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Factors Associated with Antiplatelet Medication Nonadherence among Patients Undergoing Percutaneous Coronary Intervention in Vietnam

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Abstract*— *Introduction: *Nonadherence to medication among patients with cardiovascular disease is a major problem in Vietnam. Publications around the world reveal that factors such as education level, social support, psychological factors, socioeconomics, poor relationship with health care providers, medication beliefs, adverse effects, and lack of health insurance determine medication adherence.* ***Objectives****: To determine the incidence of antiplatelet medication nonadherence and its associated factors among patients who undergoing Percutaneous Coronary Intervention (PCI) in Vietnam.* ***Methodology:*** *A descriptive cross-sectional study was conducted among a total of 123 PCI patients. Questionnaires were administered to the participants to collect demographic data and the health-related data, Morisky Medication Adherence Scales, beliefs about medication, and knowledge about medication. Data were analyzed and logistic regression was applied to determine factors associated with antiplatelet medication nonadherence.* ***Results:*** *Approximately, 50.9 percent of the participants had poor knowledge about their antiplatelet medication. The mean antiplatelet adherence score was 4.29 ± 2.53, which indicated poor adherence (MMAS-8<6 scores) Factors including low education level, income, duration of treatment, hypertension, peptic ulcer, beliefs about medication, and knowledge about medication were associated with antiplatelet nonadherence.* ***Conclusions:*** *In conclusion, medication adherence to antiplatelet among people who undergoing PCI in Vietnam was low. Therefore, intervention to promote antiplatelet adherence by considering the influences of education level, duration of treatment, beliefs about medication, and knowledge about medication on adherence.*

***Keywords*—** *antiplatelet, beliefs about medication, knowledge about medication, medication nonadherence, percutaneous coronary intervention*

I. INTRODUCTION

Coronary artery disease (CAD), the blockage in the coronary arteries leading to deprived blood supply to the cardiac muscles, is a global leading health problem. Approximately, 110 million individuals were diagnosed with CAD in 2015, in which 8.9 million died, accounting 15.6 percent of all death [1]. In Vietnam, there were 58,452 deaths from CAD, accounting for 11.58 % of total deaths in 2017 [2]. Besides high mortality, there are several cardiac complications associated with CAD such as heart failure, arrhythmia and cardiogenic shock causing enormous burden. The treatment of CAD consists of behavioral modification, medication, and revascularization.

Percutaneous Coronary Intervention (PCI) or coronary angioplasty, is an un-surgical medical procedure performing by an insertion of a small catheter into a stenosis coronary artery to re-perfuse the heart muscles. PCI is associated with improved morbidity and mortality as well as short recovery among patients with CAD. However, PCI procedure may lead to complications such as arterial thrombosis and embolization [3]. Additionally, a small device, a stent, inserted to prevent re-occlusion of the coronary artery can stimulate the platelet activation system that increases the risk of stent thrombosis. Antiplatelet therapy is suggested to prevent stent thrombosis, which is given to the patients before the PCI and need to maintain after the intervention.

Following the PCI, the patients need to take antiplatelet medications to prevent stent occlusion from platelet aggregation, however, medication nonadherence is commonly found [4]. Aghabeykan and colleagues and Son and colleagues reported 31% and 61.3% incidence of medication nonadherence among patients undergoing PCI, respectively [5, 6]. In Vietnam, 44% nonadherence to medication among patients with cardiovascular disease was revealed during the survey of 1,660 patients in two major hospitals, and most common types of nonadherence were non-persistence and non-conforming [7]. Quan Nguyen Manh's study showed that number of stent occlusion in Vietnam was approximately 3 percent.

Various factors were found to have influences on medication adherence including knowledge about medicines, prolonged treatment time, education level, health literacy, poor relationship with health care providers, beliefs about medication, medication adverse effects, social support, psychological factors, socio-economics, lack of health insurance, access to health care, asymptomatic illness, and inconvenience of medication refill [8]. In other words, the nonadherence factors may vary among different demographics and local and national health system and policy.

