

# Adherence to Medications in Patients with Ischaemic Heart Disease in Oman

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**ABSTRACT: Objectives:** This study aimed to evaluate the level of adherence to medication among patients with ischaemic heart disease (IHD) in Oman and assess the related factors. **Methods:** This cross-sectional questionnaire-based study among patients with IHD attending the outpatient clinic at Sultan Qaboos University Hospital, Muscat, Oman, was performed between January and December 2021. **Results:** A total of 105 patients (mean age = 49.9 ± 11.1 years, 78.1% male) were recruited. Most of the patients (80%) reported taking the medications by themselves; 77 (73.3%) patients said that over the preceding 2 weeks, they had missed at least 3 doses of their medication. The reasons for missing the medications included forgetting (100%), having to take too many tablets (57%), feeling that the tablets are not effective (48%) and having to take the tablets too often each day (23%). The factors responsible for patients failing to take medications could not be identified. **Conclusion:** Medication adherence was low among patients with IHD in Oman, with high pill burden being the most common reason for non-adherence. Physicians must bear this in mind when reviewing patients.

**Keywords:** Cardiovascular Disease; Medication Adherence; Myocardial Infarction; Oman.

CARDIOVASCULAR DISEASE (CVD) IS A MAJOR cause of morbidity and mortality worldwide. An estimated 17.9 million deaths (32% of all deaths) in 2019 were attributed to CVD.<sup>1</sup> A major part of the management of CVD lies in adherence to medications and lifestyle changes, with the intention of lowering future cardiovascular events and achieving symptom control.<sup>2</sup> Medications are prescribed either as primary prevention of future cardiovascular events for those at high risk or as secondary prevention of future events for those in whom a cardiovascular event has already occurred.

Current evidence-based practice involves initiating patients with CVD and those at high risk on an increasing number of medications. This can affect adherence when non-adherence to medication and lifestyle modifications remains a major issue with chronic illnesses.<sup>3</sup> Studies have demonstrated that adherence is often an issue when medications are given as a long-term preventive strategy rather than for symptom control. This is especially true for hypertensive patients, who are often asymptomatic but experience various side-effects due to medications.<sup>4</sup>

The reported adherence rates for cardiovascular medications range between 30–70%, with patients often failing to take all or part of their prescribed medications.<sup>5</sup> Poor drug adherence is a major public health issue, such that the World Health Organization (WHO), in their report on adherence to long-term therapies, stated that interventions to improve medication adherence might have a far greater impact on the health of the population than any improvement

in a specific medical treatment.<sup>6</sup>

There are many factors responsible for poor drug adherence and understanding these factors in a particular population is key to improving medication adherence and, ultimately, patient care and outcomes. The WHO has identified 5 factors affecting adherence: (1) socio-economic; (2) patient-related; (3) therapy-related; (4) co-morbid condition-related; and (5) healthcare system-related factors.<sup>6</sup> The first 4 factors are mainly related to the individual patient and it is important to understand these factors, which are very individualised and often related to patient preferences and social/cultural behaviours. These factors include costs, beliefs regarding medications and treatment, number of tablets, side-effects of tablets, understanding the need for and benefits of the medications, forgetfulness and overall well-being.<sup>7–9</sup>

Improving medication adherence helps to improve cost savings and puts to practice the lessons learned from clinical trials, ultimately reducing the burden of chronic illnesses.<sup>10</sup> Early detection of non-adherence can prevent expensive investigations, hospital admissions and unnecessary additional medications and interventions. It is important to ensure high levels of adherence to medications to improve cardiovascular outcomes in the population as a whole.<sup>2</sup>

In Oman, ischaemic heart disease (IHD) is a leading cause of mortality and morbidity, accounting for approximately 35% of all deaths in 2020.<sup>11</sup> However, there is a dearth of information regarding adherence to medication in the Middle East. Therefore, this study

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aimed to assess the level of medication adherence in patients with IHD and the patient-related factors affecting medication adherence in Oman.

