Anxiety and Physiological Responses in Patients with First Myocardial Infarction

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Abstract—**Myocardial infarction (MI) is a leading cause of mortality and morbidity in many countries. MI in patients tends to be followed by anxiety that may contribute to developing complications. The first experience of MI was found as one factor that influences anxiety in patients. Severe and untreated anxiety has negative impacts on physiological responses as a rapid response to an infarction. Moreover, the assessment and treatment of anxiety in hospitals are commonly less undervalued. The purpose of this study was to examine the anxiety levels and physiological responses among first MI patients. This study was a descriptive study with 60 first MI patients who were admitted to ICCU of Sanglah Hospital, Bali, Indonesia. Subjects were asked to complete the anxiety instrument using the 6-item State Anxiety Inventory and Trait Anxiety Inventory. Blood pressure, heart rate, and respiration rate were assessed as clinical physiological responses of anxiety. The results revealed that more than half of the subjects were found to have moderate state anxiety (53.3%) and 48.3% showed moderate trait anxiety. 35% of patients in their first experience of MI showed a high level of state anxiety. Also, there was a statistically significant correlation between physiological responses and anxiety, however, not in systolic blood pressure. A significant number of patients with first MI were assessed as having high and moderate levels of anxiety. Thus, these results might be taken as evidence to early evaluate the anxiety of MI patients to prevent further complications.**

Keywords-Anxiety; first myocardial infarction; physiological responses.

I. INTRODUCTION

In Indonesia, heart disease including Myocardial Infarction (MI) is a growing health concern and is currently listed as a number one cause of mortality [1]. MI is defined as irreversible necrosis of myocardial tissue as the impact of inadequate blood flow to the myocardium for a critical period [2]. MI leaves a lasting impact on quality of life, especially among younger patients [3]. This impact is not merely a reflection of the severity of the cardiac event or of risk factors and comorbidities but also emotional responses to the event, such as depression and anxiety that have a unique contribution to the diminished quality of life following MI.

Anxiety is defined as a feeling of fear, tension, and panic that something unpleasant is going to happen and is almost eternally followed by physical signs and symptoms [4]. Spielberger, Gorsuch, and Lushene (1970) differentiated the components of anxiety including situation (state) and person (trait) [5]. State anxiety is often transitory, and it can fluctuate and recur when appropriate stimuli evoke it. Trait anxiety refers to individual differences in the likelihood that a person would experience state anxiety in a stressful situation. Also, anxiety may have an effect on the activation of the autonomic nervous system such as physiological responses as a rapid alarm response to the person for defensive strategies [6].

The first experience of MI has been found as one of the vital factors in causing patients to become anxious particularly because their future is uncertain. It commonly occurs due to the patients' perception that MI is a life-threatening disease [7]. A previous study reported that the prevalence of anxiety was 35% among first MI patients, 16.6% of first MI patients experienced a combination of anxiety and depression [8]. Severe and untreated anxiety has negative impacts on MI patients. Anxiety in MI patients was reported to have increased the risk of re-stenosis, a length of recovery, as well as double the high risk of death compared to cardiac patients without anxiety [9, 10, 11].

Another study also reported that MI patients with sustained anxiety had negative physiological responses including increased blood pressure, increased heart rate, and decreased oxygen supply to the brain [12]. The existence of anxiety also influences a poorer quality of life and adverse outcomes due to an increased rate of long-term morbidity and mortality after cardiac infarction [3]. Although patients who experienced MI assuredly experience anxiety [13], both the assessment and treatment of anxiety tended to be undervalued. This is partially because the physical symptoms of anxiety are often covered by the symptoms of MI such as chest pain, elevated blood pressure, shortness of breath, rapid heart rate, fatigue and palpitations [14]. Moreover, anxiety that develops early after a cardiac event may continue into the recovery phase and influence the prognosis of MI in patients [15, 16].

Less awareness of the health care provider to observe the physiological consequences of anxiety in MI patients may contribute to its under-treatment. Assessing anxiety and physiological responses are critical for understanding the significance of anxiety. Furthermore, examining the relationship between anxiety and physiological responses in first experience MI patients is also important to prevent in-hospital complications and early mortality from MI. Therefore, the aim of this study was to examine anxiety levels and physiological responses in patients with their first MI in Indonesia. Findings from this study will call more attention of health care providers to the importance of assessing and treating a patient's anxiety in MI. In addition, the specific aims of this study were as follows: (1) describe the anxiety level in patients with first MI, (2) describe the physiological responses in patients with first MI, (3) describes the relationship between anxiety level and physiological responses in patients with first MI.