Therefore, this study aimed to investigate factors associated with antiplatelet nonadherence in Vietnam including personal factor and healthcare system factor. The results are expected to help improving antiplatelet adherence among people undergoing PCI in Vietnam.

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II. METHODOLOGY

Study design, setting and participant selection: This is a descriptive cross-sectional study conducted among patients who undergoing PCI at the Quang Nam hospital, an 800-bed leading hospital in Quang Nam province, Vietnam. According to record of the department, a total of 217 patients received percutaneous coronary intervention in 2019.

The participant selection criteria were adult aged ≥18 years, currently taking prescribed antiplatelet medication after hospital discharge for at least 3 months, and willingness to participate in the study. Participants who were unable to complete the questionnaire, having mental problems or cognitive impairment (score lower than 24 in MMSE test), and unable to communicate in Vietnamese language were excluded.

Sample size: The sample size (n) was calculated: $n = \frac{\left(Z1-\frac{\alpha}{2}\right)^2 . p(1-p)}{d^2}$ [10]. With using the earlier reported nonadherence prevalence in Vietnam to find out the sample size [9]. Initial estimated sample size was 112. Additionally, a 10% attrition rate was added to the sample size calculation. Consequently, the final total sample was 123. A purposive sampling method was used for sample recruitment.

Research Instruments: The research instrument was a questionnaire consisting 4 parts including 1) demographic data and the health-related items, 2) Morisky Medication Adherence Scales (MMAS-8), 3) The Beliefs in Medicines Questionnaire (BMQ), and 4) knowledge about medication questionnaire. The demographic data and the health-related items were developed by the researcher, consisted of 11 questions including age, sex, education level, income, health insurance, number of medications, comorbidity, number of stents, and duration of PCI treatment.

The MMAS-8, is an 8-items scale measuring medication adherence, originally developed by Morisky in 2008 [11]. In this study, researcher used MMAS-8-V questionnaire from a previous study [12]. Each item evaluated a specific drug using activity to determine adherence behavior. The response to the number 1–7 items was “yes” or “no” whereas the last item was a 5-point Likert response. The score of the MMAS-8 ranges from 0 to 8, the higher score, the greater adherence. Scores of 8, 6 to less than 8, and less than 6 were categorized as high, moderate, and nonadherence, respectively.

The Belief in Medicines Questionnaire (BMQ), developed by Robert Horne and his colleagues, was used to evaluate medication beliefs among patients with various chronic diseases [13]. Patients' beliefs on medicines in this study were assessed with the BMQ Specific comprising of 11 items. The BMQ Specific is divided into two subscales: Specific Necessity (5 items: N1, N2, N3, N4, N5) and Specific Concern (6 items: C1, C2, C3, C4, C5, C6). Participants responses were scored on a 5-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree). Answer for N1, N2, N3, N4, N5 were scored as "Strongly Agree” = 5 points, "Agree" = 4 points, "Uncertain" = 3 points, "Disagree" = 2 points, "Strongly Disagree" = 1 point. On the other hand, participants’ answers to C1, C2, C3, C4, C5, and C6 were scored as "Strongly Agree" = 1 point, "Agree" = 2 points, "Uncertain" = 3 points, "Disagree" = 4 points and "Strongly Disagree" = 5 points.

The questionnaire on knowledge about medication consisted of 7 items, which was adapted from the previous study [14]. The questions regarding medication names, purpose of the medication use, directions of medication usage, dosage, and possible side effects are asked. They were given an extra 1 point if the exact working mechanism of their medicine was correctly stated. The scores ≥ 5 points were identified as having good knowledge about medication whereas score < 5 points were identified as poor knowledge.

