

# COMPLIANCE AND SATISFACTION WITH TREATMENT AS A SUCCESS OF THERAPY EFFECTIVENESS IN THE GROUP OF PATIENTS WITH ISCHEMIC HEART DISEASE: A CROSS-SECTIONAL STUDY

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## Abstract

**Objectives:** Non-adherence and non-compliance to pharmaceutical treatment is one of the most common causes of not effective management of patients suffering from ischemic heart disease (IHD). It is crucial to understand the reasons behind it but studies on this subject performed in the Polish population are still lacking. **Material and Methods:** The 329 patients (160 male and 169 female) diagnosed with IHD who reported for follow-up appointments are examined. The following standardized questionnaires were used: *Treatment Satisfaction with Medicines Questionnaire* (SATMED-Q) and *Adherence to Refills and Medication Scale* (ARMS), which evaluates the patient's compliance and adherence level, respectively. **Results:** Patients with IHD showed moderate compliance with pharmacological recommendations and average satisfaction with treatment. Anemia, drugs side effects, and SATMED-Q total score were significant predictors of the overall ARMS score in the univariate analysis, whereas the male gender and satisfaction with treatment improves this results. In multivariate analysis, significant predictors of lower adherence included family history of IHD, anemia and drugs side effects, while higher education and SATMED-Q overall score increased adherence. **Conclusions:** Treatment satisfaction is a significant predictor of increased overall treatment adherence as well as adherence in terms of drug intake and drug and prescription refills. Raising patient awareness should be an important goal of future educational activities. *Int J Occup Med Environ Health.* 2023;36(4):465–76

## Key words:

compliance, effectiveness, adherence, ischemic heart disease, standardized questionnaires, Polish patients

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## INTRODUCTION

Ischemic heart disease (IHD), or coronary heart disease (CHD), or coronary artery disease (CAD), belongs to a large group of civilization diseases connected with cardiovascular disease (CVD). According to the American Heart Association, in the USA, 49.2% of adults >20 years of age suffer from CVD. The European Heart Network 2017 report states that CVD causes 45% of all deaths in Europe and 37% in the European Union, and current prevention is not sufficient, as evidenced by the growing number of cases and deaths accounted for by CVD, especially IHD [1,2]. In Poland, CVD has been identified as one of the main mortality causes, amounting to 45% of all deaths. Age-adjusted rates demonstrate an encouraging decrease in global IHD deaths, but the number of cases to be managed by healthcare systems is growing due to ageing populations [3]. Though IHD mortality has declined in recent decades, it is still responsible for approx. a third of deaths in people aged  $\geq 35$  years. In 2016 IHD was responsible for nearly half of deaths related to heart disease and accounted for 20% of the total number of deaths in Europe [4].

The main cause of IHD, not only in the elderly, but also in patients <45 years old, is the developing atherosclerotic process in the arteries of the heart. In 80% of cases the etiology of IHD in the elder group is associated with atherosclerosis of the coronary arteries and the accumulation of classic risk factors (non-modifiable and modifiable) [5]. Quick diagnosis of IHD and implementation of appropriate therapeutic and preventive measures give a good chance to extend the survival of patients. In the past few decades cardiovascular mortality has greatly decreased, changing the prognostic and diagnostic landscape of patients with suspected or confirmed IHD. Though significant progress has been made in the treatment and survival of patients with IHD, epidemiological data show that the average 5-year survival is approx. 50% [6].

Pharmacotherapy, used both as primary and secondary prevention, reduces the rate of progression of IHD and the risk of death. The therapeutic management of patients with known CVD is a complex process and requires long-term medical care. Patients with IHD may have different therapeutic regimens implemented depending on the development of the disease. In their current recommendations, the American College of Cardiology (ACC) and European Society of Cardiology (ESC) promote the use of angiotensin receptor blockers,  $\beta$ -blockers, or angiotensin-converting enzyme inhibitors. Recent guidelines indicate the benefits of combining therapies, such as angiotensin receptor blockers with a neprilysin inhibitor [7].

Non-adherence to pharmaceutical treatment as well as and non-compliance with ordinate treatment are some of the most common causes of uncontrolled CVD. As shown by a meta-analysis [8] of 21 studies, proper adherence promote slower mortality in patients with chronic diseases. A study by Ho et al. [9] demonstrated that non-adherence to medication among diabetic patients was linked to increased incidence of all-cause death and hospitalization. Regular medication intake and a high level of patient's adherence to the prescribed therapy as well as appropriate cooperation with doctor are a prerequisite for effective treatment, especially among the elderly. Failure to comply with medical recommendations leads to many adverse health consequences, including among others psychological disorders, as well as can increase in morbidity and deaths of patients. Compliance and adherence assessment is an essential element of effective planning and pharmacotherapy [10]. For this purpose, specific questionnaires are used to assess satisfaction with self-administration of prescribed medication, as well as compliance with therapeutic recommendations [11,12]. In patients with IHD, this is the key to reducing morbidity and the number of deaths. The correct application of therapeutic recommendations is the foundation

that guarantees patients an improved quality of life in the disease, recovery and extension of lifespan. The study aimed to evaluate satisfaction with self-administration of drugs and treatment satisfaction, as well as compliance and adherence to therapeutic recommendations in patients diagnosed with IHD who reported for follow-up appointments at the cardiological clinic of a university hospital, using the *Adherence to Refills and Medication Scale* (ARMS) and the *Treatment Satisfaction with Medicines Questionnaire* (SATMED-Q).

