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# The awareness and knowledge about heart failure in Poland — lessons from the Heart Failure Awareness Day and internet surveys

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**Abstract:** **B a c k g r o u n d:** Heart failure (HF) is a life-threatening condition which affects up to 2% of contemporary populations. Generally, it is a chronic and progressive disease, however in many cases it can be prevented or treated. Nevertheless, effective control of this disease requires awareness of symptoms in the society.

**A i m s:** The aim of the study was to assess the level of HF knowledge in the Polish population.

**M e t h o d s:** The questionnaire concerning knowledge about HF prepared by the Competence Network HF under the patronage of the European Heart Failure Association of the ESC, was used. The survey included 534 contributors who formed three groups: medical students — in vast majority at first half of the study course (MS) — 198 (37.1%), HF Awareness Day participants (HFDP) — 134 (25.1%) and other (OP) — 202 (37.8%).

**R e s u l t s:** Study groups differed in terms of gender, age and level of education. As predicted, MS achieved the highest score (22.5 [20.0–24.0]), compared to HFDP (20.0 [17.0–22.0],  $P < 0.001$ ) and OP (19.0

[16.0–21.0],  $P < 0.001$ ). Knowledge on typical HF symptoms was alarmingly low in the analyzed groups – dyspnea (MS – 96.0%, HFDP – 78.4%, OP – 74.6%), ankle edema (MS – 79.8%, HFDP – 50.6%, OP – 32.2%), body weight gain (MS – 14.1%, HFDP – 17.2%, OP – 4.5%). By multivariate model medical education ( $\beta$  3.372, 95% CI 2.738–4.005) and own illness or having relatives or friends with HF ( $\beta$  0.654, 95% CI 0.066–1.242) independently affected the score of awareness questionnaire.

**C o n c l u s i o n s:** The basic knowledge on HF in Poland is not sufficient. It is moderately better among MS. Further campaigns improving HF awareness are necessary.

**Key words:** heart failure, knowledge, survey, symptoms.

## Introduction

In the contemporary society, heart failure (HF) is becoming a serious medical problem which affects at least 23 million of patients worldwide with the overall prevalence between 1 to 2% in United States and Europe [1]. Each year, more than 550,000 new cases are diagnosed in the United States alone [2]. HF affects over 10% of the population over 70 years of age [3]. Prognoses indicate that due to population ageing, HF morbidity will further increase. It has significant consequences for the society due to poor prognosis, significantly decreased quality of life and high costs of treatment [4].

HF symptoms are frequently recognized late and the initiation of proper treatment is often delayed. In half of patient's, the diagnosis is made at an advanced stage of disease (NYHA III or IV class) [5]. Early diagnosis and treatment may improve prognosis but requires proper awareness and understanding of HF symptoms [6]. Higher health awareness is associated with lower all-cause mortality in patients with HF [7]. Moreover, proper modifications of lifestyle and pharmacotherapy can significantly delay HF progression, improve life expectancy and the quality of life, making HF a potentially preventable and curable disease [8].

Knowledge about HF is poorly studied among Polish citizens. HF Awareness Day is an open-air event organized in many European countries under the patronage of the HF Association of the European Society of Cardiology (ESC). The aim of this initiative is to educate and raise awareness of the HF problem in local societies [9]. In 2018, the event was organized by the HF Working Group of the Polish Cardiac Society in Cracow. It was an occasion to perform voluntary and anonymous surveys among random persons attending the event. In addition, the same questionnaire was answered by medical students and other young persons who were also reached anonymously by social media. This study shows the result of the survey. To our knowledge, this is the first research to examine this issue on the Polish population.


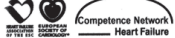
## Methods

All 534 contributors filled the questionnaire about HF. One hundred and thirty four (25.1%) of them were HF's Awareness Day participants (HFDP). Furthermore, 198 (37.1%) medical students, mostly of the 3rd year of the study course (MS) and 202 (37.8%) other participants (OP) fulfilled the online version of the survey. OP group was composed of non-medical students (law, philology, mathematics, faculties of engineering) and their nearest relatives. Subsequently, the subanalysis was performed in a subgroup of participants who declared previous personal contact with the HF problem either due to their own illness or their family members or friends (HFC) being affected, in comparison to the remaining participants (No-HFC). In consecutive subanalysis of HFC group, participants who suffered from HF (HFP) and relatives or friends of patients with HF (ROF) were compared. In order to ensure adequate group uniformity and to provide more reliable conclusions, comparable to real-life practice, the MS group was excluded from the above mentioned subanalyses.

### HF questionnaire

The HF Awareness Questionnaire has been coordinated and prepared by the Competence Network HF Germany under the patronage of the European HF Association of the ESC since 2013 and this year it was conducted in eight European countries. The original version of the questionnaire presented in Fig. 1 was translated into Polish. The forepart of the survey provided demographic data including age, gender, level of education, medical studies and professional connection with healthcare. Among other details, information about HF occurrence among contributors, their family and friends were collected. The following questions focused on the assessment of the participants' knowledge about HF symptoms, treatment methods and the influence of HF on different comorbidities. The total sum of this test was 33 points. The study protocol was complied with the Declaration of Helsinki. All participants filled the questionnaire voluntarily, without providing any personal details that could allow for their identification.