Content validity of the questionnaires were evaluated by 3 healthcare professionals who were experts in cardiology research working at the Department of Cardiology, Hue University of Medicine and Pharmacy. The Content Validity Index for Items (I-CVI) was used to evaluate, revise, or delete the items [15]. I-CVI obtained for questionnaires on MMAS-8 and Knowledge about Medication was 1.00 where that of BMQ was 0.8. Earlier, reliability of the instruments was tested among 20 patients who undergoing PCI. The Cronbach’s alpha coefficient recorded was 0.898, 0.917, 0.802 and 0.822 for MMAS-8, Belief Specific-Necessity, Belief Specific Concern, and Knowledge about Medication, respectively.

The process of forward-translation and back-translation was used to ensure translation accuracy. The translation process was carried by bilingual individuals, the researcher translated the questionnaires from English to Vietnamese and a nurse who also working as an English lecturer back translated questionnaires to English. Finally, the comparison of the two translated version was examined by the third translator. The suitability, significance, and the equivalence of the two versions for correct translation process and validation based on the research objective was ensured.

Data collection: Upon the ethical clearance, a permission was obtained from the hospital to collect data. Initially, a list of patients who undergoing PCI in Quang Nam hospital and prescribed for antiplatelet medication after discharge in 2019 was attained. An invitation to participate was posted at the clinic for those who are interested in participation may leave their contact details. Subsequently, the potential participants were contacted and asked an appointment for home visit. Then detailed information’s on the objective and advantages of the research was explained as well as their concerns were cleared. A consent form was signed before starting data collection. Two members working as a lecturer in nursing, who earlier were trained on data collection assisted the process by interviewing the participants using questionnaire. A guidance and knowledge related to the disease and current medications as well as the advantages of antiplatelet medication adherence was provided after the completion of data collection. The process was repeated until sample size was achieved. During the study, 11 participants (10%) were lost due to death (4), change a decision to participate (5) and change in residence area (2).

Data analysis: Data were entered and processed using software SPSS version 23.0. Frequency, percentage, range, mean, and standard deviation were used for data expression.

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Also, univariate and multivariate logistic regression was performed. All statistical tests were considered significant at $p < 0.05$.

Ethical consideration: The study was approved by the Ethical Committee of Human Research at Khon Kaen University (KKU), Thailand (HE632045). Participant's identity was masked with a code number; they were free to take part or withdraw from participation at any time without enforcement or influence on the service they were receiving at the hospital. All information collected in this study were kept confidential and used only for research purposes.

III. RESULTS

Demographic characteristics and health-related items: The age of the participants ranged from 36 to 87 years old with the median age of 65 years. In terms of gender, more than half were male (57.1%). Majority of the participants had lower educational level (63.3%), whereas 8.9 % had no school education. The unemployed category was the highest (33.9%) followed by the self-employment (19.7%). About 37% were having monthly income of less than 1,300,000 VND ($56). Of importance, all of them had health insurance as shown in Table 1. The average number of stents implanted among participants was 1.2 (SD = 0.5) and the mean duration of treatment was 10.2 months (SD=3.5). Average number of pills taken at one time was 3.3 pills (SD=1.6) and the mean distance from home to the hospital was 11.6 Km (SD=8.9).

TABLE 1. Demographic characteristic among participants (n=112)

Variable	Characteristics	Frequency	Percentage
Age	36-87 years	Median = 65	
Sex	Male	64	57.1
	Female	48	42.9
Employment status	Self-employed	22	19.7
	Employed	15	13.4
	Unemployed	38	33.9
	Retired	15	13.4
	Farmer	22	19.6
Education level	No school education	10	8.9
	Primary school	37	33
	Junior high school	24	21.4
	High school	16	14.3
	Intermediate/ college/ university	25	22.4
Income	≤ 1.300.000 VND (56$)	42	37.5
	> 1.300.000 VND (56$)	70	62.5
Health Insurance	Yes	112	100
	No	0	0

Hypertension was the most common co-morbid condition, affecting 64.3% of the participants, followed by dyslipidemia accounting for 50.9%. Heart failure was predominant in 30.4%, whereas 18.8% of the participants had peptic ulcers. Obesity and chronic renal disease were reported in 7.1% and 1.8% of the participants, respectively (Table 2). The proportion of participants with 3 comorbidities was 43.8% whereas that of 2 co-morbidities was 30.4%. Only 3.6% of the patients had 5 co-morbidities.