## MATERIAL AND METHODS

### Participants

The cross-sectional study included 329 patients (160 male and 169 female) diagnosed with IHD who attended follow-up consultations at the cardiological clinic of a university hospital in February–July 2021. The inclusion criteria were: age >18 years old, ischemic heart disease diagnosed in accordance with the ESC guidelines [7], treatment with  $\geq 1$  antihypertensive drugs within the past 6 months, and informed consent. The study did not include individuals with exacerbations of other serious diseases, given the possible implications for treatment adherence and completion of the survey. Patients with cognitive impairments that prevented them from filling in the surveys unassisted were also not included. Patients aged  $\geq 65$  years completed the *Mini-Mental State Examination* (MMSE) questionnaire, and subjects who scored <18 did not take part. A panel made up of a doctor, pharmacist and a nurse specialized in internal medicine were responsible for the selection of study participants. Respondents provided direct answers to each question based on their last month of treatment. Medical records were used to obtain socio-demographic (sex, age, place of residence, level of education) and clinical data (blood pressure, disease duration, medication taken, comorbidities, drugs adverse effects, IHD treatment) with the patients' consent. The group was homogeneous and fit for statistical analysis.

### Instruments

The following standardized questionnaires were used:

- SATMED-Q, a multidimensional generic questionnaire, brief (17 Likert-type items). Answers follow a scale 0–4: 0 – definitely no, 1 – slightly yes, 2 – moderately yes, 3 – rather yes, 4 – definitely yes. The questionnaire is made up of 6 domains related to satisfaction with the drug's efficacy (3 items), side effects (3 items), convenience of use (3 items), medical care (2 items), impact on daily life (3 items), and general satisfaction (3 items). The total score for treatment satisfaction, ranging 0–68 pts, is achieved by adding up all domains. This total composite score can then be converted to a more intuitive metric with a minimum of 0 and a maximum of 100 [11].
- ARMS, to assess patient adherence. It is made up of 12 items covering different aspects of non-adherence. Answers follow a 4-point scale: 1 – never, 2 – rarely, 3 – often, 4 – most of the time. Total scores range 12–48 pts, with larger values pointing to lower adherence [12].

### Ethical considerations

The local Bioethics Committee gave its approval of the study (approval No. KB-83/2021). All participants gave their written permission after being fully informed about all the steps involved. The nature and aim of the study were disclosed to the patients, who all gave their written informed consent to take part. Every patient completed every questionnaire. The Declaration of Helsinki's principles were followed in conducting the study.

### Statistical analysis

Spearman's rank correlation coefficient was used to determine the relationship between 2 quantitative variables. The influence of potential predictors on quantitative variables was analyzed using uni- and multivariate linear regressions. Regression parameters with 95% con-

fidence intervals were shown. Since the inclusion of all potential predictors yielded a satisfactory SPV (subjects per variable) ratio of approx. 14.3, variable selection was not performed. The level of significance was set to 0.05 for all statistical tests. Computations were performed using R 4.1.0. [13].

## RESULTS

### Sociodemographic and clinical characteristics of the study group

Most participants were aged 51–70 years, had secondary or higher education, lived with their partner/spouse (Table 1). The subjects took  $M \pm SD$   $6.13 \pm 2.61$  drugs. The systolic blood pressure was  $M \pm SD$   $130.53 \pm 12.93$  mm Hg, diastolic –  $M \pm SD$   $77.01 \pm 8.55$  mm Hg. Arterial hypertension most commonly coexisted with ischemic heart disease – 71.73%. More than half of the respondents (58.66%) did not report any side effects of their medications.

### Pharmacological compliance and treatment satisfaction

The ARMS questionnaire, used to evaluate pharmaceutical adherence levels, demonstrated the average adherence of the study group (Table 2), with a overall score of  $M \pm SD$   $21.83 \pm 5.81$  pts. The score on the subscale for taking medications and refilling medications and prescriptions was  $M \pm SD$   $13.83 \pm 4.22$  pts and  $8 \pm 1.98$  pts, respectively.

Patients presented a mediocre level of satisfaction with the treatment. The results for the SATMED-Q questionnaire are presented in Table 2.