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Płeć: <input type="radio"/> mężczyzna <input type="radio"/> kobieta      Wiek: [ ] [ ] lat(a)	
1. Z kim mieszkasz? (można zaznaczyć kilka odpowiedzi) <input type="checkbox"/> Mieszkam sam(a) <input type="checkbox"/> Mąż/zona/partner <input type="checkbox"/> Dzieci <input type="checkbox"/> Rodzice <input type="checkbox"/> Wnuki <input type="checkbox"/> Przyjaciele (nie partner) <input type="checkbox"/> Inni krewni	
2. Na czyją pomoc możesz liczyć kiedy masz problemy lub trudności? (można zaznaczyć kilka odpowiedzi) <input type="checkbox"/> Na nicyją <input type="checkbox"/> Mąż/zona/partner <input type="checkbox"/> Dzieci <input type="checkbox"/> Rodzice <input type="checkbox"/> Wnuki <input type="checkbox"/> Przyjaciele (nie partner) <input type="checkbox"/> Inni krewni	
3. Jaki jest Twoje wykształcenie? (wybierz <b>tylko jedno</b> odpowiedź) <input type="radio"/> Szkoła podstawowa lub brak wykształcenia <input type="radio"/> Ukończona gimnazjum <input type="radio"/> Ukończona szkoła średnia <input type="radio"/> Ukończona szkoła zawodowa lub techniczna <input type="radio"/> Wykształcenie wyższe lub ponad-wyższe (np. doktorat)	
4. Pracuję (pracowałem / tam) w branży medycznej <input type="radio"/> tak <input type="radio"/> nie Jeśli tak, <input type="radio"/> Jako lekarz <input type="radio"/> opieka medyczna (pacjenci kardiologiczni) <input type="radio"/> opieka medyczna (pacjenci nie-kardiologiczni) <input type="radio"/> Inna forma	
5. Czy wiesz jakie są objawy niewydolności serca? <input type="radio"/> tak <input type="radio"/> nie	
6. Choruję na niewydolność serca. <input type="radio"/> tak <input type="radio"/> nie <input type="radio"/> Nie wiem	
7. Ktoś z mojej rodziny choruje na niewydolność serca. <input type="radio"/> tak <input type="radio"/> nie <input type="radio"/> Nie wiem	
8. Ktoś z moich przyjaciół choruje na niewydolność serca. <input type="radio"/> tak <input type="radio"/> nie <input type="radio"/> Nie wiem	

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9. Jakie są typowe objawy niewydolności serca? (proszę zaznaczyć wszystkie możliwe odpowiedzi) <input type="checkbox"/> Bóle głowy <input type="checkbox"/> Zmęczenie <input type="checkbox"/> Przyrost masy ciała <input type="checkbox"/> Zawroty głowy <input type="checkbox"/> Dusznosc <input type="checkbox"/> Pocenie się <input type="checkbox"/> Słabość/osłabienie <input type="checkbox"/> Paraliż <input type="checkbox"/> Wymioty <input type="checkbox"/> Nagły ból w klatce piersiowej <input type="checkbox"/> Obrzęk stóp lub łydek <input type="checkbox"/> Problemy z chodzeniem <input type="checkbox"/> Nie wiem <input type="checkbox"/> Żadna z odpowiedzi nie jest prawdziwa
10. Niewydolność serca u osób starszych jest czymś normalnym. <input type="radio"/> prawda <input type="radio"/> fałsz
11. Niewydolność serca wpływa na wiele narządów ludzkiego ciała. <input type="radio"/> prawda <input type="radio"/> fałsz
12. Chorzy z niewydolnością serca powinni unikać wysiłku fizycznego. <input type="radio"/> prawda <input type="radio"/> fałsz
13. Niewydolność serca może wywołać lub skomplikować przebieg niektórych chorób. Których? (można zaznaczyć kilka) <input type="checkbox"/> Niewydolność nerek <input type="checkbox"/> Depresja <input type="checkbox"/> Atrofia (zanik) mięśni <input type="checkbox"/> Rak jelita grubego <input type="checkbox"/> Zaburzenia pamięci <input type="checkbox"/> Arytmia <input type="checkbox"/> Reumatyzm <input type="checkbox"/> Nie wiem <input type="checkbox"/> Żadna z odpowiedzi nie jest prawdziwa
14. Jak można leczyć niewydolność serca? (można zaznaczyć kilka odpowiedzi) <input type="checkbox"/> Psychoterapia <input type="checkbox"/> Rozrusznik serca <input type="checkbox"/> Dieta <input type="checkbox"/> Terapia światłem <input type="checkbox"/> Operacja serca <input type="checkbox"/> Terapia poprzez rozmowę <input type="checkbox"/> Sport <input type="checkbox"/> Farmakoterapia <input type="checkbox"/> Odpoczywanie w łóżku <input type="checkbox"/> Chemioterapia <input type="checkbox"/> Akupunktura <input type="checkbox"/> Nie wiem <input type="checkbox"/> Żadna z odpowiedzi nie jest prawdziwa
15. Czy używasz nowoczesnych rozwiązań IT, aby dbać o swoje zdrowie? (aplikacje, smartfon, smartwatch, inne urządzenia telemedyczne) <input type="radio"/> tak <input type="radio"/> nie

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Fig. 1. The study Heart Failure Awareness Questionnaire.