## Methods

This cross-sectional questionnaire-based study on patients who attended the outpatient clinic at Sultan Qaboos University Hospital in Muscat, Oman, was performed between January and December 2021. Patients aged  $\geq 18$  years, who have been diagnosed to have IHD and have either had a previous myocardial infarction (MI) or undergone percutaneous coronary intervention (PCI) for stable angina more than a year earlier were included in the study. Patients had to be independent, fully alert and oriented to be included in the study. They had to be able to take medications by themselves or be given by a care-giver. Patients who were not able to give their consent for the study and those who had a recent cardiac event or who had to be hospitalised for a cardiovascular event within the preceding 12 months were not included in the study. A sample size of 100 was chosen as this was a pilot study.

The questionnaire was self-developed and had 2 parts. The first part inquired about general patient demographics, the number of medications and the total pill burden. The second part of the questionnaire inquired about the patients' practice of taking medications. It included a question on whether they had missed more than 3 doses in the previous 2 weeks. If they had, they were considered to be non-adherent. This was because 3 out of 14 days would equate to an adherence rate of 80%, which is the adherence rate accepted by many studies as adequate. This questionnaire was initially tested on a few volunteers to adjust the wording and ensure that there were no difficult or confusing words. The questionnaire was developed in Arabic by native Arabic-speaking staff.

Ethical approval was obtained from the research committee of the Sultan Qaboos University (MREC #1550). All patients gave informed consent before answering the questionnaire. Statistical analysis was performed using Statistical Package for the Social Sciences (SPSS), Version 21 (IBM Corp., Armonk, New York, USA). Data are presented as number and percentage, mean and standard deviation or median interquartile range (IQR). Data analysis was performed using the Chi-squared test or Student's *t*-test, as appropriate. A *P* value of  $<0.05$  was considered statistically significant.

## Results

A total of 105 patients (mean age =  $49.9 \pm 11.1$  years, 78.1% [ $n = 82$ ] male) filled the questionnaires.

The patients were taking a median of 9 (IQR: 6–10) tablets per day and taking their tablets a median of 3 (IQR: 2–3) times a day. Most of the patients ( $n = 100$ , 95.2 %) had a previous MI, and the remaining ( $n = 5$ ) have chronic stable angina; 87 (82.9%) patients have reportedly undergone a previous PCI, while 12 (11.4%) have undergone a previous coronary artery bypass grafting. Hypertension was the commonest risk factor ( $n = 97$ , 92.4%), followed by diabetes ( $n = 87$ , 82.9%) and 14 (13.3%) patients had a previous stroke [Table 1].

Most of the patients ( $n = 84$ , 80%) reported that they take the medications by themselves, while the remaining ( $n = 21$ , 20%) said a family member or care-giver administers the medications; 22 (20.9%) patients use a reminder (a phone app for 12 patients and a family member for 10) to help them remember to take medications.

A total of 77 (73.3%) patients said that over the preceding 2 weeks, they have missed at least 3 doses of their medications. The reasons given for this are that they simply forgot ( $n = 57$ , 74.0%) or felt that there were too many tablets ( $n = 44$ , 57.1%) [Table 2]. Almost half

**Table 1:** Characteristics of the patients with ischaemic heart disease attending at Sultan Qaboos University Hospital, Muscat, Oman between January and December 2021 (N = 105)

Characteristic	n (%)
Mean age $\pm$ SD in years	49.9 $\pm$ 11.1
<b>Gender</b>	
Male	82 (78.1)
Female	23 (21.9)
<b>Marital status</b>	
Never married	7 (6.7)
Married	81 (77.1)
Separated	17 (16.2)
<b>Educational status</b>	
Lower than primary school	35 (33.3)
Secondary school	49 (46.7)
Graduate or more	21 (20.0)
<b>Diabetes</b>	87 (82.9)
<b>Hypertension</b>	97 (92.4)
<b>Smoker</b>	46 (43.8)
<b>Previous stroke</b>	46 (43.8)
<b>Previous MI</b>	100 (95.2)
<b>Previous CABG</b>	12 (11.4)
<b>Previous PCI</b>	87 (82.9)