### Relation between ARMS and SATMED-Q

The overall ARMS score and the score on the drug intake scale correlate significantly ( $p < 0.05$ ) and negatively with the overall SATMED-Q score and all its subscales, i.e., the higher the ARMS score in general and on the drug intake scale (worse adherence) the lower the SATMED-Q

**Table 1.** Characteristics of the study group of 329 patients diagnosed with ischemic heart disease who attended follow-up consultations at the cardiological clinic of a university hospital in February–July 2021, Poland

Variable	Participants (N = 329)
Sex [n (%)]	
female	169 (51.37)
male	160 (48.63)
Age [n (%)]	
≤50 years	4 (1.22)
51–70 years	166 (50.46)
>70 years	159 (48.33)
Residence [n (%)]	
with partner/spouse	201 (61.09)
with partner/spouse and children/ other family members	4 (1.22)
with children/other family members	50 (15.20)
alone	74 (22.49)
Education [n (%)]	
primary	13 (3.95)
vocational	94 (28.57)
secondary	109 (33.13)
higher	113 (34.35)
Blood pressure [mm Hg] (M±SD)	
systolic	130.53±12.93
diastolic	77.01±8.55
Pills taken [n/day] (M±SD)	6.13±2.61
Disease duration [n (%)]	
≤1 year	10 (3.04)
>1–5 years	68 (20.67)
>5–10 years	142 (43.16)
>10 years	109 (33.13)
Family history of ischemic heart disease [n (%)]	
no	116 (35.26)
yes	213 (64.74)
Cardiac surgery [n (%)]	
no	208 (63.22)
yes	121 (36.78)

**Table 1.** Characteristics of the study group of 329 patients diagnosed with ischemic heart disease who attended follow-up consultations at the cardiological clinic of a university hospital in February–July 2021, Poland – cont.

Variable	Participants (N = 329)
Comorbidities [n (%)]	
anemia	21 (6.38)
asthma	51 (15.50)
diabetes	97 (29.48)
hypertension	236 (71.73)
kidney failure	28 (8.51)
heart failure	122 (37.08)
Other forms of ischemic heart disease treatment [n (%)]	
no	164 (49.85)
yes	165 (50.15)
Drugs adverse effects [n (%)]	
no	193 (58.66)
yes	36 (11.25)

score and its subscale (lower satisfaction with treatment) (Table 3, Figure 1).

Refilling medications and prescriptions correlates significantly ( $p < 0.05$ ) and negatively with the overall SATMED-Q score and its subscales such as: lack of side effects, medical care, impact on daily activities, and overall satisfaction, i.e., the higher the score on the supplementation scale (worse adherence), the lower the SATMED-Q score and the subscales listed (lower satisfaction with treatment).

### Impact of selected variables on treatment adherence

In a 1-way analysis, linear regression models revealed significant ( $p < 0.05$ ) predictors of the ARMS overall score to include anemia ( $R = 4.449$ ), drug side effects ( $R = 2.868$ ), and the SATMED-Q overall score ( $R = -0.118$ ), which means that anemia and drug side effects reduce adherence to pharmacological recommendations, while treatment

**Table 2.** The *Adherence to Refills and Medication Scale* (ARMS) and *Treatment Satisfaction with Medicines Questionnaire* (SATMED-Q) results in the study group of 329 patients diagnosed with ischemic heart disease who attended follow-up consultations at the cardiological clinic of a university hospital in February–July 2021, Poland

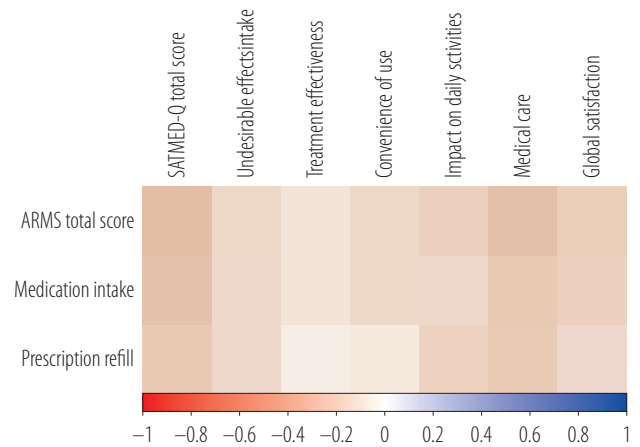
Questionnaire variable	M	SD	Average per question	Me	Min.	Max	Q1	Q3
ARMS								
overall score (scale 12–48)	21.83	5.81	1.82	22	12	36	17	26
medication intake (scale 8–32)	13.83	4.22	1.73	14	8	29	10	17
medication and prescription refill (scale 4–16)	8	1.98	2	8	4	12	7	9
SATMED-Q								
overall score (scale 0–100)	68.80	14.07	2.75	69.12	17.65	100	60.29	79.41
lack of adverse effects	45.16	39.70	1.81	50.00	0.00	100	0.00	75.00
treatment effectiveness	74.09	17.58	2.96	75.00	0.00	100	66.67	83.33
convenience of use	77.89	17.60	3.12	75.00	0.00	100	75.00	91.67
impact on daily activities	68.84	21.33	2.75	75.00	0.00	100	50.00	75.00
medical care	69.49	26.15	2.78	75.00	0.00	100	50.00	100.00
overall satisfaction	77.58	17.33	3.10	75.00	0.00	100	75.00	91.67

**Table 3.** Results of the *Adherence to Refills and Medication Scale (ARMS)* and *Treatment Satisfaction with Medicines Questionnaire (SATMED-Q)* correlation analysis in the study group of 329 patients diagnosed with ischemic heart disease who attended follow-up consultations at the cardiological clinic of a university hospital in February–July 2021, Poland

Variable	SATMED-Q overall score		Lack of adverse effects		Treatment effectiveness		Convenience of use		Impact on daily activities		Medical care		Overall satisfaction	
	r	p	r	p	r	p	r	p	r	p	r	p	r	p
ARMS overall score	-0.278	<0.001*	-0.169	0.002*	-0.116	0.035*	-0.164	0.003*	-0.201	<0.001*	-0.261	<0.001*	-0.211	<0.001*
Medication intake	-0.254	<0.001*	-0.157	0.004*	-0.119	0.031*	-0.167	0.002*	-0.158	0.004*	-0.238	<0.001*	-0.203	<0.001*
Medication and prescription refill	-0.232	<0.001*	-0.16	0.004*	-0.062	0.259	-0.086	0.12	-0.195	<0.001*	-0.226	<0.001*	-0.157	0.004*

r – Spearman's correlation coefficient.