## Statistical analysis

Statistical analyses were performed with the Statistica 13.1 (StatSoft, Statistica 13.1, Tulsa, Oklahoma, USA) software. Continuous variables are expressed as a mean  $\pm$  standard deviation or median (interquartile range) and categorical variables as a number (percentage). Continuous variables were first checked for normal distribution by the Shapiro-Wilk test and differences among the three groups were compared using the ANOVA test with post-hoc Bonferroni correction when normally distributed or the Kruskal-Wallis test for multiple comparisons of non-normally distributed variables. Categorical variables were analyzed using the chi-squared test or Fisher's exact test. All independent variables associated ( $P < 0.2$ ) with the score of HF Awareness Questionnaire in an univariate model and not correlated with another independent variable were then included in the multivariate regression analysis to determine the score of HF Awareness Questionnaire. Two-sided P-value of less than 0.05 was considered statistically significant.

## Results

The baseline characteristics and results of HF-related knowledge tests among groups were presented in Table 1. The baseline characteristics showed that the groups differed in terms of gender, age and level of education.

**Table 1.** Comparison of medical students', Heart Failure Awareness Day participants and other study contributors results of the questionnaire.

	MS n = 198	HFDP n = 134	OP n = 202	P	
Males	50 (25.3)	60 (45.5) **	81 (40.1) *	<0.001	
Age, years	21.9 (1.5)	58.9 (15.7) **	26.1 (12.6) ^	<0.001	
Level of education	Primary school	0 (0.0)	3 (2.2)	0 (0.0)	<0.001
	Junior high school	0 (0.0)	4 (3.0)	49 (24.3)	
	High school	0 (0.0)	73 (54.8)	42 (20.8)	
	Higher education	198 (100.0)	54 (40.3) **	111 (55.0) **, ^	
People who had contact with HF	66 (33.9)	77 (39.5) **	52 (26.8) **, ^	<0.001	
Do you know what are the HF symptoms?	Yes — 89 (95.5)	Yes — 100 (74.6) **	Yes — 125 (61.9) **, #	<0.001	
The sum of the knowledge test	22.5 (20.0–24.0)	20.0 (17.0–22.0) **	19.0 (16.0–21.0) **, #	<0.001	
The sum of HF symptoms knowledge test	8.0 (7.0–9.0)	7.0 (5.0–8.0) **	7.0 (5.0–8.0) **	<0.001	
HF is a normal health state among elder patients	Yes — 53 (26.8)	Yes — 44 (32.8)	Yes — 60 (30.1)	0.5	
Does HF affect many organs?	Yes — 197 (99.5)	Yes — 111 (82.8) **	Yes — 196 (97.0) ^	<0.001	
The sum of proper matching of affected organs	4.0 (3.0–5.0)	3.0 (3.0–5.0) **	3.0 (2.0 — 4.0) **, ^	<0.001	
The sum of proper matching of HF treatment	10.0 (9.0–11.0)	10.0 (8.0–11.0) **	9.0 (8.0–10.0) **, ^	<0.001	
Do HF patients should avoid physical effort?	Yes — 0 (0.0)	Yes — 42 (31.3) **	Yes — 0 (0.0) ^	<0.001	
Do you use IT devices or application to maintain health?	Yes — 98 (49.5)	Yes — 36 (26.9) **	Yes — 78 (39.0) *, #	<0.001	

Abbreviations: Data are shown as numbers (percentage), mean (standard deviation) or median (interquartile range). HF — heart failure, HFDP — Heart Failure Awareness Day participants, IT — information technology, MS — medical students, OP — other participants, \* P <0.05 vs Medical students, \*\* P <0.001 vs Medical students, # P <0.05 vs Heart Failure Awareness Day participants, ^ P <0.001 vs Heart Failure Awareness Day participants.

