

# Assessment of risk factors for cardiovascular disease in patients undergoing in-hospital early cardiac rehabilitation following acute coronary syndrome

Ocena czynników ryzyka chorób układu sercowo-naczyniowego u chorych poddawanych stacjonarnej wczesnej rehabilitacji kardiologicznej po ostrym incydencie wieńcowym

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## Abstract

**Introduction.** Effective implementation of preventive strategies is a cornerstone element of cardiac rehabilitation after myocardial infarction (MI). We aimed to assess knowledge of cardiovascular risk factors among subjects after acute coronary syndrome treated with percutaneous intervention scheduled to in-hospital cardiac rehabilitation, and to evaluate the association between the level of their awareness and burden of cardiovascular risk.

**Material and methods.** This cross sectional study included 205 consecutive subjects (153 males, 52 females, aged  $62 \pm 9$  years). Data covering burden of arterial hypertension, overweight, dyslipidemia, diabetes, smoking habit, low level of physical activity, elderly, male gender and a history of familial heart disease were retrieved from medical records and anamnesis. Knowledge and awareness of modifiable and non-modifiable cardiovascular risk factors were assessed by a questionnaire.

**Results.** The surveyed patients usually had 5 risk factors (mean  $4.53 \pm 1.43$ ). The best awareness concerned their own body mass (98%) and blood pressure level (74%). The subjects had suboptimal knowledge regarding recommendations of secondary prevention (< 50% of correct answers). In 20 questions investigating knowledge about risk factors, the patients most frequently gave 11 correct answers (mean  $54 \pm 18\%$ ). There was no association between burden of specific risk factors and patients' awareness of these factors, excluding the fact that diabetics knew their glucose level (odds ratio 2.9; 95% confidence interval 1.5–5.6,  $p < 0.01$ ). There was no correlation between patients' knowledge and the number of risk factors they had ( $r = -0.02$ ,  $p = 0.2$ ).

**Conclusions.** Despite significant burden of cardiovascular risk, the level of awareness regarding this issue remains insufficient. Also, risk factor burden does not determine the patients' knowledge. There is a need for education about secondary prevention to improve attitudes among patients after MI.

Key words: risk factor, cardiovascular, secondary prevention, knowledge, awareness

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## Introduction

Implementation of percutaneous coronary revascularization procedures as a standard treatment for myocardial infarction (MI) and their increased availability have led to a significant improvement in patient outcomes, i.e., reduction in non-fatal cardiovascular complications, and, first of all, to mortality reduction [1, 2]. Consequently, more and more patients may benefit from post-MI cardiac rehabilitation, which is designed to restore or even improve the patient's physical fitness [3].

Equally important in maintaining health is the implementation of appropriate pharmacological and non-pharmacological secondary prevention [4]. This is only possible, if the patient is aware that prevention is necessary and cooperates with a multidisciplinary therapeutic team, which at this stage is composed primarily of a physician, nurse, physiotherapist, psychologist and social worker [5, 6].

Despite implementing numerous social education programs, a significant proportion of patients do not follow lifestyle modification recommendations, and their knowledge of risk factors is insufficient [4–6]. Often, they are convinced that their heart disease is caused by non-modifiable (genetic, innate) factors rather than by modifiable factors associated with daily behavior [7]. There are also significant differences in the awareness of the principles of secondary prevention implementation between patients who did or did not receive early cardiac rehabilitation [8–10].

The answer to the question about the extent to which the knowledge of patients depends on the burden of cardiovascular risk is still being sought, as it can be expected that the more aware patients should benefit more from comprehensive cardiac rehabilitation. Therefore, the aim of this paper was to assess the awareness of cardiovascular risk factors and knowledge of secondary prevention in patients after acute coronary syndrome treated with percutaneous angioplasty who were provided with in-hospital cardiac rehabilitation as well as to evaluate the association between the level of their awareness and burden of cardiovascular risk factors.