\* Statistically significant relationship (p < 0.05).



**Figure 1.** The *Adherence to Refills and Medication Scale (ARMS)* and *Treatment Satisfaction with Medicines Questionnaire (SATMED-Q)* heatmap in the study group of 329 patients diagnosed with ischemic heart disease who attended follow-up consultations at the cardiological clinic of a university – hospital in February–July 2021, Poland

satisfaction improves it (Table 4). Anemia (R = 3.332) and drug side effects (R = 2.178) were significant predictors of taking medications reducing compliance with pharmacological recommendations, while compliance with pharmacological recommendations was increased by male gender (R = -1.013), arterial hypertension (R = -1.013), and overall SATMED-Q (R = -0.084). Adherence to drug intake recommendations was reduced by anemia (R = 1.117) and drug side effects (R = 0.690), while the predictors that significantly increased the level of adherence were higher education (R = -0.602) and the overall SATMED-Q score (R = 0.034).

In multivariate analysis, significant predictors lowering adherence were: family history of IHD (R = 1.647), anemia (R = 3.771) and drug side effects (R = 2.199), while higher education (R = -2.117) and overall SATMED-Q score (R = -0.104) increased the general level of adherence. In terms of drug intake, the predictors that significantly increased the scores on this scale were higher education (R = -1.409) and the overall SATMED-Q score (R = -0.079), while family history of IHD (R = 1.350), anemia (R = 2.405) and drug side effects (R = 1.793) reduced adherence to proper drug intake. When it comes to medica-



**Table 4.** Results of univariate and multivariate analysis of the impact of selected variables on the level of pharmacological adherence (*Adherence to Refills and Medication Scale – ARMS*) in the study group of 329 patients diagnosed with ischemic heart disease who attended follow-up consultations at the cardiological clinic of a university hospital in February–July 2021, Poland

Variable	Adherence to Refills and Medication Scale																	
	total score				drug intake				drug and prescription refills									
	univariate model		multivariate models		univariate model		multivariate models		univariate model		multivariate models							
	parameter	95% CI	P	parameter	95% CI	P	parameter	95% CI	P	parameter	95% CI	P						
Sex																		
female	ref.			ref.			ref.			ref.								
male	-1.183	-2.434–0.067	0.065	-0.776	-2.219–0.667	0.293	-1.013	-1.92–(-0.106)	0.029*	-0.553	-1.592–0.487	0.298	-0.17	-0.598–0.257	0.436	-0.223	-0.733–0.286	0.391
Age																		
≤70 years	ref.			ref.			ref.			ref.			ref.					
>70 years	0.145	-1.112–1.402	0.821	-0.123	-1.633–1.387	0.874	-0.115	-1.029–0.799	0.806	-0.238	-1.325–0.85	0.669	0.26	-0.167–0.687	0.234	0.115	-0.418–0.648	0.673
Residence																		
with spouse/partner	ref.			ref.			ref.			ref.			ref.					
with children/other family	1.355	-0.388–3.098	0.129	0.485	-1.309–2.279	0.597	0.999	-0.268–2.265	0.123	0.575	-0.717–1.867	0.384	0.356	-0.238–0.95	0.241	-0.09	-0.724–0.543	0.781
alone	0.047	-1.5–1.593	0.953	-1.618	-3.419–0.183	0.079	-0.078	-1.202–1.045	0.891	-1.054	-2.351–0.244	0.112	0.125	-0.402–0.652	0.642	-0.564	-1.200–0.072	0.083
Education																		
primary, vocational	ref.			ref.			ref.			ref.			ref.					
secondary	0.59	-0.952–2.132	0.454	0.387	-1.293–2.067	0.652	0.628	-0.495–1.75	0.274	0.435	-0.775–1.645	0.482	-0.038	-0.561–0.486	0.888	-0.048	-0.641–0.545	0.874
higher	-1.068	-2.597–0.46	0.172	-2.117	-3.799–(-0.434)	0.014*	-0.466	-1.579–0.646	0.412	-1.409	-2.621–(-0.198)	0.023*	-0.602	-1.121–(-0.083)	0.024*	-0.707	-1.301–(-0.113)	0.02*
Disease duration																		
<5 years	ref.			ref.			ref.			ref.			ref.					
5–10 years	1.064	-0.538–2.665	0.194	0.642	-1.098–2.383	0.47	0.572	-0.591–1.735	0.336	0.198	-1.056–1.451	0.757	0.492	-0.053–1.037	0.078	0.444	-0.17–1.059	0.158
>10 years	-0.027	-1.712–1.659	0.975	0.523	-1.575–2.622	0.625	-0.437	-1.661–0.787	0.484	-0.175	-1.686–1.336	0.821	0.41	-0.163–0.984	0.162	0.698	-0.043–1.439	0.066
Ischemic heart disease family history																		
no	ref.			ref.			ref.			ref.			ref.					
yes	1.134	-0.175–2.443	0.09	1.647	0.22–3.074	0.024*	0.847	-0.105–1.798	0.082	1.35	0.322–2.378	0.011*	0.287	-0.159–0.734	0.208	0.297	-0.207–0.801	0.249
Cardiac surgery																		
no	ref.			ref.			ref.			ref.			ref.					
yes	-0.392	-1.695–0.91	0.555	-0.467	-1.967–1.032	0.542	-0.376	-1.322–0.57	0.437	-0.116	-1.196–0.964	0.834	-0.016	-0.46–0.427	0.943	-0.352	-0.881–0.178	0.194
Blood pressure [mm Hg]																		
systolic	0.02	-0.03–0.07	0.441	0	-0.058–0.058	1	0.008	-0.028–0.044	0.659	-0.005	-0.046–0.037	0.829	0.012	-0.006–0.029	0.185	0.005	-0.016–0.025	0.66
diastolic	0.017	-0.058–0.093	0.655	0.019	-0.065–0.103	0.66	0.005	-0.05–0.06	0.869	0.002	-0.058–0.063	0.938	0.013	-0.013–0.038	0.337	0.016	-0.013–0.046	0.278
Comorbidities: anemia																		
no	ref.			ref.			ref.			ref.			ref.					
yes	4.449	1.925–6.974	<0.001*	3.771	1.003–6.539	0.008*	3.332	1.499–5.165	<0.001*	2.405	0.412–4.399	0.019*	1.117	0.250–1.983	0.012*	1.365	0.388–2.343	0.007*