## Declaration of HF knowledge and personal contact with the HF problem

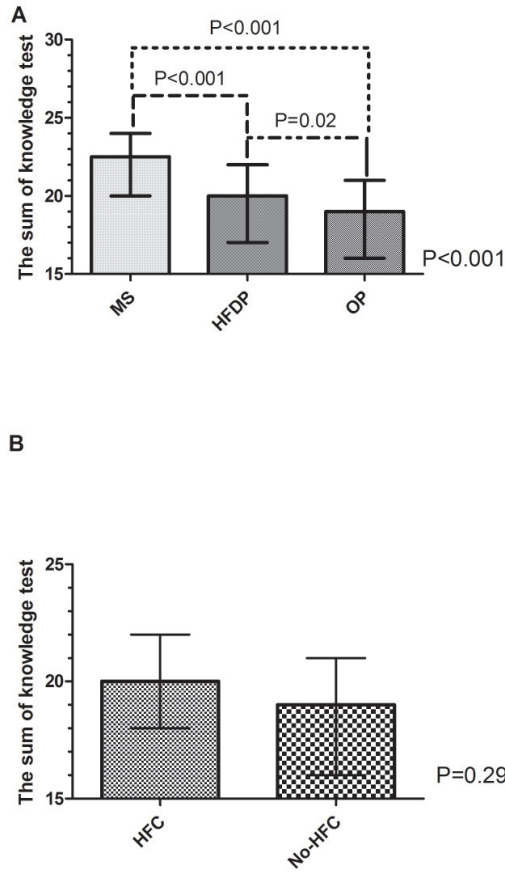
A significant difference in self-assessment of HF knowledge was observed between groups ( $P < 0.001$ ) (Table 1). The MS group declared knowledge about HF symptoms more frequently than the HFDP (95.5 vs 74.6%,  $P < 0.001$ ) and OP group (vs 61.9%,  $P < 0.001$ ). The difference was also observed between HFDP and OP groups ( $P < 0.05$ ). There were differences in personal experience with HF in the study groups. More HFDP participants had contact with HF compared to the MS group (39.5 vs 33.9%,  $P < 0.001$ ) and OP group (vs 26.8%,  $P < 0.001$ ). In detail, differences were noted among the percentage of participants with HF ( $P < 0.001$ ), contributors with relatives suffering from HF ( $P < 0.001$ ) and contributors with friends suffering from HF ( $P < 0.001$ ).

Nearly half of the MS group (49.5%) declared regular usage of information technology (IT) devices or smartphone applications to maintain health. It was significantly less frequent in the HFDP group (26.9 vs 49.5%,  $P < 0.001$ ) and in OP (39.0 vs 49.5%,  $P < 0.05$ ).

## Results of the HF knowledge test

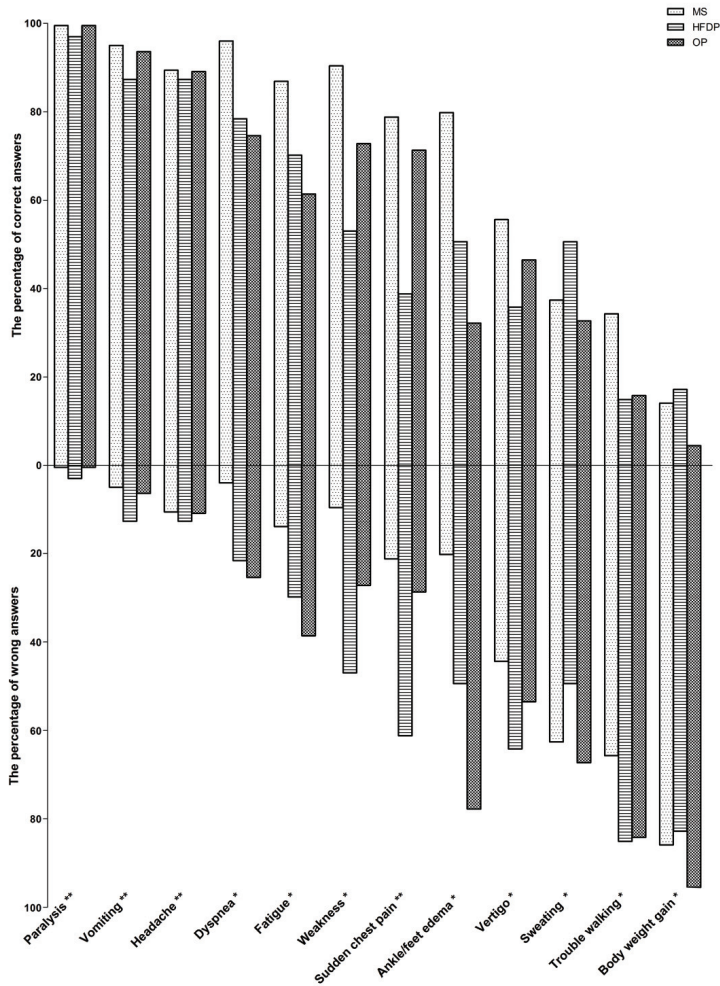
The results of the survey are presented in Table 1. The highest results of the HF knowledge test were noted in the MS group (22.5 points [20.0–24.0]), the second in HFDP (vs 20.0 [17.0–22.0],  $P < 0.001$ ) and the third in OP (vs 19.0 [16.0–21.0],  $P < 0.05$ ) (Fig. 2A).

A detailed analysis of answers is presented in Fig. 3–5. Interestingly, in the HF symptom test (Fig. 3), participants most often correctly identified symptoms which were not HF-related, i.e., paralysis (MS — 99.5%, HFDP — 97.0%, OP — 99.5% of correct answers), emesis (MS — 95.0%, HFDP — 87.3%, OP — 93.6%) and headache (MS — 89.4%, HFDP — 87.3%, OP — 89.1%). Answering the questions about typical HF symptoms was less successful: dyspnea (MS — 96.0%, HFDP — 78.4%, OP — 74.6%), fatigue (MS — 86.9%, HFDP — 70.2%, OP — 61.4%) and weakness (MS — 90.4%, HFDP — 53.0%, OP — 72.8%). Unfortunately, participants often incorrectly recognized the following as typical HF symptoms: sudden chest pain (MS — 78.8%, HFDP — 38.8%, OP — 71.3%), vertigo (MS — 55.6%, HFDP — 35.8%, OP — 46.5%) or sweating (MS — 37.4%, HFDP — 50.6%, OP — 32.7%). Surprisingly, one of the most characteristic symptoms of HF — ankle and/or feet edema — were correctly identified by only 79.8% of MS, 50.6% of HFDP and 32.2% of OP participants. Similarly, body weight gain was chosen as a HF symptom in 14.1% of MS, 17.2% of HFDP and 4.5% of OP groups. Moreover, 43% of all participants pointed towards three main HF symptoms (dyspnea, weakness and lower limb edema). The results differed across particular groups (MS — 71.7%, HFDP — 29.1%, OP — 23.3%,  $P < 0.001$ ).



