved by the Ethical Committee of the Institution. In this study, subjects were chosen randomly using a simple random sampling method.

This study encompassed stable patients following Acute

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Myocardial Infarction (MI) who had undergone primary angioplasty with stent placement and were devoid of any co-morbidities like Heart Failure, Kidney Diseases, Stroke , Pulmonary disease or psychiatric illness.

Participants within the age range of 30-75years were considered eligible for inclusion. Both male and female individuals who were willingto participate and complete the required data were selected for this study.

Patients below 30 and above 75 years old were excluded from the study, as were those who regularly used sleeping pills or antidepressants. Additionally, individuals with major illnesses such as cancer or chronic infectious diseases were also excluded. These criteria were implemented to ensure the study focused on a specific population without confounding factors that could influence the results.

3. Data Collection

After obtaining approval from the scientific and ethical committee, informed consent was obtained from stable patients who had undergone primary angioplasty for the study. Personal details were collected using a specially designed proforma, including name, age, sex, family history, qualification, occupation, income, Smoking history and marital status. Subsequently, preprocedural sleep quality was assessed within one week after the procedure, once the patients had become stable, using the Pittsburgh Sleep Quality Index (PSQI) questionnaire. The PSQI, a self-report questionnaire consisting of 19 items, was utilized to assess various aspects of sleep quality, providing seven component scores. Follow-up data were collected from the same patients at intervals of one month and two months using the same questionnaires.

Statistical analysis
Interpretation of demographic variables include age, sex, family history, income, education, job status, smoking history, marital status by using descriptive statistics with frequency and percentage. Paired t-test isused to analyze pre procedural and post procedural sleep quality

4. Results

Table 1: Demographic Profile

Variables	Frequency		Percentage
Age	30– 35	2	3.3%
	36 – 50	20	33.3%
	51 – 65	33	55.0%
	66 – 75	5	8.3%
Sex	Male	49	81.7%
	Female	11	18.3%
Family History	Yes	27	45.0%
	No	33	55.0%
Income	Nil	12	20.0%
	Bellow Rs.10,000/-	8	13.3%
	Rs.10,000 - 20,000/-	17	28.3%
	Rs.20,000 - 50,000/-	18	30.0%
	Above Rs.50,000/-	5	8.3%
Education	Up to SSLC	32	53.3%
	+ 2 / Diploma	21	35.0%
	Degree	5	8.3%
	PG/Professional	2	3.3%
Job status	Private	31	51.7%
	Daily wages	17	28.3%
	Unemployed	12	20.0%
Smoking history	Yes	24	40.0%
	No	36	60.0%
Marital status	Married	53	88.3%
	Unmarried	7	11.7%

The study was conducted on 60 participants, 49 (81.7%) male and 11 (18.3%) female. Most participants were in the age range 51-65 years. In relation to the level of education, 32 (53.3%) had a high school degree. 24(40%) hada smoking history. Familial history was present in 27(45%)
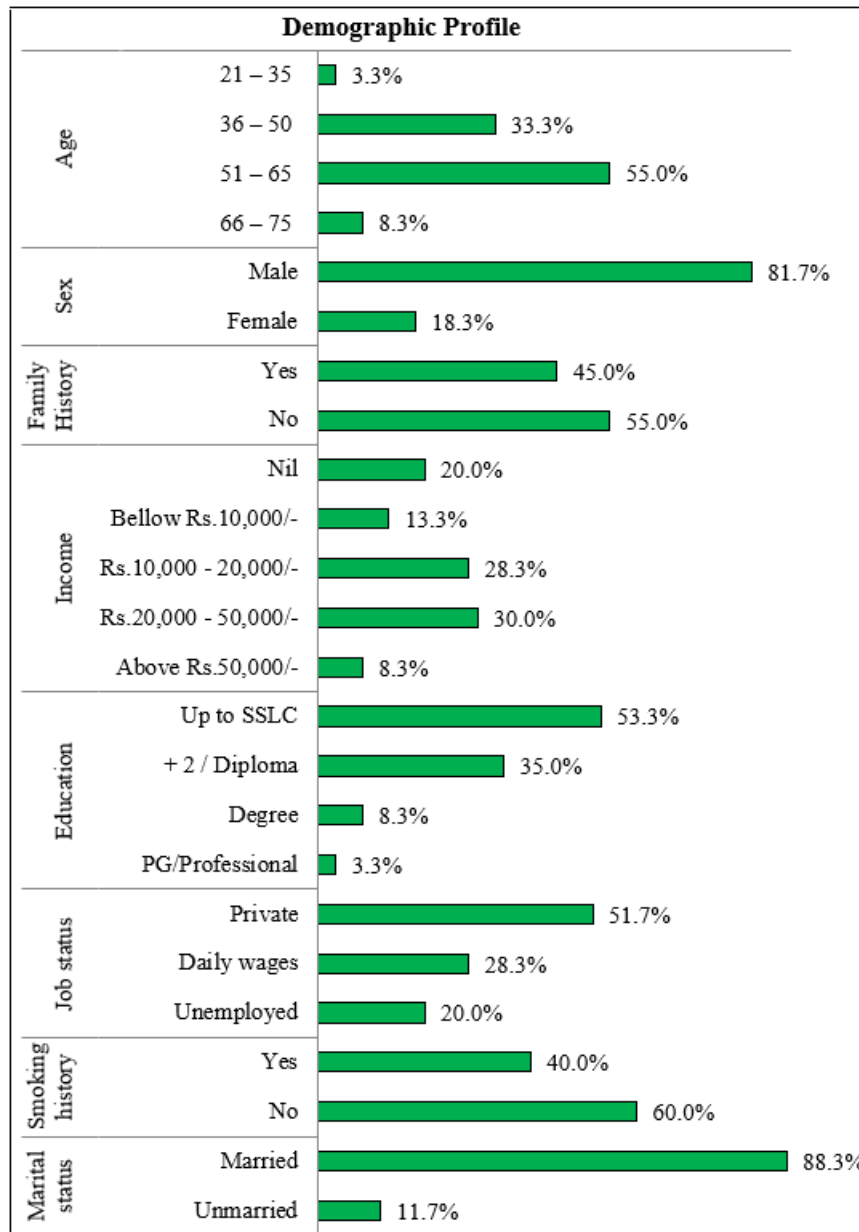
Figure 1: Demographic Profile
Sleep quality among patients before and after primary angioplasty