**Table 4.** Results of univariate and multivariate analysis of the impact of selected variables on the level of pharmacological adherence (*Adherence to Refills and Medication Scale – ARMS*) in the study group of 329 patients diagnosed with ischemic heart disease who attended follow-up consultations at the cardiological clinic of a university hospital in February–July 2021, Poland – cont.

Variable	Adherence to Refills and Medication Scale															
	total score			drug intake			drug and prescription refills									
	univariate model	parameter	95% CI	univariate model	parameter	95% CI	univariate model	parameter	95% CI	univariate model	parameter	95% CI				
Daily number of drugs taken	0.575	-0.099	-0.316–0.175	0.532	-0.068	-0.247–0.111	0.457	-0.051	-0.275–0.173	0.654	-0.003	-0.086–0.081	0.953	-0.048	-0.158–0.062	0.391
Other forms of IHD treatment	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.
no	0.478	-0.814	-1.711–0.801	0.255	-0.151	-1.064–0.762	0.746	-0.4	-1.406–0.606	0.437	-0.304	-0.73–0.123	0.163	-0.414	-0.907–0.08	0.101
Drugs adverse effects	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.
no	2.199	2.868	1.63–4.105	0.001*	2.178	1.281–3.075	<0.001*	1.793	0.829–2.757	<0.001*	0.69	0.262–1.118	0.002*	0.406	-0.067–0.879	0.093
yes	<0.001*	-0.104	-0.161–(-0.075)	<0.001*	-0.084	-0.115–(-0.053)	<0.001*	-0.079	-0.113–(-0.045)	<0.001*	-0.034	-0.049–(-0.019)	<0.001*	-0.025	-0.041–(-0.008)	0.004*
SATMED-Q overall score	<0.001*	-0.104	-0.161–(-0.075)	<0.001*	-0.084	-0.115–(-0.053)	<0.001*	-0.079	-0.113–(-0.045)	<0.001*	-0.034	-0.049–(-0.019)	<0.001*	-0.025	-0.041–(-0.008)	0.004*

SATMED-Q – *Treatment Satisfaction with Medicines Questionnaire*.

\* Statistically significant relationship ( $p < 0.05$ ).

tion and prescription refills, higher education ( $R = -0.707$ ) and the overall SATMED-Q score ( $R = -0.025$ ) increased the level of adherence in this domain of the ARMS questionnaire, while anemia ( $R = 1.365$ ) decreased the level of adherence in this respect.