Abbreviations: Data are shown as median (interquartile range). HFC — participants who had contact with heart failure, HFDP — Heart Failure Awareness Day participants, MS — medical students, No-HFC — participants who did not have contact with heart failure, OP — other participants.

**Fig. 2.** The total sum of heart failure knowledge test among groups.

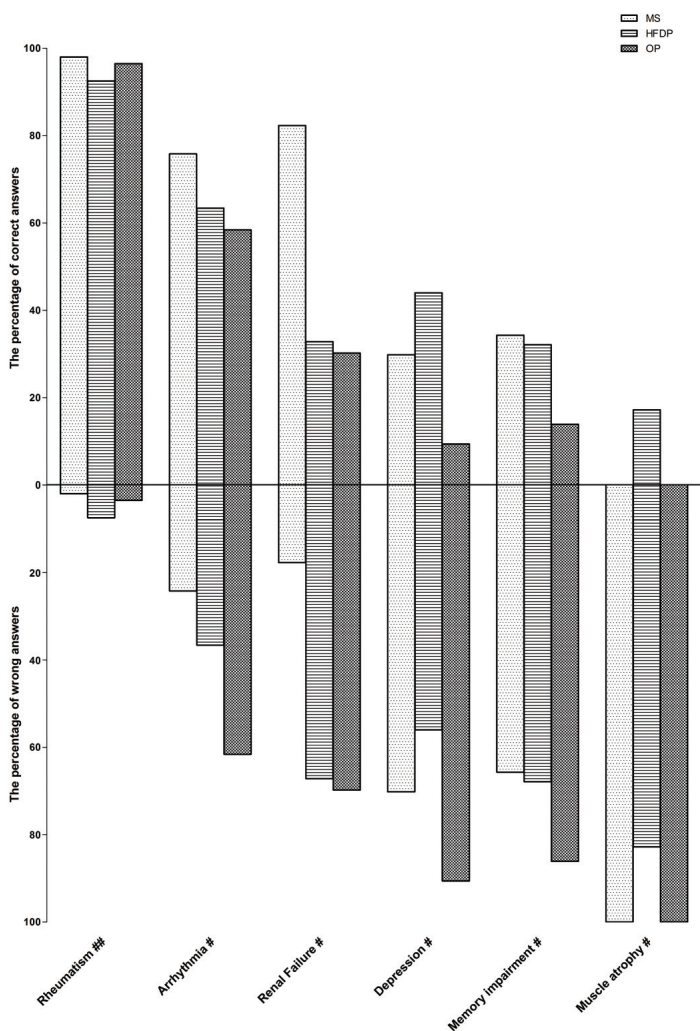


Abbreviations: HFDP — Heart Failure Awareness Day participants, MS — medical students, OP — other participants, \* — is heart failure symptom, \*\* — is not heart failure symptom.

**Fig. 3.** Percentage of correct answers of HF symptoms test among groups.

Among questions about organs affected by HF (Fig. 4), the mostly frequently excluded answer was rheumatism (MS — 98.0%, HFDP — 92.5%, OP — 96.5%). However, the respondents usually did not give correct answers about other conditions related to HF like arrhythmia (MS — 75.8%, HFDP — 63.4%, OP — 58.4%), renal failure (MS — 82.3%, HFDP — 32.8%, OP — 30.2%), depression (MS — 29.8%, HFDP — 44.0%, OP — 9.4%), memory impairment (MS — 34.3%, HFDP — 32.1%, OP — 13.9%), muscle atrophy (MS — 0.0%, HFDP — 17.2%, OP — 0.0%).