*SD = standard deviation; MI = myocardial infarction; CABG = coronary artery bypass grafting; PCI = percutaneous coronary intervention.*

**Table 2:** Reasons for non-adherence to medication (n = 77)

Reasons	n (%)
Forget to take tablets	57 (74.0)
Too many tablets	44 (57.1)
Too many side-effects	18 (23.3)
Not effective	37 (48.1)
Too often per day	15 (19.4)

the patients (n = 37, 38.1%) felt that the drugs were not effective and 18 (23.3%) felt they had to take them too many times a day. A further 41 (39.0%) patients said they stop taking the tablets whenever they feel well; the majority of patients (n = 80, 76.2%) felt that taking the tablets was a burden and 63 (60.0%) said they sometimes do not take the tablets while travelling.

There was no difference in age, gender, educational status, number of tablets or number of times a day between those who had taken all their medications over the preceding 2 weeks and those who had missed at least 3 doses over the same time period [Table 3].

The cardiovascular risk factors were similar in both groups, except that the number of those who missed their tablets was higher among those who had a previous stroke ( $P = 0.01$ ). Although there did not appear to be any differences between the two groups, by binary logistic regression, the only factor that predicted non-adherence was the number of tablets taken daily (odds ratio [OR] = 1.26, 95% confidence interval [CI]: 1.001–1.59;  $P = 0.04$ ).

## Discussion

The rate of non-adherence to medication was high in this study, with more than three-quarters of those surveyed reporting that they had missed multiple doses of their medications over the previous 2 weeks. These findings are similar to those of other studies.<sup>3–5,8,9</sup> Adherence to medications among patients with CVD is low worldwide. In a meta-analysis of 20 observational studies involving more than 300,000 patients with CVD, it was estimated that the prevalence of poor adherence was as high as 43%.<sup>12</sup> For individual risk factors, this rate can be even higher. It has been demonstrated that at the end of 6 months, one-third of patients discontinued their antihypertensive medications and only around half of all patients persist with their initial therapy after 1 year.<sup>4</sup>

The rate of adherence to primary preventive measures for CVD is generally lower than that to secondary preventive measures. Patients who have suffered an MI or a stroke are likely to take their

**Table 3:** Differences between those who failed to take their tablets and those who did not (N = 105)

Characteristics	n (%)		P value
	Adherence group (n = 28)	Non-adherence group* (n = 77)	
Mean age ± SD in years	49.01 ± 10.1	50.2 ± 11.5	0.61 <sup>†</sup>
<b>Gender</b>			0.60
Male	23 (82.1)	59 (76.6)	
Female	5 (17.9)	18 (23.4)	
<b>Marital status</b>			0.54
Married	21 (75.0)	60 (77.9)	
Single/divorced/widowed	7 (25.0)	17 (22.1)	
<b>Educational status</b>			0.7
Primary school or less	9 (32.1)	26 (33.7)	
Completed secondary school	12 (42.8)	37 (48.1)	
Postgraduate studies	7 (25.0)	14 (18.1)	
<b>Number of tablets</b>	8 (5–10)	9 (6–10)	0.24 <sup>‡</sup>
<b>Number of times per day</b>	3 (2.5–3)	3 (3–3)	0.9 <sup>†</sup>
<b>Diabetes</b>	21 (75.0)	66 (85.7)	0.19
<b>Hypertension</b>	26 (92.8)	71 (92.2)	0.91
<b>Smoker</b>	11 (39.2)	35 (45.4)	0.67
<b>Previous CVA</b>	0 (0.0)	14 (18.1)	0.01
<b>Previous CABG</b>	1 (3.5)	11 (14.2)	0.12
<b>Previous PCI</b>	21 (75.0)	66 (85.7)	0.19
<b>Who gives the tablets</b>			0.52
Self	22 (78.5)	62 (80.5)	
Care-giver	6 (21.5)	15 (19.5)	
Use reminder	7 (25.0)	15 (19.5)	0.53

SD = standard deviation; CVA = cerebrovascular accident; PCI = percutaneous coronary intervention; CABG = coronary artery bypass grafting

\*Those who missed more than 3 doses in the last 2 weeks.