## DISCUSSION

A significant problem of the patient, as well as for the entire healthcare system and an effective therapy, is non-compliance with medical recommendations. Modification of medical recommendations is observed, as well as reduction, omission of drug doses or discontinuation of a given drug when the patient’s health condition improves. Patients who do not comply with the recommendations very often return to their doctors reporting a sudden deterioration of their health, which necessitates the implementation of expensive therapies and very often is associated with hospitalization or may even lead to death. The basic condition for effective therapy is respecting the principles of adherence and compliance [14]. Also for pharmacoeconomic reasons, failure to follow medical recommendations is associated with an increase in healthcare costs. Other factors also influence the success of therapy. The causes of failure are related to the patient himself, the healthcare system, the physician as a therapy provider, and therapeutic errors that occur as a result of the interaction between all the factors mentioned. It is necessary to adopt rational techniques in order to refine therapy and improve adherence to medical recommendations. Doctors, pharmacists, nurses and other healthcare professionals play an important role in improving modern treatment and communication between the patient and the doctor [14,15]. Non-adherence to the therapeutic plan is a relatively frequent phenomenon, diversified within the population, which constitutes a serious and often underestimated limitation of the effectiveness of treatment. Some data from the literature show that adherence to pharmacological recommendations is not sufficient among patients



with CAD [16]. In own study of the authors, patients showed an average level of compliance with the recommendations in terms of taking medications and refilling medications and prescriptions, which is consistent with other studies [17,18]. In a study by Khatib et al. [17] the non-compliance rate for at least one secondary prevention medicine (SPM) was 43% and 53.3% of reported cases were related to only one SPM [17]. In addition, 66.7% of patients were not taking statins and 61.7% aspirin, with 30.8% of patients intentionally not taking medications. Similarly, in a study conducted on patients treated with hypertensive drugs, 36.8% had low antihypertensive medication adherence [19].

Drug-intake satisfaction is an important factor in adherence to pharmacological recommendations in CAD patients. It can be defined as an assessment of the process of taking drugs and the related effects of their use [20]. In the authors' own study, patients presented an average level of satisfaction with the CAD treatment. Similarly, in studies on treatment satisfaction among patients with chronic diseases, a low level of satisfaction and poor adherence to the recommended treatment was reported [19]. Some authors revealed a weak negative correlation between satisfaction and mental health for specific treatment groups, slightly higher for cardiology patients than other groups [21]. Contrary to this study, Mulchandani et al. [22] showed much higher satisfaction with treatment, with approx. three-quarters of the study participants with CAD reporting overall satisfaction with their medications [22]. Almost half of the studied population had primary education, and therefore their understanding of the condition as well as the potential hazards and advantages of statin medication was probably insufficient, which may explain the difference in results. In the authors' own study, higher education was a statistically significant predictor increasing the general level of pharmacological adherence of the respondents. Van Veghel et al. [23] proved that the level of satisfaction of patients

with CAD improved and reached statistically significantly higher results after educating patients [23].

In the correlation analysis, both the overall level of treatment satisfaction and all domains' scores from the SAT-MED-Q questionnaire significantly increased the general level of adherence. A study of subjects treated with hypertensive drugs pointed to a significant difference in mean scores within the domains of effectiveness ( $p < 0.001$ ), convenience ( $p < 0.001$ ), and global satisfaction ( $p < 0.001$ ) between participants with varying adherence levels [19]. Similarly, in a study by Mulchandani et al. [22], patients with CAD were shown to be more likely to report poorer efficacy if they reported any adverse effects. Furthermore, there was a positive correlation between overall treatment satisfaction and pharmaceutical efficacy [22].

It has been shown that patient satisfaction with the medications allows us to predict the continuation of pharmacological treatment, as well as compliance with the principles of correct and consistent application of therapy [24]. Patients' satisfaction is well documented to influence their behavior and approach towards treatment, and is an important metric for its evaluation. It is particularly important in the case of civilization diseases, such as CAD, as the level of adherence rises together with satisfaction. Good adherence can significantly reduce the number of ischemic events and enhance life quality [25]. Outcomes reported by patients, such as satisfaction with the medication prescribed, supply evaluable data for assessing the influence of therapy on everyday life and overall health [26].

Adherence to pharmacological treatment is essential for the management and prevention of ischemic heart disease. Studies suggest that adherence to pharmacological treatment leads to reduction in the number of new ischemic events and the improvement of CAD sufferers' health-associated life quality [27,28]. In a study by Breekveldt-Postma et al. [29], non-compliance with pharmacological recommendations entailed a 15% increased

risk of hospitalization due to myocardial infarction 2 years after the start of treatment [29]. In multivariate analysis, family history of CHD, anemia and drug side effects were significant predictors of lower adherence. This is consistent with the research of other authors. The subjects of a study by Khatib et al. [17] indicated worse well-being while taking medications and a lack of conviction about the benefits of taking medications as the reasons for not following prescribed treatment [17]. Satisfaction with prescribed medications is especially important for a patient's daily life and well-being and can provide useful feedback information of medication adherence. Non-adherence substantially exacerbates illness, leads to psychological and mental disorders, and even death. Generally it can increase health care costs, which are still a current problem in all societies [30].

## CONCLUSIONS

Patients with IHD show a moderate level of compliance with pharmacological recommendations and average treatment satisfaction, which is a significant predictor of increasing overall adherence to pharmacological recommendations and the level of adherence in terms of drug intake and refilling prescriptions and medications. This provides vital information for primary care physicians.

## Practical implications

The authors' study shows treatment satisfaction to be a key factor when it comes to compliance regarding patients with IHD. Routine assessments of treatment satisfaction enable the identification of individuals whose negative experiences may increase their likelihood of low treatment adherence and result in negative clinical outcomes. Systematic assessment of compliance with therapeutic recommendations gives medical staff a chance to identify barriers as well as patients' lack of knowledge and can serve as a learning tool in studying patients-medical professionals cooperation problems.