Medication nonadherence is described in Table 3. In brief, data analysis showed that 50.9% of the patients forget to take their medications occasionally. Most participants (59.8%) reported that they miss taking their antiplatelet medication(s) for reasons other than forgetting. The proportion of the participants who had cut back or stopped taking antiplatelet medication(s) without letting their doctor, nurse, and pharmacist know was 12.5%. Additionally, 36.6% of the participants stopped taking their medications after feeling their health under control. Nearly one third participants felt hassled for sticking to their treatment plan.

TABLE 2. Co-morbid disease among the participants (n=112)

Co-morbidities	Status	Behavior		N (%)
		Nonadherence	Adherence	
Hypertension	Yes	30 (26.8)	42(37.5)	72 (64.3)
	No	27 (24.1)	13 (11.6)	42 (35.7)
Diabetes	Yes	12 (10.7)	7 (6.2)	19 (17.0)
	No	45 (40.2)	48 (42.9)	93 (83.0)
Dyslipidemia	Yes	27 (21.1)	30 (26.8)	57 (50.9)
	No	30 (26.8)	25 (23.3)	55 (49.1)
Obesity	Yes	2 (1.8)	6 (5.4)	8 (7.1)
	No	55 (43.1)	49 (43.8)	104 (92.9)
Heart failure	Yes	19 (17.0)	15 (13.4)	34 (30.4)
	No	38 (33.9)	40 (35.7)	78 (69.6)
Chronic renal disease	Yes	2 (1.8)	0 (0)	2 (1.8)
	No	55 (49.1)	55 (49.1)	110 (98.8)
Peptic ulcer	Yes	16 (14.3)	5 (4.5)	21 (18.8)
	No	41 (36.6)	50 (44.6)	91 (81.2)
Other disease	Yes	56 (50.0)	48 (42.9)	104 (92.9)
	No	1 (0.9)	7 (6.2)	8 (7.1)
Number of co-morbidities	1	2 (1.8)	4 (3.6)	6 (5.4)
	2	13 (11.6)	21 (18.8)	34 (30.4)
	3	32 (28.6)	17 (15.2)	49 (43.8)
	4	10 (8.9)	9 (8.0)	19 (17.0)
	5	0 (0.0)	4 (3.6)	4 (3.6)

TABLE 3. The items of MMAS 8 among participants (n=112)

Variables	Response	Frequency	Percentage
Forget to take your pills	Yes	57	50.9
	No	55	49.1
Missing taking medicine over past 2 weeks	Yes	67	59.8
	No	45	40.2
Stopping medicine when feeling worse	Yes	14	12.5
	No	98	85.5
Forgetting to take along medicines when travelling	Yes	56	50.0
	No	56	50.0
Not taking all medications yesterday	Yes	63	56.3
	No	49	43.8
Stopping medicine if condition is under control	Yes	41	36.6
	No	71	63.1
Hassling to stick to treatment	Yes	34	30.4
	No	78	69.6
Having difficulty remembering to take all medications	Never	28	25.0
	Once in a while	19	17.0
	Sometime	31	27.6
	Usually	15	13.4
	All of the time	19	17.0

The mean adherence score of the participants was 4.29 ± 2.53. The results showed that 13.4% had high adherence, while 37.5% had moderate adherence, and 50.9% had low adherence to antiplatelet treatment (Table 4). Regarding the barrier to get medicines, the highest proportion (35.7%) was for price followed by 32% to COVID 19. The geographical distance and lack of time to buy drugs accounted for 17.9% and 8%, respectively.