All P values were analysis by Chi-squared test apart from <sup>†</sup>Student's t-test and <sup>‡</sup>Mann Whitney U test.

medication more regularly than those who have not suffered an event.<sup>12</sup> However, even for those on secondary prevention, adherence is sub-optimal, as demonstrated in a study on 4,591 post-MI patients, where approximately 18% of them did not collect their prescriptions even once in the 4 months following the MI.<sup>13</sup> In a separate cohort study of 22,379 post-acute coronary syndrome patients, 60% discontinued their statin medication within 2 years of hospitalisation.<sup>14</sup>

Many factors affect adherence to medications.<sup>5</sup> These include physician- or healthcare-related

factors, patient factors and socio-economic factors. Healthcare-related factors include busy outpatient consultations, pill burden, access to pharmacies and ease of refills and costs. Patient-related factors include socio-economic factors such as affordability, access to healthcare, social circumstances, forgetfulness and understanding of the disease process.<sup>15</sup>

Patients' beliefs regarding medications and the disease process and its management are an important part and determinant of medication adherence. It has been shown that these beliefs play an important role in medication adherence even among people of Middle-Eastern origin residing in Australia.<sup>16</sup> Beliefs regarding medications include beliefs about the importance and usefulness of taking medications and concerns regarding the illness. Horne *et al.* divided patients into 1 of 4 subgroups according to their attitudes towards medication: sceptical (low necessity, high concerns), ambivalent (high necessity, high concerns), indifferent (low necessity, low concerns) and accepting (high necessity, low concerns).<sup>17</sup> The sceptical and ambivalent patients have been shown to have lower adherence rates compared to the other two groups.<sup>16,18</sup> Education is therefore an important part of ensuring adherence and empowering the patient to take care of their own health; the need for and benefits of adherence must be explained to the patients. The beliefs of the cohort of patients in this study were not specifically studied, although they were asked whether they felt their medications were effective.

Cultural factors such as the use of traditional medicine, which is high in Oman, could also play a role in non-adherence. Al-Riyami *et al.* found that for chronic illnesses, a high proportion of people prefer to take herbal medications and undergo traditional practices than take prescribed medications.<sup>19</sup> Scicchitano *et al.* described the role of 'functional foods' or 'nutraceuticals' in CVD.<sup>20</sup> Functional foods are defined as any food or food ingredient that may provide a health benefit beyond the traditional nutrients it contains, while nutraceuticals are defined as any food (or part of a food) that provides medical or health benefits, including the prevention and/or treatment of a disease.<sup>21,22</sup> This concept might explain the benefits of herbal diets and the willingness of the population to try these remedies rather than modern medications.

The findings of the current study are also in keeping with data from the Middle East, where adherence rates of 1.4–88% have been demonstrated in various conditions.<sup>23</sup> A study on patients with hypertension in Oman also revealed that less than 50% of patients adhered to their medications.<sup>24</sup> Al-Qasem *et al.* conducted a systemic review of studies from the Middle East and found that the reasons

reported by patients for non-adherence in the Middle East are similar to those reported in the international literature.<sup>23</sup> However, some of the reasons mentioned, such as patient dissatisfaction and/or lack of trust in healthcare providers and lack of social support, were unique to the Middle East. Poor physician support and explanation and lack of understanding of the need for medications have also been previously described by studies from this region.<sup>25</sup>