## Material and methods

The epidemiological cross-sectional study included 205 consecutive patients hospitalized in a referral rehabilitation center for in-hospital early cardiac rehabilitation from May 2013 to April 2014 after their first acute coronary syndrome episode treated with percutaneous angioplasty. All of the respondents were residents of Silesia. The inclusion criterion was qualification for comprehensive cardiac rehabilitation [11]. Exclusion criteria were: symptoms of unstable angina, severe circulatory failure, history of coronary artery bypass grafting, physical disability preventing participation in all

stages and procedures of rehabilitation, significant impairment of cognitive function, disability preventing self-completion of the questionnaire, significant and uncontrolled systemic illness and lack of patient consent.

The basic research tool was the questionnaire developed by the authors based on the "Guidelines of the Polish Forum for the Prevention of Cardiovascular Diseases" on the knowledge of modifiable and non-modifiable cardiovascular risk factors [12]. The questionnaire was subjected to a validation procedure and was characterized by good reproducibility, with kappa statistics ranging from 0.82 to 1.0. Information on risk factors (elderly, male gender, positive family history, hypertension, overweight/obesity, dyslipidemia, diabetes, smoking, low physical activity) were retrieved from available medical records and structured interviews conducted at admission.

The project has received the approval/positive opinion of the Bioethics Committee.

Statistical analysis of data was performed using the SAS 9.4 software (SAS Institute Inc., Cary, North Carolina, United States). For the description of quantitative variables, the mean values and their standard deviations were calculated, with the normal distribution being verified by the Smirnov-Kolmogorov test. Absolute values and percentages were used for the description of qualitative variables. Correlations between quantitative variables were assessed based on the Pearson's correlation coefficient values and non-normally distributed data were subjected to a logarithmic transformation. The relationships between qualitative variables were assessed based on odds ratios (ORs) and their 95% confidence intervals (CIs). In order to interpret the obtained differences and relationships, the criterion of statistical significance of  $p < 0.05$  was adopted.

## Results

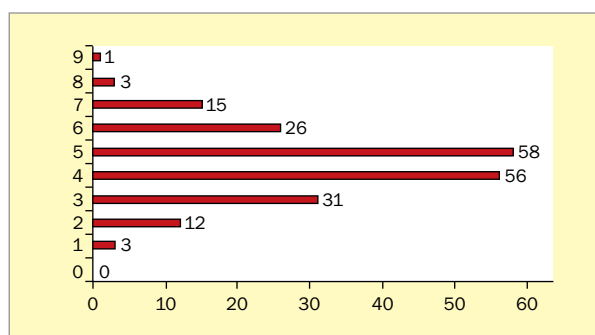
The study included 205 patients (153 men and 52 women) aged  $62 \pm 9$  years. The characteristics of the study population, including the prevalence of risk factors, are summarized in Table 1. The majority of the surveyed patients had 5 risk factors (mean  $4.53 \pm 1.43$ ) (Figure 1).

Table 2 shows the patients' awareness of their body weight, blood pressure, glycemia and cholesterol levels. Most often the patients knew their body weight and blood pressure values, whereas cholesterol level was the parameter known by the lowest number of patients. The patients had suboptimal knowledge of the basic principles of cardiovascular disease prevention ( $< 50\%$  correct answers in all questions) (Table 3). With regard to questions about the knowledge of the specific cardiovascular risk factors, the respondents knew the most about overweight and smoking (Table 4) and the majority of them gave 11 correct (20 possible) answers (mean  $54 \pm 18\%$ ).

**Table 1.** Characteristics of the study population

Variable	Value
Male gender	153 (75%)
Age [years]	62 ± 9
BMI [kg/m <sup>2</sup> ]	29 ± 4
Overweight or obesity	159 (77%)
Obesity	72 (35%)
Type of obesity	
Android (WHR ≥ 1)	54 (74%)
Gynoid (WHR < 1)	8 (26%)
Smoking (current)	71 (35%)
Smoking – pack-years	16 ± 8
Declared low physical activity	23 (11%)
Hypertension	154 (75%)
Diabetes	55 (27%)
Dyslipidemia	100 (49%)
History of familial cardiovascular disease	127 (62%)

BMI – body mass index; WHR – waist-to-hip ratio

**Figure 1.** Global burden of modifiable and non-modifiable risk factors (i.e. elderly, male gender, positive family history, hypertension, overweight/obesity, dyslipidemia, diabetes, smoking, low physical activity)