Truong Ho Ha Yen, Wasana Ruaisungnoen, and Hoang Anh Tien, "Factors Associated with Antiplatelet Medication Nonadherence among Patients Undergoing Percutaneous Coronary Intervention in Vietnam," *International Journal of Multidisciplinary Research and Publications (IJMRAP)*, Volume 3, Issue 3, pp. 58-64, 2020.

TABLE 4: Medicine adherence level among participants (n=112)

Variables	N (%)	$\bar{x}$ (SD)	Minimum	Maximum
Adherence Level	112 (100)	4.29 (2.53)	0	8
Nonadherence	57 (50.9)	2.05 (1.26)	0	5
Moderate adherence	40 (37.5)	6.08 (0.27)	6	7
Good adherence	15 (13.4)	8	8	8

The BMQ – Specific consisted of 2 subscales, the beliefs specific necessity and the beliefs specific concerns. The overall mean score of beliefs specific necessity about antiplatelet among study participants was 10.95 (SD 4.52) with the minimum score of 5 and the maximum score of 21 (Table 5). The item with the highest mean score of the beliefs specific necessity was *my life would be impossible without this medicine* ($\bar{x}$ 2.27, SD 1.06). The item that had the lowest mean score was *this medicine protects me from becoming worse* ($\bar{x}$ 2.05, SD 0.84)**.**

TABLE 5. Beliefs specific necessity score among the participants (n=112)

Variables	$\bar{x}$ (SD)	Minimum	Maximum
My health, at present, depends on this medicine	2.19 (1.03)	1	4
My life would be impossible without this medicine	2.27 (1.06)	1	4
Without this medicine, I would be very ill	2.18 (0.97)	1	5
My health in the future will depend on this medicine	2.26 (0.88)	1	4
This medicine protects me from becoming worse	2.05 (0.84)	1	4
Beliefs specific necessity	10.95 (4.52)	5	21

The overall mean score of beliefs specific concerns about antiplatelets in this study was 14.85 (SD = 4.41) with the minimum score of 6 and the maximum score of 24 (Table 6). The item with the highest mean score was *this medicine is a mystery to me* ($\bar{x}$ 3.19, SD 1.29). The item with the lowest mean score in this scale was *this medicine gives me unpleasant side effects* ($\bar{x}$ 2.04, SD 0.96).

TABLE 6. Beliefs specific concern score among the participants (n=112)

Variables	$\bar{x}$ (SD)	Minimum	Maximum
Having to take this medicine worries me	2.38 (0.88)	1	4
I sometimes worry about long-term effects of this medicine	2.47 (0.94)	1	4
This medicine is a mystery to me	3.19 (1.29)	1	5
This medicine disrupts my life	2.19 (0.81)	1	4
I sometimes worry about becoming too dependent on this medicine	2.56 (0.88)	1	4
This medicine gives me unpleasant side effects	2.04 (0.96)	1	4
Beliefs specific concern	14.85 (4.41)	6	24

Findings showed that among all items of knowledge about medication, the higher proportion of the participants stated that they had knowledge on almost every aspect of medication, except for *Names of all medications* and *Know what to do when side effects occur*. The majority of *do not know* item (78.6%) was the name of the medications they were taking (Table 7). The largest percentage of *know (yes)* item was *Medication directions for use* and *Know what to do when missing a dose of medication* with 60.7% of each.