II. METHODOLOGY

A. Design and Participants

The study was conducted descriptively in the Intensive Cardiac Care Unit (ICCU) of Sanglah Hospital, Bali, Indonesia. The total size sample was 60 first MI patients who were admitted to the ICCU with the following inclusion criteria; have stable hemodynamics, 18 years or older, and were not receiving any anti-anxiety medication.

B. Measures

Demographic data of all the participants were obtained using the Demographic Data and Health Related Questionnaire (DDHQ). The study instrument was State and Trait Anxiety Inventory (STAI) questionnaire which is a clinical scale used to assess anxiety. The original STAI is composed of two measurements of anxiety: State Anxiety Inventory (SAI) and Trait Anxiety Inventory (TAI). The SAI in the original version consists of a 20-item measure and was shortened by Chlan (2003) to a 6-item state anxiety inventory [17]. The 6-item SAI measures temporal feelings of fear and worry, using a four-point Likert scale. Recent research reported it is also a well established scale used extensively in research and clinical practice, including in the Indonesian population [18].

The TAI contains 20-items to evaluate anxiety experienced in general and reflects a stable predisposition to anxiety as determined by personality patterns. The TAI uses a four-point Likert scale [5]. Both the SAI and TAI were used in the Indonesian language in this study and were tested for reliability in 20 Indonesian MI patients who met the inclusion criteria. The reliability coefficients of SAI and TAI were 0.87 and 0.86, respectively.

The physiological responses that were assessed were systolic blood pressure (SBP), diastolic blood pressure (DBP), heart rate (HR), and respiration rate (RR). SBP and DBP were measured by a mercury sphygmomanometer in the semi-fowler's position with the head of the bed raised approximately 30 degrees. HR and RR were measured by a wristwatch within one minute. In order to protect the privacy of the participants, all questionnaires were anonymous. All data were collected on the second day of the patient's admission to the hospital.

C. Analysis of Data

After data collection, data were analyzed using a computer software program with descriptive statistics. Also, Pearson correlation test was used for determining the relationship between anxiety and psychological responses. An assumptions test was met before analyzing the data.

III. RESULTS

Participants' Characteristics

Table I represents the demographic characteristics of the subjects were participating in this study. It was revealed that the mean age was 55.8 years old with the youngest subject being 37 years old and the oldest subject was 77 years old. In terms of gender, the highest frequency (80%) belonged to males. The majority of the subjects was married (93.3%) and was Hindu (80.0%). Only two of the subjects had no experience of having any formal education. More than half of the subjects had a monthly family income higher than three million Indonesian rupiah (58.3%) and had a family history of cardiovascular disease (51.7%). Most of the subjects (66.7%) were employed. Most of the subjects had other comorbid diseases with 26 subjects with hypertension, 20 subjects had diabetes mellitus, and 31 subjects had hypercholesterolemia. Almost all of the subjects had no experience of receiving an educational program related to myocardial infarction (93.3%).

Level of anxiety and physiological responses

Table II shows the anxiety levels and physiological responses of the subjects with MI. The mean score of the trait anxiety for the whole sample was 48.47 (SD = 13.31) and state anxiety was 15.60 (SD = 4.01). More than half of the subjects had moderate trait anxiety (53.3%). State anxiety of the subjects with first MI was found to be moderate (48.3%) and high (35%). The means of systolic blood pressure and diastolic blood pressure were 116.50 and 76.83, respectively. Most of the systolic and diastolic blood pressures, heart rates, and respiration rates were found within the normal range.

Correlation of state anxiety and physiological responses

Table III represents the relationship between anxiety and the physiological responses of systolic and diastolic blood pressure, heart rate and respiration rate of first MI patients. A Pearson correlation test was run to determine the relationship between state anxiety and physiological response values. It was revealed that there was a weak negative correlation found between state anxiety and systolic blood pressure ($r = -0.33$, $p < 0.05$). Diastolic blood pressure also showed a very weak relation with state anxiety ($r = 0.22$, $p > 0.05$), but the correlation was found to be not significant. There was a moderate, positive correlation between state anxiety and heart rate ($r = 0.50$, $p < 0.01$). Furthermore, a strong, positive correlation was also found between state anxiety and respiration rate ($r = 0.72$, $p < .01$).