There was no correlation between the burden of cardiovascular risk factors and patients' awareness of these risk factors and knowledge of the principles of cardiovascular prevention, except for the awareness of own blood glucose level among diabetic patients (OR = 2.9; 95% CI 1.5–5.6,  $p < 0.01$ ) (Table 5). Associations of borderline significance were found between the presence of excess body weight and knowledge of recommended physical activity (OR = 2.0; 95% CI 1.0–4.0,  $p = 0.05$ ) and between the presence of dyslipidemia and awareness of own cholesterol level (OR = 1.7; 95% CI 0.95–2.9  $p = 0.08$ ). There was no correlation between knowledge of risk factors (percentage of correct answers in the questionnaire) and global risk burden (the number of risk factors in one patient) ( $r = -0.02$ ,  $p = 0.2$ ).

**Table 2.** Awareness of own modifiable risk factors of cardiovascular disease

Risk factors studied	Number of patients (proportion)
Body weight	201 (98%)
Hypertension	151 (74%)
Glycemia	103 (50%)
Total cholesterol	82 (40%)

**Table 3.** Knowledge about basic principles of cardiovascular disease prevention

Evaluated principle of CVD prevention	Number of patients (proportion)
Normal blood pressure values	40 (20%)
Normal glycemic levels	89 (43%)
Normal cholesterol levels	101 (49%)
Knowledge about HDL	87 (42%)
Knowledge about LDL	88 (43%)
Recommendations on physical activity	93 (45%)

CVD – cardiovascular disease; HDL – high-density lipoprotein; LDL – low-density lipoprotein

**Table 4.** Knowledge about cardiovascular risk factors

Is this a cardiovascular risk factor?	Correct answer
Excessive body weight	184 (90%)
Elderly	78 (38%)
Osteoporosis	72 (35%)
Male sex	35 (17%)
Tallness	86 (42%)
Vegetable oil consumption	54 (26%)
Hypertension	153 (75%)
Physical activity	60 (29%)
Cigarette smoking	181 (88%)
Pipe smoking	140 (68%)
Diabetes	135 (66%)
Ulcerous disease	67 (33%)
High cholesterol	157 (77%)
Low HDL-cholesterol	31 (15%)
Frequent stress	165 (80%)
Depressive symptoms	15 (7%)
Environmental pollution	86 (42%)
Cardiovascular diseases in family members	134 (65%)
Sedentary lifestyle	142 (69%)
Stroke in family members	55 (27%)

HDL – high-density lipoprotein

**Table 5.** Association between the prevalence and awareness of cardiovascular risk factors and knowledge about selected principles of prevention

Risk factor	Awareness or knowledge	OR (95% CI) and p-value
Overweight or obesity	Awareness of own body weight	0.4 (0.02–7.0), p = 0.5
	Knowledge about physical activity	2.0 (1.0–4.0), p = 0.05
Obesity	Awareness of own body weight	1.6 (0.2–15.7), p = 0.7
	Knowledge about physical activity	1.1 (0.6–1.9), p = 0.8
Hypertension	Awareness of own blood pressure values	1.1 (0.5–2.2), p = 0.8
	Knowledge about normal blood pressure values	1.0 (0.4–2.2), p = 0.9
Diabetes	Awareness of own glycemic level	2.9 (1.5–5.6), p < 0.01
	Knowledge about normal glycemic levels	1.5 (0.8–2.8), p = 0.2
Dyslipidemia	Awareness of own cholesterol level	1.7 (0.95–2.9), p = 0.08
	Knowledge about normal cholesterol levels	1.6 (0.9–2.7), p = 0.1
	Knowledge about HDL-cholesterol	0.8 (0.4–1.3), p = 0.3
	Knowledge about LDL-cholesterol	0.8 (0.5–1.4), p = 0.4

OR – odds ratio; CI – confidence interval; HDL – high-density lipoprotein; LDL – low-density lipoprotein