In the current study, the number of tablets was the only identifiable predictive factor for non-adherence. The patients' age, gender, educational status and marital status did not affect adherence. The use of aids and whether the patient self-medicated or was given their medication by a care-giver did not affect adherence. It is possible that the study's small sample size was not able to differentiate between those who were adherent and those who were not. The mean age of the current study's patients was 49 years, with only a small proportion of them aged >60 years. This could explain why age did not appear to be a contributing factor. Previous studies on adherence to medications for other conditions in the region demonstrated that gender and educational status affected adherence, with female patients and those with a lower educational status having poorer adherence. In the current study, the authors could not demonstrate any difference in adherence, possibly because of the small sample size and overall poor adherence among all the groups.<sup>23,26,27</sup>

The only factor that predicted low adherence in the current study was the pill burden. Most patients with IHD are on many tablets for secondary prevention. After coronary intervention or on adequate medical therapy, many patients have adequate control of their symptoms, which then becomes a determinant of poor adherence.<sup>8,13,14,28</sup> The average number of tablets per day for patient in this study was 9, which is a large number. A large proportion of the patients thought they were taking too many tablets and felt burdened by it. Therefore, it is important for physicians to review patients' medications at each visit to ensure that patients are not on any medications that they do not need to be on—e.g., dual antiplatelet therapy can be stopped after one year (if indicated). The use of combination tablets reduces pill burden and has been demonstrated to improve adherence in patients with CVD, with improved clinical outcomes.<sup>29</sup> Perhaps local health authorities can consider using more combination tablets in routine practice.

Assessment of medication adherence is not easy as there are many questionnaires validated for various conditions.<sup>15</sup> However, all of them have their advantages and disadvantages, which have been described elsewhere. The authors did not use any of these questionnaires but instead chose to directly ask

the patients whether they missed any doses in the previous 2 weeks. Although direct questioning has its limitations, the authors felt it would help them explore the reasons behind non-adherence.<sup>30</sup>

This study has a few limitations. Medication adherence varies over time, with patients having periods of strict adherence as well as periods of mild to severe nonadherence.<sup>31</sup> The authors only investigated patients' adherence within the 2 weeks preceding the study. This is, therefore, not representative of their overall long-term adherence. This study was conducted in the outpatient setting of a tertiary hospital in Muscat, Oman, which is a large city. The results are not generalisable to the whole of Oman and its rural environs. Access to healthcare and patients' beliefs, traditions and customs differ in the different parts of Oman, along with their social and economic conditions, all of which play a role in medication adherence and were not fully assessed in this study. Another limitation is the lack of follow-up. It would have proved useful to study the effects of interventions and co-operation between primary and secondary care on the level of medication adherence, as this has been previously demonstrated to be useful in an Italian population.<sup>32</sup>

The current study was limited to the Omani population and adherence rates among the expat population might be different due to their different socio-economic conditions. The current study's sample size was small because it was conducted at a time when the social restrictions related to the COVID pandemic were just being lifted. Access to healthcare and patients was still not as free as it was prior to the pandemic. However, this study is the first of its kind on adherence to medications among patients with IHD in Oman. Studies with larger sample sizes are required to fully assess the barriers to optimal medication adherence among patients with IHD from different parts of Oman.

## Conclusion

The rate of medication non-adherence among patients with IHD in Oman is high. The number of tablets was the major determinant of non-adherence. Lowering the pill burden, frequently reviewing patients' medications and using combination tablets must be considered for this patient population. Additionally, more needs to be done to assess the needs of each patient in order to improve their understanding of their diagnosis and improve overall adherence.

## CONFLICTS OF INTEREST

The authors declare no conflicts of interest.

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## AUTHORS' CONTRIBUTION

AA, QA, MA and HA were involved in data collection and contributed to drafting the manuscript. SKN performed the data analysis and drafted the manuscript. All authors approved the final version of the manuscript.

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