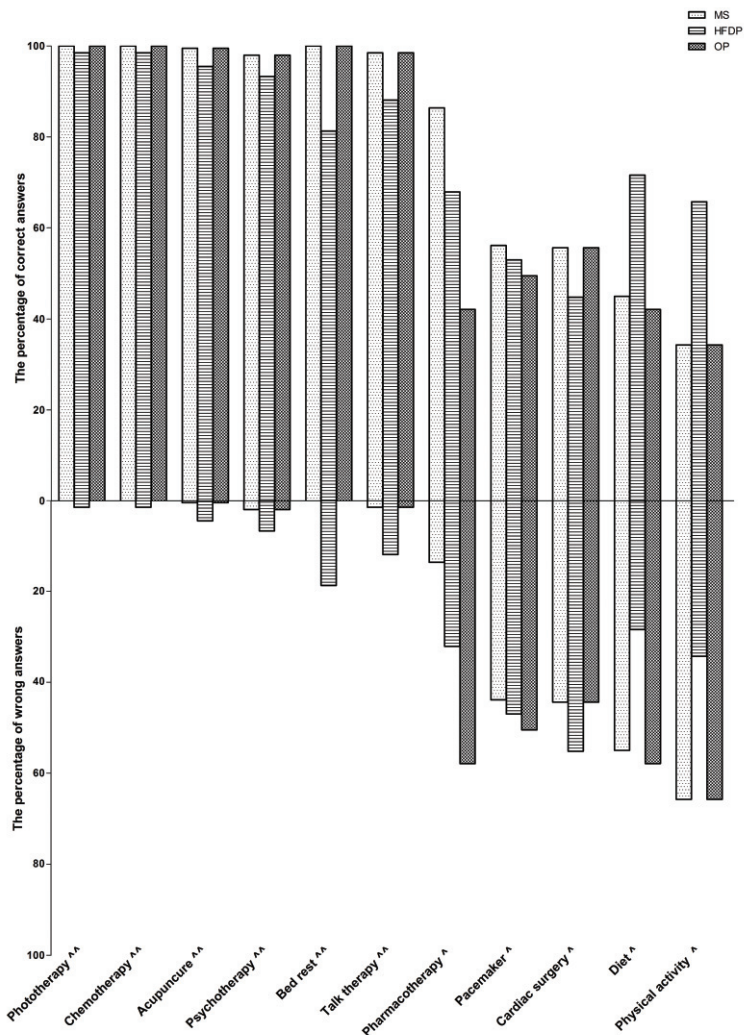


Abbreviations: HFDP — Heart Failure Awareness Day participants, MS — medical students, OP — other participants, # — comorbidities caused by HF or exacerbating HF, ## — comorbidities not caused by HF and not exacerbating HF.

Fig. 4. Percentage of correct answers about comorbidities caused by HF or exacerbating HF.

Questions about HF treatment were also included in the questionnaire. In most cases, methods that are not used in HF treatment were properly selected (Fig. 5). This included phototherapy (MS — 100.0%, HFDP — 98.5%, OP — 99.5%), chemotherapy (MS — 100.0%, HFDP — 98.5%, OP — 100.0%), acupuncture (MS — 99.0%, HFDP — 95.5%, OP — 97.0%), psychotherapy (MS — 96.0%, HFDP — 93.3%, OP — 96.5%), bed rest (MS — 100.0%, HFDP — 81.3%, OP — 100.0%), talk therapy (MS — 98.0%,

HFDP — 88.1%, OP — 99.0%). Correct methods of treatment were chosen by about a half of participants in each group, i.e., pharmacotherapy (MS — 86.4%, HFDP — 67.9%, OP — 42.1%), implantable pacemaker (MS — 56.1%, HFDP — 53.0%, OP — 49.5%), cardiac surgery (MS — 55.6%, HFDP — 44.8%, OP — 47.5%), diet (MS — 45.0%, HFDP — 71.6%, OP — 42.1%) and physical activity (MS — 34.3%, HFDP — 67.9%, OP — 42.1%).



Abbreviations: HFDP — Heart Failure Awareness Day participants, MS — medical students, OP — other participants ^ — is a heart failure treatment method, ^^ — is not a heart failure treatment method.

Fig. 5. Percentage of correct answers about HF treatment methods among groups.

## The results of subgroup analysis — HFC and No-HFC

After the above-mentioned exclusion of MS, who are related to medicine for obvious reasons, the characteristics of groups are presented in Table 2. Among HFC, 35 contributors (27.1%) suffered from HF (HFP) and 94 (72.9%) are relatives or friends of patients with HF (ROF). HFC and No-HFC did not differ in terms of gender ( $P = 0.29$ ), level of education ( $P = 0.333$ ) and proportion of IT health devices and smartphone application users, however No-HFC were significantly younger. More importantly, the HFC group more frequently declared HF symptoms knowledge in comparison to the No-HFC group participants (78.3 vs 59.9%,  $P = 0.002$ ), but the level of knowledge was not confirmed in the survey. Without a correction for the age of respondents, the score of the knowledge test was similar in both groups (20.0 [17.0–22.0] vs 19.0 [16.0–21.0],  $P = 0.29$ ) (Fig. 2B). However, the HFC group had significantly better knowledge about HF treatment than the No-HFC participants (9.0 [9.0–10.0] vs 9.0 [7.0–9.0],  $P = 0.02$ ). Surprisingly, more contributors in the No-HFC group were aware that HF affected many organs, compared to the HFC group (94.7 vs 86.1%,  $P = 0.01$ ).

**Table 2.** Comparison of the results of people (excluding medical students) who had contact vs who did not have contact with heart failure patients.