## Discussion

In the past, rehabilitation programs were often treated by patients and health care professionals only as a form of developing and improving physical fitness. Increased awareness of the problem of secondary prevention and understanding of the role of multidisciplinary teams have enabled the development of comprehensive cardiac rehabilitation programs, including physiotherapy, occupational therapy, education, psychological and social therapy, counseling for risk factors and pharmacotherapy [3–6]. Comprehensive cardiac rehabilitation has become a platform that connects many medical specialties, but also family members and their immediate environment. What is important, its results are unquestionable – effective rehabilitation reduces the risk of death, especially cardiovascular mortality by 25–30% [13, 14]. Considering the above, this project was undertaken, and the results were quite disturbing. The obtained data revealed the ignorance of patients about cardiovascular disease prevention, despite significant cardiovascular risk burden, but they also showed a lack of clear relation between the presence of cardiovascular risk factors and awareness and knowledge of these factors in patients after acute coronary syndrome.

These results are consistent with the observations of other authors. This applies both to the profile of patients participating in the rehabilitation program, including their cardiovascular risk burden, and to the level of knowledge and awareness of secondary prevention. The patients participating in cardiac rehabilitation program are mainly men (60–80%), over 60 years of age, hypertensive, overweight or obese (60–80%), with diabetes (10–30%),

dyslipidemia (50–80%), current smokers (10–40%), and frequently fulfilling the diagnostic criteria of metabolic syndrome [4–6]. The knowledge of patients after acute coronary syndrome who underwent invasive treatment is negligible or inadequate in relation to the health risk [10, 15–19]. Relevant data concerning Polish population are provided by a pilot study from the Poznań center, including 31 patients who underwent in-hospital rehabilitation, [15] and a comprehensive analysis of registry data of over 19,000 patients with acute coronary syndrome [16]. Deskur-Śmielecka et al. [15] have shown that, despite the high proportion of patients with medical and family history of cardiovascular diseases, the level of knowledge and awareness of risk factors for ischemic heart disease and recommended lifestyle modifications among patients was low, especially for diabetes, hypertension and dietary cholesterol, animal fat and sodium. In turn, Budnik and Opolski [16] documented that 35% of patients believed that it was beneficial to reduce physical activity after angioplasty and one third was afraid of moderate physical activity. Although 85% of patients claimed to be aware of the recommendations on appropriate diet, 26% of the patients declared not willing to implement these recommendations in their daily practice. As regards international data, papers of Australian [10, 17, 18], Canadian [19], Swedish [7] and Irish [20] authors are of key importance. They all resulted in similar conclusions, because they document poor knowledge and the lack of an association between knowledge and the burden of cardiovascular risk. For example, in a study performed by Redfern et al. [10], 71% of the patients were unable to identify any risk factors they were exposed to, and among patients

surveyed by Fernandez et al. [18], only one third of the respondents were able to list 6 modifiable risk factors for coronary heart disease. What's interesting, the latter study showed that only diabetic patients were aware that diabetes is a direct risk factor of cardiovascular disease.

Looking for the cause of such disturbing results, it can be speculated that patients treated with coronary angioplasty often have no sense of disease [20, 21]. Easily accessible, effective and safe treatment, short hospitalization and quick relief of pain are the main reasons why patients do not realize the seriousness of the disease and even belittle it. Unfortunately, short duration of hospital stay also precludes the implementation of health education. Against this background, the role of early post-hospital rehabilitation seems to be important, but is provided only to a small group of patients [22]. In addition, patients seek quick, immediate, trouble-free solutions. The effort necessary to control modifiable risk factors is often an insurmountable barrier for them, especially in the absence of support from relatives or health care professionals in their living and working environments. This thesis can be supported by e.g., an observation of the loss of participants in long-term trials in the field of prophylaxis or prevention. Lastly, attention should be paid to the low efficiency of educational activities. On the one hand, this may be due to the patient's attitude described above; on the other hand, the reasons may include insufficient time for education, poorly designed programs or inappropriate content. It has been documented that these programs should be targeted and consistent with the risk profile of the participant [23, 24]; yet they are too general and standardized for the entire population. A patient who is often elderly and has concomitant diseases often feels lost in a new health situation (acute coronary syndrome), a new place (stationary rehabilitation), a new social environment and may be unprepared for such a large number of general, non-individualized rules and principles. It is therefore essential to promote and develop programs that increase patient awareness and knowledge about cardiovascular risk to the fullest extent possible.