TABLE 7. Knowledge about medication among the participants (n=112)

Variables	Response	N (%)
Names of all medications	Yes	22 (21.1)
	Do not know	87 (78.6)
Purpose of medication	Yes	65 (58.0)
	Do not know	47 (42.0)
Medication directions for use	Yes	68 (60.7)
	Do not know	44 (39.3)
Medication timing	Yes	65 (58.0)
	Do not know	47 (42.0)
Medication side effects	Yes	58 (51.8)
	Do not know	54 (48.2)
Know what to do when side effects occur	Yes	38 (33.9)
	Do not know	74 (66.1)
Know what to do when missing a dose of medication	Yes	68 (60.7)
	Do not know	44 (39.3)

A univariate analysis showed that the patients who had low educational levels (no school education, primary school, Junior high school) were more likely to be non-adherent (O.R = 39.2; 95% CI of 12.0-127.8) to their medications including low income (<1300000 VND) participants (O.R = 37.6; 95% CI of 10.3-136.5). Nevertheless, there was no association between medication nonadherence and age, sex, and distance to the hospital. The duration of treatment was associated significantly with medication nonadherence (O.R = 1.153; 95% CI of 1.034-1.286) but not to the number of stents and the number of pills taken once. Moreover, co-morbidities such as hypertension (O.R = 2.9; 95% CI of 1.3-6.5) and peptic ulcer (O.R = 3.9; 95% CI of 1.3-11.6) were associated with medication nonadherence among the participants. No association between medication nonadherence and diabetes, dyslipidemia, heart failure, number of co-morbidities was found (Table 8).

TABLE 8. A univariate analysis of medication nonadherence and various variables

Variable	β	OR (95% CI)	p	R^2
Age (per year increase)	-1.99	0.6 (0.3-2.2)	0.076	0.254
Sex	0.376	1.4 (0.7-3.1)	0.327	0.011
Educational level	3.668	39.2(12.0-127.8)	<0.001*	0.554
Income	3.626	37.6(10.3-136.5)	<0.001*	0.509
Distance to hospital (per km increase)	0.014	1,0 (0,9-1,1)	0.510	0.005
Number of stents (per stent increase)	00.836	2.3 (0.9-5.6)	0.066	0.044
Duration of treatment (per a month increase)	00.156	2.4 (1.2-3.7)	0.006*	0.507
Number of pills taken once (per pill increase)	00.377	1.4 (0.5-3.4)	0.43	0.007
Hypertension	-1.067	0.3 (0.1-0.8)	0.01*	0.081
Diabetes	0.604	1.8 (0.7-5.1)	0.245	0.016
Dyslipidemia	0.329	1.4 (0.2-9.0)	0.731	0.007
Heart failure	0.288	1.3 (0.6-3.0)	0.486	0.006
Peptic ulcer	1.362	3.9 (1.3-11.6)	0.014*	0.08
Number of comorbidities	-0.119	0.9 (0.6-1.3)	0.574	0.004
Knowledge about medication	4.644	104(28.4-381.2)	<0.001*	0.725
Specific necessity score (per point increase)	-0.666	0.5 (0.4-0.6)	<0.001*	0.655
Specific concern score (per point increase)	-0.733	0.5 (0.4-0.6)	<0.001*	0.586
BMQ Specific (per point increase)	-0.406	0.7 (.6-0.8)	<0.001*	0.689

Truong Ho Ha Yen, Wasana Ruaisungnoen, and Hoang Anh Tien, "Factors Associated with Antiplatelet Medication Nonadherence among Patients Undergoing Percutaneous Coronary Intervention in Vietnam," *International Journal of Multidisciplinary Research and Publications (IJMRAP)*, Volume 3, Issue 3, pp. 58-64, 2020.

There was a strong association between medication knowledge and patient's nonadherence to medicine; the participants with poor knowledge were 104 times more likely to be nonadherent than the group of participants with good knowledge (p<0.001). Additionally, an inverse relationship between *beliefs about medication* and nonadherence was found. When the beliefs specific necessary, beliefs specific concern and BMQ specific were increased by 1 point, the nonadherence decreased by 50%, 50% and 70%, respectively.