## Strengths and limitations

The study has several limitations. Some of the studied variables were evaluated using self-reported measures, which may have inherent limitations including memory bias and over- or under-reporting of some information. One of the limitations of the study is its cross-sectional study design. An additional limitation is the single-centre nature of the study and its small sample size, as organizing a study involving a higher number of participants was difficult to manage during the COVID-19 pandemic.

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## REFERENCES

1. Virani SS, Alonso A, Aparicio HJ, Benjamin EJ, Bittencourt MS, Callaway CW, et al. Heart Disease and Stroke Statistics – 2021 Update. A Report From the American Heart Association. *Circulation*. 2021;143(8):e254-e743. <https://doi.org/10.1161/CIR.0000000000000950>.
2. Wilkins E, Wilson L, Wickramasinghe K, Bhatnagar P, Leal J, Luengo-Fernandez R, et al. European Cardiovascular Disease Statistics 2017 edition. European Heart Network, Brussels. [cited 2022 Nov 26]. Available from: <http://www.ehnheart.org/images/CVD-statistics-report-August-2017.pdf>.
3. Khan MA, Hashim MJ, Mustafa H, Baniyas MY, Al Suwaidi SKBM, AlKatheeri R, et al. Global Epidemiology of

- Ischemic Heart Disease: Results from the Global Burden of Disease. Study. *Cureus*. 2020;12(7):e9349. <https://doi.org/10.7759/cureus.9349>.
- Townsend N, Wilson L, Bhatnagar P, Wickramasinghe K, Rayner M, Nichols M. Cardiovascular disease in Europe: epidemiological update 2016. *Eur. Heart. J.* 2016;37(42):3232-3245. <https://doi.org/10.1093/eurheartj/ehw334>.
  - Hajar R. Risk factors for coronary artery disease: historical perspectives. *Heart Views*. 2017;18(3):109-114. [https://doi.org/10.4103/HEARTVIEWS.HEARTVIEWS\\_106\\_17](https://doi.org/10.4103/HEARTVIEWS.HEARTVIEWS_106_17).
  - Ponikowski P, Voors AA, Anker SD, Bueno H, Cleland JGF, Coats AJS, et al. 2016 ESC Guidelines for the diagnosis and treatment of acute and chronic heart failure: The Task Force for the diagnosis and treatment of acute and chronic heart failure of the European Society of Cardiology (ESC). Developed with the special contribution of the Heart Failure Association (HFA) of the ESC. *Eur. Heart. J. Fail.* 2016;18(8):891-975. <https://doi.org/10.1002/ehfj.592>.
  - Arnett DK, Blumenthal RS, Albert MA, Buroker AB, Goldberger ZD, Hahn EJ, et al. 2019 ACC/AHA Guideline on the Primary Prevention of Cardiovascular Disease: Executive Summary: A Report of the American College of Cardiology/American Heart Association Task Force on Clinical Practice Guidelines. *Circulation*. 2019;140(11):e563–e595. <https://doi.org/10.1161/CIR.0000000000000678>.
  - Simpson SH, Eurich DT, Majumdar SR, Padwal RS, Tsuyuki RT, Varney J, et al. A meta-analysis of the association between adherence to drug therapy and mortality. *BMJ*. 2006;333(7557):15. <https://doi.org/10.1136/bmj.38875.675486.55>.
  - Ho M, Rumsfeld JS, Masoudi FA, McClure DL, Plomondon ME, Steiner JF, et al. Effect of medication nonadherence on hospitalization and mortality among patients with diabetes mellitus. *Arch. Intern. Med.* 2016;166(17):1836–1841. <https://doi.org/10.1001/archinte.166.17.1836>.
  - MassotMesquida M, de la Fuente JA, Andrés Lorca AM, Pillasagua IA, Blanco EB, Vidal SG, et al. Primary Care Records of Chronic-Disease Patient Adherence to Treatment. *Int J Environ Res Public Health*. 2021;18(7):3710. <https://doi.org/10.3390/ijerph18073710>.
  - Ruiz MA, Pardo A, Rejas J, Soto J, Villasante F, Aranguren JL. Development and validation of the “Treatment Satisfaction with Medicines Questionnaire” (SATMED-Q). *Value Health*. 2008;11(5):913-926. <https://doi.org/10.1111/j.1524-4733.2008.00323.x>.
  - Kripalani S, Risser J, Gatti ME, Jacobson TA. Development and evaluation of the Adherence to Refills and Medications Scale (ARMS) a oonglow-literacy patients with chronic disease. *Value Health*. 2009;12(1):118-123. <https://doi.org/10.1111/j.1524-4733.2008.00400.x>.
  - R Core Team. R: A language and environment for statistical computing. R Foundation for Statistical Computing, Vienna, Austria. [cited 2022 Nov 26]. Available from: <http://softlibre.unizar.es/manuales/aplicaciones/r/fullrefman.pdf>.
  - Jose J, Jimmy B. Patient Medication Adherence: Measures in Daily Practice. *Oman Med. J.* 2011;26(3):155-159. <https://doi.org/10.5001/omj.2011.38>.
  - Morley L, Cashell A. Collaboration in Health Care. *J. Med. Imaging. Radiat. Sci.* 2017;48(2):207-216. <https://doi.org/10.1016/j.jmir.2017.02.071>.
  - Bitton A, Choudhry NK, Matlin OS, Swanton K, Shrank WH. The impact of medication adherence on coronary artery disease costs and outcomes: a systematic review. *Am. J. Med.* 2013;126(4):357.e7–35.e27. <https://doi.org/10.1016/j.amjmed.2012.09.004>.
  - Khatib R, Marshall K, Silcock J, Forrest C, Hall AS. Adherence to coronary artery disease secondary prevention medicines: exploring modifiable barriers. *Open Heart*. 2019;6(2):e000997. <https://doi.org/10.1136/openhrt-2018-000997>.
  - Kubica A, Kosobucka A, Michalski P, Pietrzykowski Ł, Jurerek A, Wawrzyniak M, et al. The Adherence in Chronic Diseases Scal – a new tool to monitor implementation of a treatment plan. *Folia Cardiologia*. 2017;12(1):19-26. <https://doi.org/10.5603/FC.a2016.0105>.
  - Zyoud SH, Al-Jabi SW, Sweileh WM, Morisky DE. Relationship of treatment satisfaction to medication adherence:

- findings from a cross-sectional survey among hypertensive patients in Palestine. *Health Qual. Life Outcomes*. 2013; 11:191. <https://doi.org/10.1186/1477-7525-11-191>.
20. Padilha JC, Santos VB, Lopes CT, Lopes JL. Prevalence of pharmacological adherence in patients with coronary artery disease and associated factors. *Rev Lat Am Enfermagem*. 2021;29:e3464. <https://doi.org/10.1590/1518-8345.4554.3464>.
21. Kaldenberg DO. Patient satisfaction and health status. *Health Mark. Q*. 2001;18(3-4):81-101. [https://doi.org/10.1300/J026v18n03\\_07](https://doi.org/10.1300/J026v18n03_07).
22. Mulchandani R, Lyngdoh T, Chakraborty P, Kakkar AK. Satisfaction With Statin Treatment Among Adult Coronary Artery Disease Patients: An Experience From a Resource-Constrained Setting. *Heart Lung Circ*. 2019;28(12):1788-1794. <https://doi.org/10.1016/j.hlc.2018.10.024>.
23. van Veghel D, Soliman-Hamad M, Schulz D, Schulz DN, Cost B, Simmers TA, et al. Improving clinical outcomes and patient satisfaction among patients with coronary artery disease: an example of enhancing regional integration between a cardiac centre and a referring hospital. *BMC Health Serv. Res*. 2020;20(1):494. <https://doi.org/10.1186/s12913-020-05352-w>.
24. Atkinson MJ, Sinha A, Hass SL, Colman SS, Kumar RN, Brod M, et al. Validation of a general measure of treatment satisfaction, the Treatment Satisfaction Questionnaire for Medication (TSQM), using a national panel study of chronic disease. *Health Qual. Life Outcomes*. 2024;2:12. <https://doi.org/10.1186/1477-7525-2-12>.
25. Liberato ACS, Rodrigues RCM, São-João TM, Alexandre NMC, Gallani MCBJ. Satisfaction with medication in coronary disease treatment: psychometrics of the Treatment Satisfaction Questionnaire for Medication. *Rev. Lat. Am. Enfermagem* 2016;24:e2705. <https://doi.org/10.1590/1518-8345.0745.2705>.
26. Khanna PP, Shiozawa A, Walker V, Bancroft T, Essoi B, Akhras KS, et al. Health-related quality of life and treatment satisfaction in patients with gout: results from a cross-sectional study in a managed care setting. *Patient Prefer. Adherence*. 2015;9:971-981. <https://doi.org/10.2147/PPA.S83700>.
27. Naderi SH, Bestwick JP, Wald DS. Adherence to drugs that prevent cardiovascular disease: meta-analysis on 376,162 patients. *Am. J. Med*. 2012;125(9):882-887.e1. <https://doi.org/10.1016/j.amjmed.2011.12.013>.
28. Hawkes AL, Patrao TA, Atherton J, Ware RS, Taylor CB, O'Neil A. Effect of a telephone-delivered coronary heart disease secondary prevention program (proactive heart) on quality of life and health behaviours: primary outcomes of a randomized controlled trial. *Int. J. Behav. Med*. 2013;20(3):413-424. <https://doi.org/10.1007/s12529-012-9250-5>.
29. Breekveldt-Postma NS, Penning-van Beest FJA, Siiskonen SJ, Falvey H, Vincze G, Klungel OH, et al. The effect of discontinuation of antihypertensives on the risk of acute myocardial infarction and stroke. *Curr. Med. Res. Opin*. 2008;24(1):121-127. <https://doi.org/10.1185/030079908x253843>.
30. Levy AE, Huang C, Huang A, Ho PM. Recent Approaches to Improve Medication Adherence in Patients with Coronary Heart Disease: Progress Towards a Learning Healthcare System. *Curr. Atheroscler. Rep*. 2018;20(1):5. <https://doi.org/10.1007/s11883-018-0707-0>.