This study is not free from the limitations of conclusions. Due to single-center design, the study may be subject to systematic errors and extrapolation of results may be limited. In the statistical analysis, we did not take into account the influence of several variables that may affect the knowledge and attitudes of the respondents, i.e. education, occupational status, marital status or socio-economic profile [19, 24, 25], although many authors negate their significant role in this area [9, 17, 20]. We have not assessed psychological factors or personality profiles of patients, which often have important impact on the interpretations of the results and may be relevant in acute or progressive diseases [26, 27]. Therefore, we did not consider whether the acute coronary syndrome was the first or subsequent disease. It cannot be ruled out that patients who do not participate in rehabilitation have a completely different level of knowledge about secondary prevention, as confirmed by numerous studies [8–10], but it can be assumed that awareness in this group of patients is even worse. In addition, we used in the study our own, innovative questionnaire, although the validation procedure confirmed its credibility. Finally, we have not assessed the burden of poor diet among the study participants, but the standardization of questions in this area is extremely difficult, which can affect the reliability of the answers provided.

## Conclusions

Patients who underwent early cardiac rehabilitation after acute coronary syndrome episode are characterized by unsatisfactory awareness and knowledge of cardiovascular risk factors. What is important, despite the significant cardiovascular risk, the presence of risk factors does not determine the knowledge about them. Effective educational interventions for secondary prevention are therefore needed to raise awareness in patients after invasive treatment for MI.

## Conflict of interest(s)

None declared.

## Streszczenie

**Wstęp.** Skuteczne wdrożenie zasad prewencji jest jednym z priorytetów kompleksowej rehabilitacji osób po zawale serca (MI). Celem pracy była ocena znajomości czynników ryzyka chorób układu sercowo-naczyniowego u chorych po ostrym incydencie wieńcowym leczonych przezskórną angioplastyką, poddawanych rehabilitacji kardiologicznej w warunkach stacjonarnych oraz ocena związku między ich znajomością a rozpowszechnieniem.

**Materiał i metody.** Przekrojowym badaniem objęto 205 kolejnych chorych (153 mężczyźni i 52 kobiety w wieku  $62 \pm 9$  lat). Informacje dotyczące obciążenia nadciśnieniem tętniczym, nadwagą, dyslipidemią, cukrzycą, paleniem tytoniu, małą aktywnością fizyczną, starszym wiekiem, płcią męską i dodatnim wywiadem rodzinnym uzyskano na podstawie dostępnej dokumentacji medycznej oraz wywiadu. Kwestionariuszowo oceniono wiedzę i znajomość modyfikowalnych i niemodyfikowalnych czynników ryzyka sercowo-naczyniowego.

**Wyniki.** Badani najczęściej byli obciążeni 5 czynnikami ryzyka (średnio  $4,53 \pm 1,43$ ). Najlepsza znajomość dotyczyła własnej masy ciała (98%) i ciśnienia tętniczego (74%). Pacjentów cechowała suboptymalna wiedza o rekomendacjach w zakresie prewencji wtórnej (< 50% prawidłowych odpowiedzi). W 20 pytaniach o znajomość poszczególnych czynników ryzyka pacjenci najczęściej wskazywali 11 poprawnych odpowiedzi (średnio  $54 \pm 18\%$ ). Nie odnotowano związku między obciążeniem poszczególnymi czynnikami ryzyka a ich znajomością oraz wiedzą na temat zasad prewencji, z wyjątkiem obecności cukrzycy, a znajomością glikemii (iloraz szans = 2,9; 95-proc. przedział ufności CI 1,5–5,6;  $p < 0,01$ ). Nie stwierdzono korelacji między wiedzą badanych a sumarycznym obciążeniem czynnikami ryzyka ( $r = -0,02$ ;  $p = 0,2$ ).

**Wnioski.** Mimo znaczącego obciążenia ryzykiem sercowo-naczyniowym, badanych cechuje niezadowalająca świadomość w tym temacie. Obecność czynników ryzyka nie determinuje wiedzy na ich temat. Konieczne są skuteczne interwencje edukacyjne dotyczące prewencji wtórnej, celem podniesienia postaw osób po MI.