Table 2: Sleep Quality – Descriptive Statistics

Sleep quality	Mean	SD	Minimum	Maximum
Before	8.12	2.99	2	16
1st month	12.55	3.49	4	19
2nd month	8.25	3.27	2	16

The above table interprets the mean PSQI score among patients undergone primary angioplasty. A high PSQI score of sleep quality indicates poor sleep quality. The level of sleep quality in these three phases can be seen in the following table and graph.

Table 3: Level of Sleep quality among patients undergone primary angioplasty

Sleep quality	Before		Post 1		Post 2	
	f	%	f	%	f	%
Good Sleep Quality	9	15%	1	1.7%	13	21.7%
Poor Sleep Quality	51	85%	59	98.3%	47	78.3%

From the above table it can be seen that majority of the patients (85%) were having poor sleep quality. Only 15% in the good sleep quality. Whereas in the 1st month after procedure, the poor sleep quality increased to 98.3% and only 1.7% in good sleep quality. In the second month post-procedure, there was a notable improvement, with 21.7% reporting good sleep quality and 78.3% experiencing poor sleep quality.
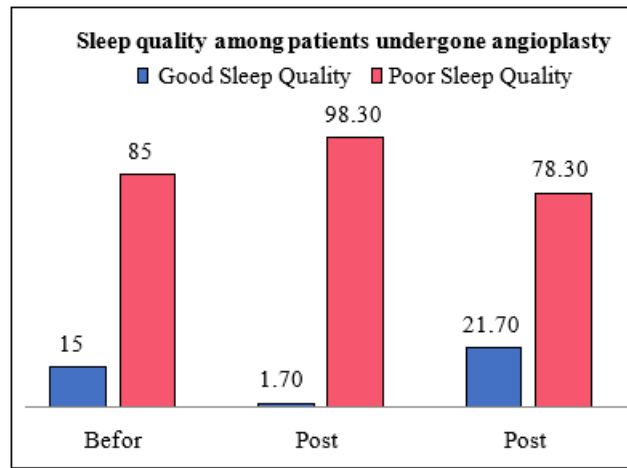
Figure 2: Level of Sleep quality among patients undergone primary angioplasty

Table 4: Mean, S.D. and t value to compare the Sleep quality before & 1 month afterprimary angioplasty

Sleep quality	Mean	S.D.	n	Difference between mean	t	df	p-value
SQ before	8.12	2.99	60	4.43	20.55	59	$p < 0.001$*
SQ after angioplasty	12.55	3.49					

The mean column in the t-test table displays the mean score of sleep quality before and afterangioplasty. The Standard Deviation column displays the standard deviation of the scale scores. The difference between mean (4.43) shows the difference between mean scores in before and after (8.12& 12.55).

The test statistic t = 20.55 shows a significance *(p < 0.001),* there is significant difference inthe sleep quality before and 1st month after primary angioplasty. The sleep quality has significantly reduced among the patients 1 month after angioplasty.