TABLE I. DEMOGRAPHIC CHARACTERISTICS OF THE SUBJECTS (N=60)

Characteristics	n	%
Age (M=55.80, SD=10.11, min-max age =37-77)		
Gender		
Male	48	80.0
Female	12	20.0
Marital Status		
Single	2	3.3
Married	56	93.3
Widowed	2	3.3
Religion		
Islamic	6	10.0
Christian	6	10.0
Hindu	48	80.0
Education Level		
None	2	3.3
Primary School	6	10.0
Secondary school	20	33.3
Senior High School	16	26.7
College/University	16	26.7
Occupation		
Employed	40	66.7
Unemployed	20	33.3
Average monthly income of family*		
< 3,000,000 IDR (> 230 USD)	25	41.7
≥ 3,000,000 IDR (≥ 230 USD)	35	58.3
Smoking status		
Non smoker	23	61.7
Smoker/ex-smoker	37	38.3
Family history of cardiovascular disease		
Yes	29	48.3
No	31	51.7
Comorbid disease**		
Hypertension	26	43.3
Diabetes Mellitus	20	33.3
Hypercholesterolemia	31	51.7
Prescribed oral cardiac Medication**		
Anti-platelet agents	44	73.3
Statins	36	60.0
Vasodilators	32	53.3
Anticoagulants	29	48.3
Beta blockers	24	40.0
Diuretics	13	21.7
Angiotensin II	7	11.7
Calcium channel blockers	9	15.0
ACE inhibitor	8	13.3
Experience receiving MI education		
Yes	4	6.7
No	56	93.3

Note. *IDR: Indonesian Rupiah, ** Can have more than 1, n = Frequency

TABLE II. THE LEVEL OF ANXIETY AND PHYSILOGICAL RESPONSES (N=60)

Variables	n (%)	Range	M	SD	Level
Trait Anxiety		22-72	48.47	13.31	Moderate
20-39 (Low)	13 (21.7)				
40-59 (Moderate)	32 (53.3)				
60-80 (High)	15 (25.0)				
State anxiety		8-24	15.60	4.01	Moderate
6-11 (Low)	10 (16.7)				
12-17 (Moderate)	29 (48.3)				
18-24 (High)	21 (35.0)				
SBP		90-150	116.50	15.05	Normal
DBP		60-100	76.83	12.68	Normal
HR		53-92	76.83	10.03	Normal
RR		13-24	17.58	3.06	Normal

Note. n = Frequency, M = Mean, SD = Standard Deviation

TABLE III. RELATIONSHIP BETWEEN ANXIETY LEVEL AND PHYSIOLOGICAL RESPONSES (N=60)

Variable	SBP		DBP		HR		RR	
	r	p*	r	p*	r	p**	r	p**
State Anxiety	-0.33	0.01	-0.16	0.22	0.50	0.00	0.72	0.00

Note. * = Correlation is significant at the .05 level (2-tailed) ** = Correlation is significant at the .01 level (2-tailed)

IV. DISCUSSION

This study revealed that the majority of first MI patients had moderate levels of both trait and state anxiety. This finding is similar to the study conducted by Merta (2010) in 30 patients with first MI, all had experienced moderate anxiety [19]. Another study in Indonesia also supported that among 93.3% anxiety patients with MI, 48.3% experienced a moderate level of anxiety and 1.7% had a high level of anxiety [20]. However, this current study found 35% of first MI patients suffered high levels of state anxiety. This result was supported by the demographic characteristics which contributed to the level of anxiety, the mean age of the subjects was 55.8 years and most of them were male (80%).

A study reported that MI was common in persons aged over 45 years old [21]. These findings are consistent with other studies that stressed males or females aged up to 50 years old had a prevalent risk of increase in the incidence of severe MI [21, 22]. Nevertheless, anxiety and stress seem to be found in younger aged patients rather than older patients with MI [24, 25]. This may be related with poor behavior in younger ages such as a higher prevalence of smoking and alcohol intake [24]. Young and middle aged persons were at a higher risk of heart disease due to psychological distress not being treated in particularly younger age groups. This explanation may be that young or middle aged persons may be less likely to be insured, less likely to have access to medical care and be able to afford medications, compared to the elderly [26].