Słowa kluczowe: czynnik ryzyka, sercowo-naczyniowy, prewencja wtórna, wiedza, świadomość

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## References

- Roffi M, Patrono C, Collet JP, et al. Management of Acute Coronary Syndromes in Patients Presenting without Persistent ST-Segment Elevation of the European Society of Cardiology. 2015 ESC Guidelines for the management of acute coronary syndromes in patients presenting without persistent ST-segment elevation: Task Force for the Management of Acute Coronary Syndromes in Patients Presenting without Persistent ST-Segment Elevation of the European Society of Cardiology (ESC). *Eur Heart J.* 2016; 37(3): 267–315, doi: [10.1093/eurheartj/ehv320](https://doi.org/10.1093/eurheartj/ehv320), indexed in Pubmed: [26320110](https://pubmed.ncbi.nlm.nih.gov/26320110/).
- Steg PH, James SK, Atar D, et al. Task Force on the management of ST-segment elevation acute myocardial infarction of the European Society of Cardiology (ESC). ESC Guidelines for the management of acute myocardial infarction in patients presenting with ST-segment elevation. *Eur Heart J.* 2012; 33(20): 2569–2619, doi: [10.1093/eurheartj/ehs215](https://doi.org/10.1093/eurheartj/ehs215), indexed in Pubmed: [22922416](https://pubmed.ncbi.nlm.nih.gov/22922416/).
- Price KJ, Gordon BA, Bird SR, et al. A review of guidelines for cardiac rehabilitation exercise programmes: Is there an international consensus? *Eur J Prev Cardiol.* 2016; 23(16): 1715–1733, doi: [10.1177/2047487316657669](https://doi.org/10.1177/2047487316657669), indexed in Pubmed: [27353128](https://pubmed.ncbi.nlm.nih.gov/27353128/).
- Piepoli MF, Hoes AW, Agewall S, et al. Authors/Task Force Members, Additional Contributor: Simone Binno (Italy), Document Reviewers: 2016 European Guidelines on cardiovascular disease prevention in clinical practice: The Sixth Joint Task Force of the European Society of Cardiology and Other Societies on Cardiovascular Disease Prevention in Clinical Practice (constituted by representatives of 10 societies and by invited experts): Developed with the special contribution of the European Association for Cardiovascular Prevention & Rehabilitation (EACPR). *Eur J Prev Cardiol.* 2016; 23(11): NP1–NP96, doi: [10.1177/2047487316653709](https://doi.org/10.1177/2047487316653709), indexed in Pubmed: [27353126](https://pubmed.ncbi.nlm.nih.gov/27353126/).
- Giobergia E, Mento C, Pasero E, et al. [Efficacy of team work in health promotion and secondary prevention in patients admitted for cardiovascular rehabilitation]. *Monaldi Arch Chest Dis.* 2010; 74(4): 172–180, doi: [10.4081/monaldi.2010.258](https://doi.org/10.4081/monaldi.2010.258), indexed in Pubmed: [21337806](https://pubmed.ncbi.nlm.nih.gov/21337806/).