The multivariate logistic regression model on adjusting other factors showed that education level (p=0.019), duration of treatment (p=0.03), BMQ Specific (p=0.002), and knowledge about medication (p=0.044) were significantly associated with medication nonadherence (Table 9). The nonadherence among participants with poor knowledge was 19.9 times (OR = 19.9, 95%CI = 1.1-365.3) higher than patients with good knowledge about medication. When the duration of treatment increased by 1 month, the risk of nonadherence increased by 2.2 times (p = 0.048). However, an increase in BMQ score, decreased the medication nonadherence by 70% (OR = 0.7, p <0.001).

TABLE 9. A multivariate analysis for medication nonadherence with various factors

Variables	β	OR (95%CI)	p
Education level	3.631	37.7 1.8-777.1)	0.019*
Income	-0.150	0.9 (0.1 – 13.0)	0.914
Duration of treatment (per month increase)	0,423	1.526 (1.042-2.337)	0.03*
Hypertension	-1.487	0.226 (0.017-2.953)	0.257
Peptic ulcer	1.039	2.8 (02-52.0)	0.490
Knowledge about medication	2.991	19.9 (1.1-365.3)	0.044*
BMQ Specific (per point increase)	-0,387	0,7 (0.5-0.9)	0.002*

IV. DISCUSSION

Our study finds that the percentages of antiplatelet medication nonadherence was 50.9%, which is different from the previous studies reporting 14.9%; 23.8%, 24.6% (6-12 month), and 53.61% (after 12 months) in Vietnam [7, 9, 16]. Likewise, studies in other country have revealed a lower incidence (28-50.4 %) than the current study [19-31]. Several reasons may explain the finding; for example, the lockdown policy to prevent the COVID-19 epidemic leaded to difficulties to refill medication among 32% of the participants in this study. It was mentioned that the medicine cost was too high for the participants to afford. Previous study in Vietnam also highlighted that high cost of drug makes it difficult for long-term adherence in low-income patients [16]. Not only in Vietnam but also in the United States, one in eight patients with CAD were non-adherent to their drugs because of costs [20]. Also, an older age with low formal education of participants resulted in inadequate understanding of the disease and medication adherence benefits, as stated in previous study [21].

A univariate analysis showed that six variables were associated with antiplatelet nonadherence including education, income, duration of treatment, comorbid (hypertension, peptic ulcer), knowledge about medication, and beliefs about medication in the study. Furthermore, few of these variables were associated with antiplatelet nonadherence in multivariate analysis. Age and sex were not associated with antiplatelet nonadherence, as in previous studies [22, 23]. It is possible that Vietnamese male, female, younger or older have similar views on the benefits of antiplatelet to their health condition after PCI. Similarly, the number of stents and distance to hospital was not associated with the antiplatelet nonadherence. The result was not consistent with a few earlier studies [9, 24]. However, this difference may be a result of geographical influenced on the road traffic and availability of public transport or other factors related to the patient's accessibility to hospital. Relatively low numbers of the patients (17.9%) felt that distance to the hospital was a barrier for their medication adherence in this study. The number of medications taking once was not associated with antiplatelet nonadherence in this study, which can be explained from data that 69.6% of the study participants found their health condition improved with medication thus felt comfortable to take them. However, the contrast finding was found in Brown & Bussell's study [25].

This study found that patients with older age and lower education levels were more likely to be nonadherence than patients with younger age and higher education level. The proportion of elderly patients in the study was relatively high (average age was 65). The elderly in this study lived through the war period of the country so many of them were unable to get formal education. The lower education level makes it difficult for them to be literate with detail information such as name of drugs, medication usage instruction, and other health-related information, which may result in nonadherence. It's been reported earlier that patients' lower education levels negatively affects adherence to treatment [26]. Our result was consistent with other studies [19, 23]. Similarly, medication nonadherence among participants with lower income (≤ 1,300,000 VND) was 37.6 times higher than those with higher income (OR = 37.6 95% CI=10.3-136.5, p <0.001). This finding is consistent with the study of Luu and colleagues, in 2019 [9]. Although patients in this study who had health insurance did not have to pay for medication expense such as aspirin and clopidogrel, those who had to copay need to spend at least 30% out-of-pocket cost [34]. Frequently, the medication such as clopidogrel 75mg was not listed in the insurance coverage plan; therefore, the patients need to self-pay which can lead to nonadherence in Vietnam.