This study found that in 12 female subjects with first MI only one subject reported a low level of anxiety and the other subjects reported moderate and high levels of anxiety. Females were more likely to develop high levels of anxiety after an infarction than males [14, 27], in addition, married females and

females with lower incomes tended to have greater anxiety levels [25]. Some studies pointed out that being female was related to having greater levels of anxiety and depression, and those females with poor health behavior including low levels of activity, poor nutrition, increased smoking and alcohol consumption also reported developing anxiety [24, 25, 28]. However, more research is needed to find out the possible reasons for this.

Despite most of subjects being male in this study, both the female and male subjects still showed as having the same opportunity in developing anxiety. Prospective cohort studies noticed that males have a high prevalence of psychological distress and anxiety. Men with higher anxiety levels were closely related to being widowed or divorced, having sedentary life styles i.e low levels of activity, being unemployed, and retired due to ill health. Smoking and drinking alcohol and low financial levels were also found to increase the risk of psychological distress and anxiety in males [24, 29]. On the contrary, our finding showed that males who were married, employed, and had greater financial stability had greater levels of anxiety. In addition, males who were smokers tended to have moderate levels of anxiety in our study. An increased smoking habit was associated with greater distress and anxiety [29]. Moreover, almost all of the subjects (93.3%) had no experience in receiving education related to MI even they had hypertension, diabetes or hypercholesterolemia as comorbid disease. The sample in this study demonstrated similar results as another study that showed MI patients who had less knowledge or a lack of education in regards to their illness was a factor affecting increasing levels of anxiety [34].

From the biological point of view, anxiety can disturb the regulation of the autonomous nervous system and lessen the regulatory power of the Vagus nerve in the heart, which will result in physiological responses and increase the rate of acute heart failure. Also, anxiety may contribute to fatal cardiac events by exaggerating sympathetic activity [31]. The overall mean score of the physiological responses of blood pressure, heart rate and respiration rate in this sample was in the normative value range (Table III). Also, there was a weak negative correlation between anxiety and systolic blood pressure ($r = -0.33$, $p < 0.05$), but it was not significant for diastolic blood pressure ($r = -0.16$, $p > 0.05$). Higher anxiety was associated with lower systolic blood pressure in patients with first MI. This finding demonstrates the result that was similar to another published study [32].

A significant positive correlation was found between heart rate and respiration rate in this sample ($r = 0.50$, $r = 0.72$, respectively). Greater heart rates and respiration rates were related to higher anxiety. The findings regarding the relationship between anxiety and psychological responses were inconsistent among previous studies [32, 33, 35, 36]. A study described the respiration rates and the heart rates are increase during the anxiety. Patient may experience shortness of breath, chest pressure, a feeling of dread, nausea, dizziness, vertigo, and sweating [37]. Those symptoms appear very similar with MI. Others have suggested a link between anxiety and electrical instability of the myocardium; electrophysiology studies have shown that ventricular premature beats increase with stimulation from certain psychological stressors and

decrease with a reduction in sympathetic neural inputs [38, 39]. An association between chronic anxiety and arrhythmia has not been established, however.

The small relationship between anxiety and physiological responses of this current study may have been influenced by the medications and treatments in the hospital such as vasodilator, beta blockers, Angiotensin II, etc. (Table I). Some of the medications have a direct effect to maintain the physiological responses of the patients to prevent complications. Therefore, this study recommends that the relationship of the level of anxiety and physiological responses need to investigated in the future with consideration to medications used in patients.

V. CONCLUSION

The result of current study, supported by previous studies, indicated that the prevalence of anxiety in first MI patients was relatively common. The finding from this study suggests important clinical implications. The overall moderate and high levels of anxiety provide a rationale for health care providers to assess and determine the best ways to manage patients to decrease the adverse effects of anxiety. Although the findings of the relationship between anxiety and physiological responses were inconsistent, anxiety was consistently at a moderate level and some of the medications may have contributed to this finding.

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