		HFC n = 129	No-HFC n = 207	P
Males		49 (38.6)	92 (44.4)	0.29
Age, years		47.7 (22.1)	34.0 (19.0)	<0.001
Level of education	Primary school	1 (0.8)	2 (1.0)	0.33
	Junior high school	16 (12.4)	37 (17.9)	
	High school	51 (39.5)	64 (30.9)	
	Higher education	61 (47.3)	104 (50.2)	
Do you know what are the typical HF symptoms?		Yes — 101 (78.3)	Yes — 124 (59.9)	0.002
The sum of the knowledge test		20.0 (17.0–22.0)	19.0 (16.0–21.0)	0.29
The sum of HF symptoms knowledge test		7.0 (5.0–8.0)	7.0 (5.0–8.0)	0.54
HF is a normal health state among elder patients		Yes — 43 (33.3)	Yes — 61 (29.9)	0.51
Does HF affect many organs?		Yes — 111 (86.1)	Yes — 196 (94.7)	0.01
The sum of proper matching of affected organs		3.0 (2.0–4.0)	3.0 (2.0–4.0)	0.35
The sum of proper matching of HF treatment		9.0 (9.0–10.0)	9.0 (7.0–9.0)	0.02
Do HF patients should avoid physical effort?		Yes — 22 (17.1)	Yes — 20 (9.7)	0.1
Do you use IT devices or application to maintain health?		Yes — 43 (33.3)	Yes — 71 (34.6)	0.81

Abbreviations: Data are shown as numbers (percentage), mean (standard deviation) or median (interquartile range). HFC — participants who had contact with heart failure, HF — heart failure, IT — information technology, No-HFC — participants who did not have contact with heart failure.

## The results of subgroup analysis — HFP vs ROF

The direct comparison of HFP and ROF were calculated. HFP were significantly older (67.6 (12.4) vs 40.2 (20.2),  $P < 0.001$ ) and more often were males (54.3 vs 32.6%,  $P = 0.04$ ) than ROF group. Interestingly, among HF knowledge test, participants in ROF more often were aware that HF affected many organs (92.6 vs 68.6%,  $P = 0.001$ ). The total questionnaire scores were surprisingly similar between groups.

### Predictors of the score of HF Awareness Questionnaire

The multivariate model for the score of HF Awareness Questionnaire is shown in Table 3. Age, gender, higher education, medical education and participant's illness or possession of relatives or friends with HF associated ( $P < 0.2$ ) with the score of HF Awareness Questionnaire in univariate model were included to the multivariate regression model. Moreover, significant correlation between medical and higher education ( $r = 0.527$ ,  $P < 0.001$ ) was found. In a final multivariate model medical education and respondents illness or possession of relatives or friends with HF independently affected the score of HF Awareness Questionnaire with variance of  $R^2 = 0.2$  ( $P < 0.001$ ) (Table 3).

**Table 3.** Independent predictors of the score of HF Awareness Questionnaire.

Independent variables	Univariate model				Multivariate model			
	$\beta$	95% CI for $\beta$		$P$ -value	$\beta$	95% CI for $\beta$		$P$ -value
Age (per year)	-0.019	-0.035	-0.003	0.02	0.015	-0.002	0.032	0.08
Gender (F/M)	-0.456	-1.075	0.162	0.15	0.059	-0.517	0.635	0.84
Medical education	3.021	2.463	3.580	<b>&lt;0.001</b>	3.372	2.738	4.005	<b>&lt;0.001</b>
Higher education	1.995	1.382	2.609	<b>&lt;0.001</b>	NA	NA	NA	NA
Respondents illness or possession of relatives or friends with HF	0.664	0.050	1.278	<b>0.03</b>	0.654	0.066	1.242	<b>0.03</b>

Abbreviations: CI — confidence interval, HF — heart failure, NA — not applicable.

## Discussion

The questionnaire designed by the Competence Network HF Germany and European HF Association of the ESC was used in this study for the first time to evaluate knowledge about HF in Poland. It demonstrated important shortages in understanding HF symptoms, associated conditions and treatment methods. This is also the

first analysis of HF literacy among Polish citizens in the era of common access to digital media. Moreover, this is the first Polish study to assess knowledge differences in different subpopulations, including medical students. According to our initial assumption, MS achieved the highest score in the test which has been confirmed by multivariate model but differences between the above-mentioned groups were less distinctive than it might be supposed. This may be probably explained by the fact that selected group of 3rd year MS has only finished the theoretical part of the study course, rather than the clinical.

As it has been shown, the level of knowledge about symptoms, complications and treatment of chronic HF is still insufficient. Previous data about the low level of HF knowledge has mainly originated from the SHAPE study performed in 2005 [10]. A total of 7,958 subjects from 9 European countries participated in this study. In the SHAPE study, 96% of Polish participants were convinced that patients with HF should avoid physical activity, compared to 71% of French, 38% Germans and 32% Swedish citizens. In our current study only 31% respondents selected this answer. Likewise, the percentage of respondents, who believed that HF is a natural consequence of aging was over 80% in the SHAPE study and only 33% in this research. As demonstrated in the SHAPE study, the problem of shortage in HF knowledge applies to other European countries. According to Zelenak *et al.*, only 40% of Germans recognized shortness of breath, reduced effort tolerance and edema of the lower limbs as typical symptoms of HF [11]. Lainscak *et al.* found that not more than 30% of respondents identified a typical HF description of the symptoms [12]. Of note, in our study 43% of respondents recognized main HF symptoms study (dyspnea, weakness and lower limb edema), comparing to only 3% of German participants of SHAPE [10].