Table 5: Mean, S.D. and t value to compare the Sleep quality 1st and 2nd month after angioplasty

Sleep quality	Mean	S.D.	n	Difference between mean	t	df	p-value
SQ 1month after angioplasty	12.55	3.49	60	4.3	14.29	59	$p < 0.001$*
SQ 2nd month after angioplasty	8.25	3.27					

The Mean column in the t-test table displays the mean score of sleep quality in the 1st and 2nd month after primary angioplasty. The Standard Deviation column displays the standard deviation of the scale scores. The difference between mean (4.3) shows the difference between mean scores in

before and 1st month after angioplasty (12.55 & 8.25).

The test statistic t = 14.29 shows a significance *(p < 0.001),* there is significant improvement in the sleep quality during the 2nd month when compared with 1st month.

Table 6: Mean, S.D. and t value to compare the Sleep quality before angioplasty & 2nd month after angioplasty

Sleep quality	Mean	S.D.	n	Difference between mean	t	df	p-value
SQ before	8.12	2.99	60	0.13	0.51	59	0.61
SQ 2nd month after angioplasty	8.25	3.27					

The Mean column in the t-test table displays the mean score of sleep quality in the before & 2nd month after primary angioplasty. The Standard Deviation column displays the standard deviation of the scale scores. The difference between mean (0.13) shows the difference between mean scores in before & 2nd month after primary angioplasty (8.12 & 8.25).

The test statistic t = 0.51 shows no significance *(p = 0.61),* there is no significant differencein the sleep quality before and the 2nd month after primary angioplasty. The sleep quality of the patients is similar before and 2 months after angioplasty.

5. Discussion

Primary percutaneous transluminal coronary angioplasty has been widely performed in patients with acute coronary syndrome with favorable outcomes, leading to the highest-level recommendation (IAevidence) in the guideline on the

management of acute myocardial infarction [10,11].

Primary percutaneous coronary intervention (PPCI), is the treatment of choice acute myocardial infarction (heart attack) caused by a complete blockage of a coronary artery. Unlike elective angioplasty,which is performed in a non-emergency setting, primary angioplasty is performed urgently during a heartattack.

Sleep is important for overall wellbeing [12]. ICU patients may have more short-term sleep disturbancescaused by both the period of critical care and the high prevalence of concurrent diseases. Sleep-related problems may persist long after the patients have left the ICU [13]. Factors that influence sleep disturbance during hospitalization and 6 months after discharge are different [14].

In a study conducted by Tugba Onegi et.al concluded that

patients undergoing coronary angiography had poor sleep quality and high levels of fatigue, and this was caused by several factors [15].

Lotti Orwelius et al conducted a study in Sweden titled "Prevalence of sleep disturbances and long-term reduced health-related quality of life after critical care," researchers found a high prevalence of sleep disturbances among patients following discharge from the ICU [16].

The impact of coronary artery diseases and associated therapies, such as PTCA, on sleep quality remains an understudied area. Thus, the primary objective of this study was to investigate the effects of PTCA on sleep quality in patients following the procedure. By assessing changes in sleep patterns and quality in post-PTCA, we aimed to highlight how this intervention could affect sleep quality for acute MI patients.

In our study, a notable pattern in sleep quality emerged from the study findings. Initially, there was a significant decrease observed in 1st month post procedural sleep quality when compared with pre procedural sleep quality. However, this trend reversed in the subsequent month, with a significant increase noted in sleepquality between the first- and second-month after procedure. Interestingly, no significant change was detected when comparing pre-procedural sleep quality with that at the 2nd month after angioplasty.

Patients may experience discomfort or pain at the catheter insertion site or due to post-procedural soreness and Medications, which can disrupt sleep. Primary angioplasty, as an emergency intervention for thefirst heart attack, may cause mental distress, and financial concerns may further impact sleep quality. May be these are the factors likely contribute to decreased sleep quality during the first month after primary angioplasty particularly in the first week after the event.. After discharge, counseling sessions aimed at improving mental and physical strength, as well as enhancing sleep quality, are recommended for patients and the family.

In our study results indicate that sleep quality fluctuates after angioplasty, initially declining and thengradually improving, stabilizing close to baseline levels by the second month. It meant that there is an improvement in sleep quality after angioplasty at the last month of follow up.

There are several limitations in our study; the small sample size and short study period may affect the accuracy of results and also There is no comparative arm with Acute Myocardial Infarction patients managed without Primary Angioplasty. This limitation is difficult to overcome as unlikely to get Acute MI patients managed medically alone. Further follow-up is necessary for the better understanding of significant differences or improvement in sleep quality.

6. Conclusion

In our study, we observed a significant change in sleep quality following primary angioplasty. Sleep quality initially decreased in the first month but notably improved during the second month of follow up. Additionally, continued investigation is necessary to understand the sustained improvement in sleep quality observed from the second month onward. Further research is essential to identify factors influencing sleep quality post-procedure and to offer counseling aimed at enhancing sleep for patients and their families. Family support is crucial for optimizing outcomes for patients undergoing angioplasty.

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