- Piepoli MF, Corrà U, Benzer W, et al. Cardiac Rehabilitation Section of the European Association of Cardiovascular Prevention and Rehabilitation. Secondary prevention through cardiac rehabilitation: from knowledge to implementation. A position paper from the Cardiac Rehabilitation Section of the European Association of Cardiovascular Prevention and Rehabilitation. *Eur J Cardiovasc Prev Rehabil.* 2010; 17(1): 1–17, doi: [10.1097/HJR.0b013e3283313592](https://doi.org/10.1097/HJR.0b013e3283313592), indexed in Pubmed: [19952757](https://pubmed.ncbi.nlm.nih.gov/19952757/).
- Perk J, Hambraeus K, Burell G, et al. Study of Patient Information after percutaneous Coronary Intervention (SPICI): should prevention programmes become more effective? *EuroIntervention.* 2015; 10(11): e1–e7, doi: [10.4244/EIJV1011A223](https://doi.org/10.4244/EIJV1011A223), indexed in Pubmed: [24472705](https://pubmed.ncbi.nlm.nih.gov/24472705/).
- Cottin Y, Cambou JP, Casillas JM, et al. Specific profile and referral bias of rehabilitated patients after an acute coronary syndrome. *J Cardiopulm Rehabil.* 2004; 24(1): 38–44, indexed in Pubmed: [14758102](https://pubmed.ncbi.nlm.nih.gov/14758102/).
- Blackburn GG, Foody JM, Sprecher DL, et al. Cardiac rehabilitation participation patterns in a large, tertiary care center: evidence for selection bias. *J Cardiopulm Rehabil.* 2000; 20(3): 189–195, indexed in Pubmed: [10860201](https://pubmed.ncbi.nlm.nih.gov/10860201/).
- Redfern J, Ellis ER, Briffa T, et al. High risk-factor level and low risk-factor knowledge in patients not accessing cardiac rehabilitation after acute coronary syndrome. *Med J Aust.* 2007; 186(1): 21–25, indexed in Pubmed: [17229029](https://pubmed.ncbi.nlm.nih.gov/17229029/).
- Dylewicz P, Jegier A, Piotrowicz R, et al. Kompleksowa Rehabilitacja Kardiologiczna. Stanowisko Komisji ds. Opracowania Standardów Rehabilitacji Kardiologicznej Polskiego Towarzystwa Kardiologicznego. *Folia Cardiologica.* 2004; 11(Suppl A): A1–A48.
- Polskie Forum Profilaktyki Chorób Układu Krążenia. Dostęp: <http://www.pfp.edu.pl/index.php?id=wytyczne>.
- Anderson L, Thompson DR, Oldridge N, et al. Exercise-based cardiac rehabilitation for coronary heart disease. *Cochrane Database Syst Rev.* 2016(1): CD001800, doi: [10.1002/14651858.CD001800.pub3](https://doi.org/10.1002/14651858.CD001800.pub3), indexed in Pubmed: [26730878](https://pubmed.ncbi.nlm.nih.gov/26730878/).
- Taylor RS, Unal B, Critchley JA, et al. Mortality reductions in patients receiving exercise-based cardiac rehabilitation: how much can be attributed to cardiovascular risk factor improvements? *Eur J Cardiovasc Prev Rehabil.* 2006; 13(3): 369–374, indexed in Pubmed: [16926666](https://pubmed.ncbi.nlm.nih.gov/16926666/).
- Deskur-Smielecka E, Borowicz-Bierkowska S, Przywarska I, et al. [Knowledge of cardiovascular risk factors and recommended lifestyle modifications in patients after an acute coronary syndrome. The influence of short-term, stationary rehabilitation. Preliminary results]. *Kardiologia Pol.* 2008; 66(2): 230–232, indexed in Pubmed: [18344166](https://pubmed.ncbi.nlm.nih.gov/18344166/).
- Budnik M, Opolski G. The assessment of coronary heart disease risk factors correlated with demographic and social data in post-