Furthermore, in the SHAPE study, significant differences in public awareness concerning various cardiovascular diseases were reported. The respondents were significantly better in recognizing myocardial infarction and stroke than HF symptoms — 28% of participants properly identified angina or myocardial infarction and 48% of them identified stroke or TIA by the main symptoms [10]. The higher level of knowledge concerning stroke has also been reported by Schneider *et al.* [13]. Among 2,173 American respondents, 70% correctly classified at least one of the five warning signs of stroke and 72% at least one of the stroke risk factors. Fang *et al.* [14] found that 97% of 76,864 adults in a general public survey in the USA properly listed at least one symptom of heart attack [15]. Sudden chest pain, typically connected by the general public with heart disease, was also associated with HF by participants in this study (over 60% of HFDP and around 25% of MS and OP). Myocardial infarction and stroke are popular topics in the public domain, distributed widely by traditional and digital media and movies [15]. Noteworthy, the problem of poor health education of the Polish citizens does not only apply to HF and has been repeatedly reported for

cardiovascular risk factors [16], arrhythmia [17], venous thromboembolism [18] and anticoagulation treatment [18, 19].

The awareness of HF symptoms is essential for early diagnosis and appropriate treatment. In our study, the majority of each group (MS, HFDP and OP) correctly excluded false symptoms like paralysis, emesis and headache. Furthermore, most participants recognized dyspnea, fatigue and weakness as alarming signs of HF. However, many respondents had difficulties with identifying dyspnea, weakness, body weight gain or lower limbs edema as characteristic symptoms of HF [3]. These symptoms can be self-assessed by patients and could often represent the first manifestation of HF development. Therefore, early recognition of such symptoms might play an important role in early diagnosis and subsequently better treatment efficacy and prognosis [6]. Interestingly, over 50% of respondents found the connection between HF and arrhythmia which accounts for nearly 50–60% of mortality in patients with HF [20]. Meanwhile, renal failure, which also accelerates the overall progression of HF [21], was listed by over 80% of MS and only one-third of HFDP and OP groups.

We would like to emphasize that among the HFDP, almost 80% pointed diet and over 70% selected physical activity as HF treatment methods. These results are better than in the MS group and in the OP group. In our opinion, they are satisfying considering that only 39.5% of the HFDP had previous personal contact with chronic HF. It could be caused by the fact that during the Heart Failure Awareness Day the information about importance of diet and exercise training was promoted from the main stage of the event. The overall results remain however unsatisfactory, especially among the MS group in case of HF literacy and according to the literature in case of knowledge of other cardiovascular diseases and new interventional treatment methods [22]. Among evidence-based HF treatment methods, respondents pointed correct answers in slightly more than 40% of cases. This result cannot be considered satisfactory. In the SHAPE study, only 65% of participants agreed with the statement that “drugs are the treatment of HF” [10].

Although, a statistically insignificant difference in the test result between HFC and No-HFC not matched in terms of age was found, the multivariate analysis showed that the result of score is independently affected by medical education and personal contact with HF. That results indicate that the real contact with patients suffering from HF raise awareness of this disease. This suggests that physicians should pay more attention to informing patients as well as their relatives, who often take care of the patients, especially the elders, regarding potential HF symptoms and proper treatment. Undoubtedly, this could provide better compliance, improve disease control and influence prognosis [8].

Another issue is the impact of IT devices on medical knowledge. Younger participants (MS and OP groups) more frequently used IT devices or smartphone

applications. New technologies seem to be an attractive approach to improve health literacy in the future.

Our study has several limitations. First, the questionnaires were distributed in different ways — via online form or collected in paper form during the HF Awareness Day. Mostly second, or third-year medical students were included in the MS group, so the group was not representative for the whole MS population. Nevertheless, the study was not set on direct analysis of variability of the HF knowledge level during medical studies. Third, the survey was filled only once by each participant of the study. The impact of participation in the HF Awareness Day has not been verified in subsequent time points, however the progress in the level of knowledge can be assessed in the future, using similar methodology. Fourth, the questionnaire was not validated in previous studies.

### **Conclusions**

As demonstrated, the level of HF knowledge is still insufficient across the analyzed groups. Further HF awareness campaigns including the current media and IT devices are necessary to gain adequate knowledge about HF in Polish society.

### **Conflict of interest**

None declared.

### **Authors' contributions**

Karol Nowak: conception, design of methodology, data collecting, analysis and interpretation, literature review, writer, critical review.

Konrad Stępień: conception, design of methodology, data collecting, analysis and interpretation, literature review, writer, critical review.

Patrycja Furczyńska: data collecting, analysis and interpretation, literature review, writer.

Izabella Owsianka: data collecting, analysis and interpretation, literature review, writer.

Aleksandra Włodarczyk: data collecting, analysis and interpretation, literature review.

Jarosław Zalewski: design of methodology, analysis and interpretation, critical review.

Jadwiga Nessler: literature review, analysis and interpretation, critical review.

Andrzej Gackowski: conception, design of methodology, analysis and interpretation, literature review, writer, critical review.

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