Furthermore, hypertension and peptic ulcer were associated with antiplatelet nonadherence. The patients without hypertension showed 2.9 times higher nonadherence to treatment than patients with hypertension (p = 0.009, OR=2.9; 95% CI =1.3-6.5). This finding is congruent with previous study [28]. A possible explanation is that hypertension, a chronic disease is closely associated with coronary disease and thus makes patients become aware to take medicines regularly to prevent possible complications [28]. Moreover, the group of patients with no peptic ulcer were 3.9 times more adherence than the patients with peptic ulcer (p=0.014; OR=3.9; 95% CI=1.3-11.6). One of the side effects of antiplatelet medications is gastric irritation and thus

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makes patients hesitated to continue taking medication. Therefore, proper instruction by healthcare providers to monitor and manage possible side effects may promote confidence and increase adherence to medication use.

The duration of treatment was significantly associated with medication nonadherence. An increase of treatment duration for 1 month was associated with 2.4 times increase of nonadherence (p = 0.006; OR = 2.4; 95% CI=1.2-3.7). In Luu's study, a high percentage of patients discontinuing medication within a year of treatment was noticed [9]. Furthermore, we found that nonadherence rate increased from 10% in the first month to more than 50% after one year. This finding was consistent with the study by Ho and colleagues, 2009 in which nonadherence of 16.0% after 6 months was increased to 21.2% after 12 months [29]. The study showed that keeping treatment adherence rate stable over the time requires stable economic conditions, good income, good education, wide coverage of health insurance plan, and good relationship with healthcare staffs [9]. Consequently, in our study, low income and lack of knowledge on medication benefits explained low adherence to antiplatelet.

BMQ Specific score was negatively associated with medication nonadherence (OR = 0.7, p <0.001) in our study. Similar results were revealed in earlier published studies as well [17, 30, 31]. Our score of Beliefs Specific Concern was higher than Beliefs Specific Necessity of medication. A relationship between attitudes and beliefs about medications, and medication nonadherence has been reported earlier [30, 31]. Many patients need to reconcile their emotions about the necessity to use their medications and resolve the concerns they face. Individual recognitions to benefits of the medication they are using are key to improve adherence to them. Therefore, patient's adherence to the drug is high when they become convinced that the medications are necessary for them and positively influence their illness condition [31].

Finally, our analysis showed that knowledge about medication was associated with antiplatelet medication nonadherence. We found that more than half of the patients had poor knowledge about medication, which could be related to low formal education they earned. However, the knowledge about medication can be increased by proper counselling of the healthcare providers [32]. Likewise, a recent study in the Netherlands demonstrated that providing drug-related information, possible side effects, and the consequences of nonadherence at the counter by pharmacist helped patients overcome the possible barriers to drug use [33].

There are some limitations in the study. Since a convenient sampling was used while selecting the participants, the study does not represent all patients who undergoing PCI in Quang Nam province. The World Health Organization identified factors affecting medication nonadherence into five groups, but this study only focused on patient factors to nonadherence. Moreover, all the data collected were based on participant's informed data, which may raise concern about the reliability of the data. People with memory trouble were not included in this study, in which this group may contain many of those with an unintentional nonadherence due to forgetfulness.

V. CONCLUSIONS

The study reveals that the incidence of nonadherence for antiplatelet therapy was 50.9% with a mean MMAS-8 score of 2.21 (SD=1.41) among PCI patients. Education level, duration of treatment, BMQ Specific, and Knowledge about Medication were significantly associated with antiplatelet nonadherence in Quang Nam province, Vietnam.

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