- coronary intervention patients in Polish population. *Cardiol J.* 2015; 22(3): 276–284, doi: [10.5603/CJ.a2015.0021](https://doi.org/10.5603/CJ.a2015.0021), indexed in Pubmed: [26118382](https://pubmed.ncbi.nlm.nih.gov/26118382/).
17. Liew H, Taylor DM, Tjipto A, et al. Investigation of the variables that impact upon the knowledge of cardiac risk factors. *Emerg Med Australas.* 2006; 18(3): 252–258, doi: [10.1111/j.1742-6723.2006.00848.x](https://doi.org/10.1111/j.1742-6723.2006.00848.x), indexed in Pubmed: [16712535](https://pubmed.ncbi.nlm.nih.gov/16712535/).
  18. Fernandez RS, Salamonson Y, Griffiths R, et al. Awareness of risk factors for coronary heart disease following interventional cardiology procedures: a key concern for nursing practice. *Int J Nurs Pract.* 2008; 14(6): 435–442, doi: [10.1111/j.1440-172X.2008.00717.x](https://doi.org/10.1111/j.1440-172X.2008.00717.x), indexed in Pubmed: [19126071](https://pubmed.ncbi.nlm.nih.gov/19126071/).
  19. Kayaniyl S, Ardern CI, Winstanley J, et al. Degree and correlates of cardiac knowledge and awareness among cardiac inpatients. *Patient Educ Couns.* 2009; 75(1): 99–107, doi: [10.1016/j.pec.2008.09.005](https://doi.org/10.1016/j.pec.2008.09.005), indexed in Pubmed: [18952393](https://pubmed.ncbi.nlm.nih.gov/18952393/).
  20. Nolan MT, McKee G. Is Knowledge Level of Coronary Heart Disease and Risk Factors Among Post-Percutaneous Coronary Intervention Patients Adequate? *J Cardiovasc Nurs.* 2016; 31(3): E1–E9, doi: [10.1097/JCN.000000000000291](https://doi.org/10.1097/JCN.000000000000291), indexed in Pubmed: [26422635](https://pubmed.ncbi.nlm.nih.gov/26422635/).
  21. Fernandez RS, Griffiths R, Juergens C, et al. Persistence of coronary risk factor status in participants 12 to 18 months after percutaneous coronary intervention. *J Cardiovasc Nurs.* 2006; 21(5): 379–387, indexed in Pubmed: [16966915](https://pubmed.ncbi.nlm.nih.gov/16966915/).
  22. McDonall J, Botti M, Redley B, et al. Patient participation in a cardiac rehabilitation program. *J Cardiopulm Rehabil Prev.* 2013; 33(3): 185–188, doi: [10.1097/HCR.0b013e318282551a](https://doi.org/10.1097/HCR.0b013e318282551a), indexed in Pubmed: [23403913](https://pubmed.ncbi.nlm.nih.gov/23403913/).
  23. Clark AM, Catto S, Bowman G, et al. Design matters in secondary prevention: individualization and supervised exercise improves the effectiveness of cardiac rehabilitation. *Eur J Cardiovasc Prev Rehabil.* 2011; 18(5): 761–769, doi: [10.1177/1741826710397107](https://doi.org/10.1177/1741826710397107), indexed in Pubmed: [21450605](https://pubmed.ncbi.nlm.nih.gov/21450605/).
  24. McKinley S, Dracup K, Moser DK, et al. The effect of a short one-on-one nursing intervention on knowledge, attitudes and beliefs related to response to acute coronary syndrome in people with coronary heart disease: a randomized controlled trial. *Int J Nurs Stud.* 2009; 46(8): 1037–1046, doi: [10.1016/j.ijnurstu.2009.01.012](https://doi.org/10.1016/j.ijnurstu.2009.01.012), indexed in Pubmed: [19243778](https://pubmed.ncbi.nlm.nih.gov/19243778/).
  25. Griffo R, Ambrosetti M, Tamarin R, et al. ICAROS investigators. Effective secondary prevention through cardiac rehabilitation after coronary revascularization and predictors of poor adherence to lifestyle modification and medication. Results of the ICAROS Survey. *Int J Cardiol.* 2013; 167(4): 1390–1395, doi: [10.1016/j.ijcard.2012.04.069](https://doi.org/10.1016/j.ijcard.2012.04.069), indexed in Pubmed: [22575623](https://pubmed.ncbi.nlm.nih.gov/22575623/).
  26. Lavie CJ, Milani RV. Adverse psychological and coronary risk profiles in young patients with coronary artery disease and benefits of formal cardiac rehabilitation. *Arch Intern Med.* 2006; 166(17): 1878–1883, doi: [10.1001/archinte.166.17.1878](https://doi.org/10.1001/archinte.166.17.1878), indexed in Pubmed: [17000945](https://pubmed.ncbi.nlm.nih.gov/17000945/).
  27. Siennicka AE, Gościńska-Bis K, Wilczek J, et al. Perception of health control and self-efficacy in heart failure. *Kardiol Pol.* 2016; 74(2): 168–178, doi: [10.5603/KP.a2015.0137](https://doi.org/10.5603/KP.a2015.0137), indexed in Pubmed: [26202531](https://pubmed.ncbi.nlm.nih.gov/26202531/).